Typo-morphological inequities in urban green spaces: park design and informal adaptation in Delicias de Villa, Lima

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Revised version received 17 June 2025

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Abstract

This study examines how typo-morphological characteristics of urban green spaces in Lima's self-built neighbourhoods reflect tensions between informal growth, community needs and equitable access. Surveys of eight parks in Delicias de Villa (2021–22) reveal that, while spaces adapt to topography through mixed forms, limited green coverage and deteriorated infrastructure constrain functionality, prompting informal guerrilla gardens. Three parks lack formal recreational zoning, while institutional encroachment affects two others. Football dominates usage patterns, marginalizing other demographic groups despite connectivity from surrounding commercial/educational facilities. The analysis identifies key design limitations, including unshaded terraces and impermeable edges, that compound spatial inequities, while self-built adaptations demonstrate alternative possibilities. Findings highlight morphological barriers to equitable access; the tension between informal solutions and systemic neglect; and the potential for integrated green networks that combine formal planning with neighbourhood self-organization patterns and hybrid zoning. The study contributes to understanding how physical design mediates social equity in the public spaces of informal settlements.

Keywords

typo-morphological analysis; Latin American urban peripheries; informal urban growth; public space equity; adaptive reuse

Urban Morphology (2026) 30 (1), 6–22; DOI:10.51347/UM30.0003; ISSN 1027-4278;

Introduction

The rapid and uncontrolled urban growth experienced by the most important cities in Latin America has, in recent years, directly influenced the decrease in their urban green spaces (UGS) (Flores *et al.*, 2022). This problem is evident in the growing body of scientific literature that addresses the study of these spaces, mainly in urban parks, emphasizing their role as providers of ecosystem services and biodiversity (de Macedo *et al.*, 2021). However, the great economic and social inequalities in the region are manifested, in turn, in the physical configuration of its cities, generating spatial fragmentation and inequalities in the access to urban greenery (Wright Wendel *et al.*, 2012). Although urban parks enhance the value of adjacent real estate and, hence, are increasingly attractive to investors and their target audience (Halecki *et al.*, 2023), they face problems of lack of maintenance, security and inadequate investment (Alcocer-García *et al.*, 2022). These challenges are particularly pronounced in self-built neighbourhoods, where unregulated growth leaves little room for UGS; as in Lima, Peru, where over 90 per cent of urban expansion in the last two decades has been informal (Espinoza and Fort, 2020). Here, the lack of urban planning and stark inequities are reflected in an average of only 3.5 m^2 of public green space per inhabitant, while only 4 of its 43 districts exceed 9 m^2 (Moreno *et al.*, 2024).

Compounding this issue is the limited research on the quality of public spaces in these areas, particularly regarding their design (Schroeder, 2024). Although, self-built neighbourhoods in Lima and the rest of Latin America have been extensively subject to social science analyses, there is still limited evidence focused on their typologies and

urban forms (Pesántez-Yépez and Cabrera-Jara, 2024). This is even more true for UGS which, like other public spaces fostering community life in these contexts, are often scarce (Caquimbo Salazar *et al.*, 2017). In Lima, UGS in informal settlements emerged post-1961 Shanty Town Law (Matos Mar, 2012), with parks often retrofitted into leftover spaces. Their form reflects state neglect and incremental community adaptations, while there is a lack of studies to understand and improve their functioning, from their design and pedestrian scale. This study asks how do the typo-morphological characteristics of UGS in Delicias de Villa reflect tensions between informal urban growth, community needs, and equitable access? We argue that morphological surveys reveal design barriers (impermeable edges, unshaded terraces) that perpetuate exclusion, despite community-led adaptations.

The typo-morphological approach and urban greenery in self-built neighbourhoods

The typo-morphological approach in architecture and urban design combines two fields of study that have traditionally been treated independently. While urban morphology considers the individual characteristics that shape the physical form of the city, typology studies the common characteristics in the different architectures of the city and the relationship between them, describing a kind of code (Đjokić, 2009). Typo-morphological approaches combine urban-architectural and historico-geographical perspectives (Mobaraki and Oktay Vehbi, 2022) to analyze spatial forms and typological processes in both historic and contemporary contexts (Jiao *et al.*, 2023). Both urban form and architectural type are a product of multiple factors that can include socio-political, economic and geographic characteristics (Gao *et al.*, 2023). Thus, morphology offers a broad basis for social and cultural critique (Kropf, 2017); and can play a significant role in understanding socio-spatial inequities. On the other hand, it is important to understand typology not as a fixed but a flexible classification method, from which one can start to innovate and provides a comparative approach that complements the individual focus of morphological analysis (Leite and Justo, 2017). Recent typo-morphological research, such as the analysis of Guayaquil's working-class neighbourhoods, demonstrates the value of a multi-scale approach, highlighting how house fronts and passages mediate between public and private spaces (Bamba Vicente *et al.*, 2021). However, this approach often overlooks the unique challenges of informal settlements, where urban growth and development are largely unregulated.

On the other hand, UGS are usually defined as sectors of turf, shrubs and trees, where abundant vegetation and natural elements provide physical benefits, such as cleaner air, to the rest of the urban area (Ayala-Azcárraga *et al.*, 2019). Various studies highlight the role of UGS in physical and mental health, and the creation of a sustainable relationship between human beings and their built environment. For example, Cheng *et al.* (2021) show how the presence of water, low soil temperatures and minimal impermeable soil in urban parks are related to high happiness rates in dense populations. Similarly, parks with diverse natural sounds are perceived as more restorative, while anthropogenic noise diminishes their benefits (Uebel *et al.*, 2021). In Huancayo, Peru, the vitality of urban parks has been linked to tree configuration, wildlife accessibility, land cover and landscape design (Gonzáles Quispe and Orellana Tapia, 2024). Despite these benefits, the inequitable distribution of UGS reinforces spatial exclusion, as proximity to green spaces typically correlates with unaffordable housing markets for lower-income residents (De Haas *et al.*, 2021). Therefore, it is urgent to solve the problems generated by current distributions, either by enhancing existing green spaces or creating new green infrastructure projects. Consequently, it is necessary for UGS planning to value both their configuration and design aspects.

In this sense, there is a recent body of scientific literature that has addressed the

study of UGS typology and/or morphology. Kim *et al*. (2020) emphasize the essential role of informal green spaces (perceived as nature by the population) for human well-being in urban interstices such as street edges, canals or abandoned lots; though public perceptions vary across nine distinct typologies. At a morphological level, Zhao *et al.* (2023) examine the characteristics of refuge in urban parks, showing how spaces surrounded by trees and plants motivate a sense of shelter in users, which is closely linked to physical properties of their design, such as surface area, green coverage and enclosure capacity. A local precedent for this study is the analysis of six Spanish squares in the Peruvian Andes, which compares their typological and morphological characteristics, including gardens, to understand their situational qualities (Orellana Tapia *et al*., 2022). However, much of the existing literature relies on quantitative metrics such as green area per capita, often neglecting the design, functionality, and immediate contexts of UGS, particularly in informal or self-built neighbourhoods.

Self-built neighbourhoods, often equated with marginal settlements, are characterized by self-produced, incremental growth and a lack of formal planning (Avellaneda, 2011; Connolly, 2013). In Latin America, these neighbourhoods emerge in diverse landscapes, from highlands to coastal areas, yet share common traits of informality and state neglect (Giannotti, 2014). Matos Mar (2012) traces their origins in Peru to the 1961 Shanty Town Law, which legalized land invasions and established frameworks for informal settlements. This process reflects the agency of low-income families in the absence of state-led urban planning, resulting in cities shaped by individual efforts rather than coordinated development (Takano and Tokeshi, 2007). Consequently, UGS and their ecosystem services are rarely prioritized in these contexts, perpetuating inequalities in access to green spaces and their associated benefits. This gap in research and planning underscores the need for a critical re-evaluation of UGS in self-built neighbourhoods, focusing on their design, functionality, and socio-spatial integration.

Methodology

Chorrillos, one of Lima's 49 districts (with a population of 351,582 in 2020), combines formal and informal urban fabrics, with Delicias de Villa representing a unique self-built neighbourhood (population: 20,000) on former agricultural land. Its proximity to a nature reserve and low-density regulations makes it an ideal case study for examining the tensions between informal growth, community needs, and equitable access to green space (Figure 1).

This study examines eight parks in Delicias de Villa (Table 1) through a typo-morphological lens with fieldwork conducted between November 2021 and February 2022 (Covid quarantine in Lima ended on July 2020, public spaces were fully functioning during fieldwork), as part of a research project funded by Universidad Científica del Sur. The research combines documentary and spatial analysis with pedestrian-scale field observations to understand how park morphology mediates accessibility in this self-built neighbourhood.

The research employed a three-phase approach. First, documentary analysis of municipal archives and the National Institute of Statistics and Informatics (INEI) datasets established the historical and planning context of these parks as retrofitted interstitial spaces. Secondly, on-site surveys applied Gehl's (1986) "soft edges" framework with precise operational definitions for surrounding buildings: permeable edges were categorized as soft (80 per cent visual/physical access), intermediate (partial permeability), or hard (opaque barriers). Also, park measurements of path widths, stair dimensions and shaded route continuity were taken. These physical metrics were complemented by systematic observations of user behaviour, documenting time-specific patterns of park use across gender and age groups to identify exclusionary design features.

Thirdly, spatial documentation integrated these findings through annotated architectural plans and sketches, highlighting tensions between formal design shortcomings (such as the 36.25 per cent impermeable edges limiting accessibility) and informal community

Figure 1. a) Metropolitan Lima and Chorrillos district. b) Parks location in Delicias de Villa neighbourhood. Numbers correspond to Table 1 (source: based on work undertaken for this study by architecture students C. Cueva, A. Arellano and J. Linares, 2024).

Table 1. Park areas in Delicias de Villa.

Parks	Total Area (m^2)	Green coverage (%)
1. Cordillera Central	4,408	21.32
2. Defensores del Zigzag	10,901	8.78
3. El Mirador (Vigía de la cruz)	10,270	8
4. Capitán FAP José Abelardo Quiñones	11,480	6.56
5. Jesús Artesano	4,463.87	100
6. Humedal	167,755.75	31
7. Micaela Bastidas	10,443	73.08
8. Capitán Juan Fanning García	5,215	20
	Average (%)	21.22

adaptations (such as guerrilla gardens). Particular attention was paid to pedestrian circulation, with shaded path connectivity and stairway widths (ranging from 1.35 m to 3.00 m across sites) analyzed in relation to Lima's mild climate conditions (15–25°C) that make year-round outdoor activity possible but shade provision critical. Part of the graphic material supporting these findings was created by students of the Urban Project 3 course at the Universidad Científica del Sur within this research project.

This methodology bridges the literature gap by demonstrating how typo-morphological analysis can reveal the pedestrian-scale consequences of design decisions in informal settlements, from how 1.5 m-wide paths shape elderly access to how unshaded terraces reduce afternoon usage. The approach shows how spatial metrics correlate with observed social patterns of inclusion and exclusion in Lima's rapidly-urbanizing periphery.

Results

The typo-morphological analysis of the eight parks in Delicias de Villa (Figures 2 and 3)

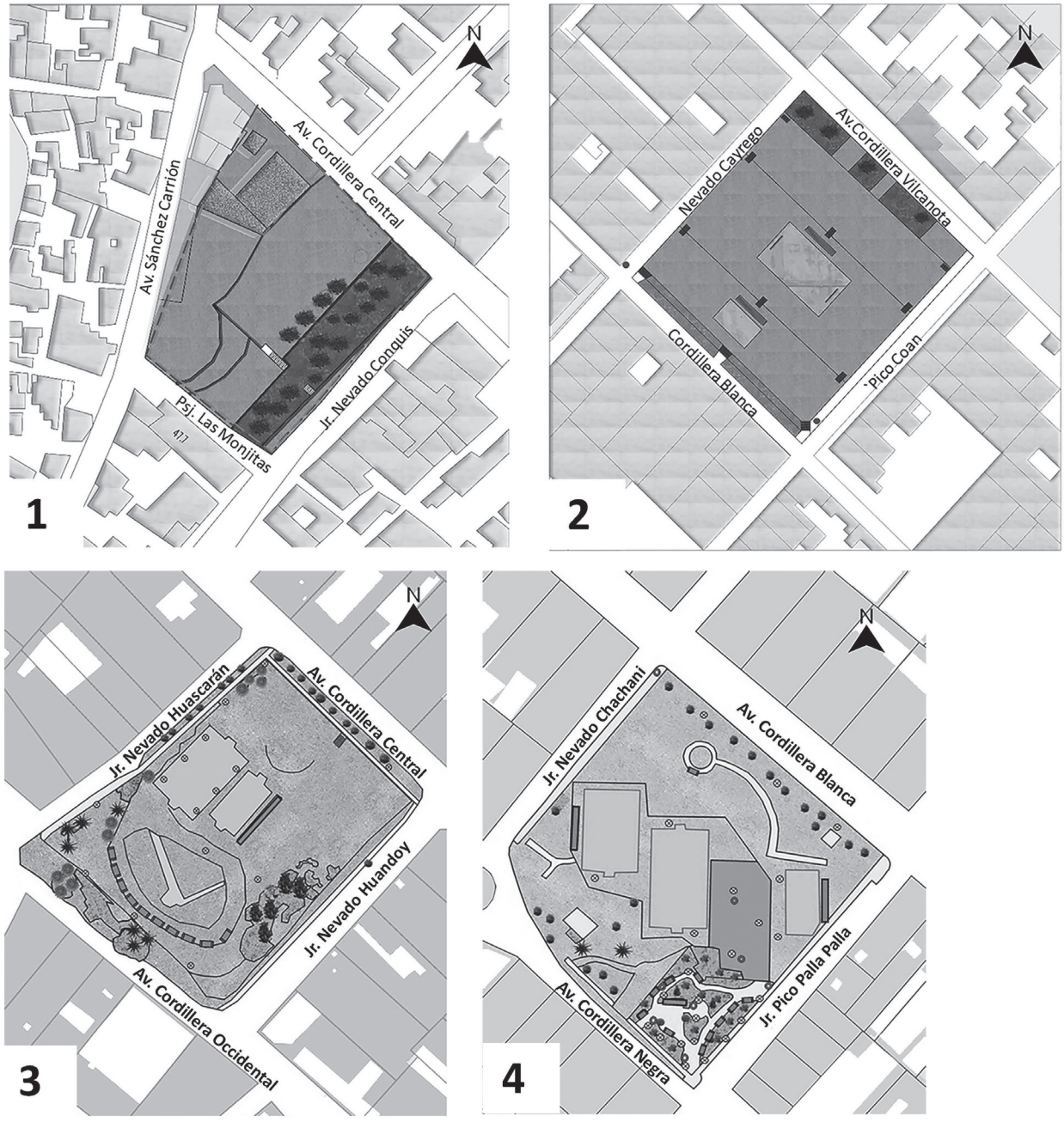

Figure 2. Park plans in Delicias de Villa: Cordillera Central (1), Defensores del Zigzag (2), El Mirador (3) and Quiñones (4). Green coverage represented by dark grey (source: based on work undertaken for this study by architecture students P. Balboa, M. Pereda, K. Reduciendo, J. Corcuera and J. Cordero, 2024).

reveals a dynamic relationship between historical processes, spatial configurations, and community practices. These parks reflect both the constraints of informal urbanization and the resilience of local adaptations. Their forms, functions and environmental conditions are shaped by incremental development, institutional neglect, and grassroots interventions, offering insights into the challenges and possibilities of urban green spaces in Latin America's peripheries.

Historical development and socio-spatial transformations

The parks emerged from a historical trajectory marked by informal settlement growth and ad-hoc planning. Originally part of the sixteenth-century colonial estate of Villa, the area transitioned into smaller agricultural plots before becoming a self-built neighbourhood from 1947 onwards (Flores Zúñiga, 2008). The designation of parks in the 1950s and 1960s was often

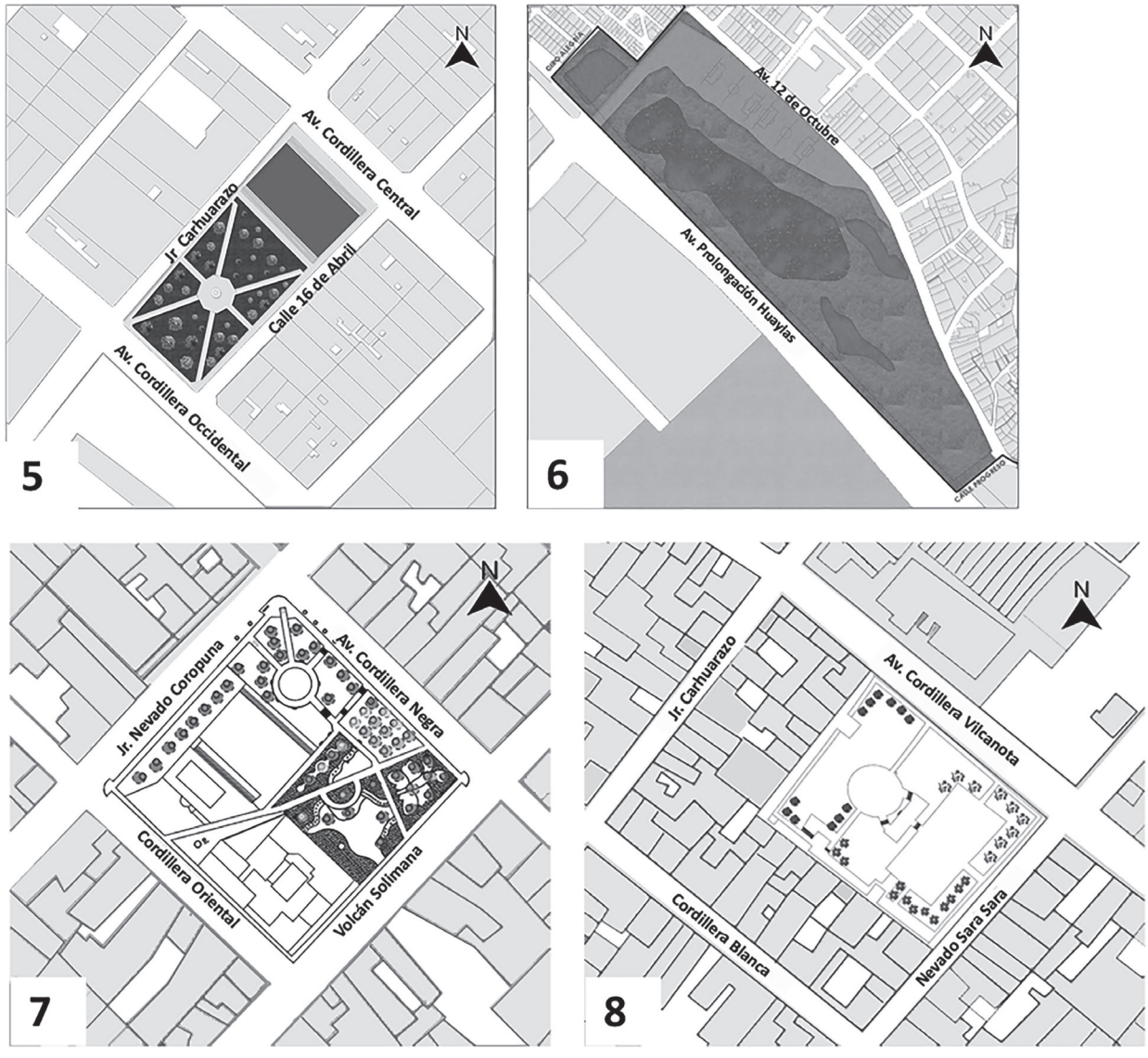

Figure 3. Park plans in Delicias de Villa: Jesús Artesano (5), Humedal (6), Micaela Bastidas (7) and Fanning (8). Green coverage and wetland represented by dark grey (source: based on work undertaken for this study by architecture students F. Bancayán, J. Cavero, M. Robles, E. Quintana and I. Rivera, 2024).

incidental, with many spaces retrofitted into leftover or topographically-challenging lots by community adaptations. For instance, El Mirador (10,270 m^2) (Figure 2), Jesús Artesano (4,463.87 m^2), and Micaela Bastidas (10,443 m^2) (Figure 3) persisted as green areas due to their steep slopes, which deterred housing construction. Subsequently, the Metropolitan Municipality of Lima played a significant role in the conversion of five vacant lots into sports facilities with concrete football and basketball courts in the 1980s. This municipal intervention represented a rare instance of institutional engagement in the neighbourhood's public space development. However, these formal interventions coexisted with ongoing informal processes. Institutional encroachments, such as the partial occupation of Micaela Bastidas by a school in 1982, and the construction of a church in Cordillera Central (4,408 m^2) in 2015, highlight the tension between public space preservation and competing land uses in informal contexts. This dual trajectory, combining municipal projects with organic community adaptations, created a patchwork of public spaces with varying degrees of formality and functionality. The historical layering is particularly visible in parks like Humedal (167,755.75 m^2), where sports facilities gradually expanded into adjacent wetland areas through informal use.

Morphological adaptations and functional limitations

The physical forms of the parks are deeply influenced by Lima's arid climate and rugged terrain. Terraced designs, seen in Cordillera Central (with only 21.32 per cent green coverage) (Figure 4) and Defensores del Zigzag (8.78 per cent green coverage) (Figure 5), address slope instability but often result in exposed, impermeable surfaces that lack shade and vegetation. The edge permeability data (Table 2) shows these terraced parks have intermediate permeability (Cordillera Central, 66 per cent soft edges; Defensores del Zigzag, 50 per cent), creating visual connections while maintaining physical separation. The average green coverage across all parks stands at just 21.22 per cent, with Jesús Artesano (100 per cent) and Micaela Bastidas (73.08 per cent) as notable exceptions (Table 1).

Guerrilla gardens in Defensores del Zigzag, El Mirador and Humedal parks (Figures 6 and 7) exemplify community-driven adaptation with recycled materials. These spaces, often located along permeable edges (57 per cent soft edges at El Mirador), feature drought-resistant species and demonstrate how informal interventions can enhance biodiversity. However, their potential is limited by inconsistent institutional support and the predominance of sports facilities, which reinforces gendered usage patterns.

Connectivity presents another challenge, with significant variations in pedestrian infrastructure. Stairway widths range from narrow 1.35 m paths in Cordillera Central to more generous 3.00 m passages in Capitán Juan Fanning García (5,215 m^2) (Figure 8), while shaded pathways vary dramatically in length, from just 6 m in Jesús Artesano to 102.34 m in Humedal, the largest park. These disparities in accessibility infrastructure particularly affect elderly and disabled residents. Functionally, sports dominate with football courts present in all parks (Figure 9). While these facilities respond to local demand, their dominance sidelines other uses (such as cultural events and children's games), reinforcing gendered and age-based exclusions. The predominant use of easily available materials including earth, stone, concrete and metal arches highlights the overly pragmatic nature of decision makers concerning UGS design, solely based on affordability, standardization and low maintenance.

Environmental constraints and equity implications

Lima's arid climate exacerbates the environmental limitations of the parks. The scarcity of water and loss of agricultural land have made vegetation maintenance difficult, particularly in parks such as Humedal, where only 31 per cent of the extensive area maintains functional green space. Edge conditions further compound these issues: while many street fronts are permeable (enhancing safety and access), impermeable barriers including the chapel walls in Cordillera Central disrupt pedestrian flow and microclimatic comfort.

Socially, the design of the parks perpetuates inequities. Parks with more permeable edges show greater diversity of users, particularly

Figure 4. View of Cordillera Central (source: photograph by architecture student K. Reduciendo, 2022).

Figure 5. View of Defensores del Zigzag (source: photograph by architecture student K. Reduciendo, 2022).

Table 2. Edge permeability around parks.

Parks	Streets	Edges permeability (No.)			Total building fronts per street
		Soft	Intermediate	Hard	
1. Cordillera Central	Cordillera Central	5	2	4	11
	Sánchez Carrión	8	1	0	9
	Las Monjitas	3	0	0	3
	Nevado Conquis	5	1	3	9
	SUBTOTAL	21	4	7	32
	%	66	12	22	100
2. Defensores del Zigzag	Nevado Cayrego	4	0	6	10
	Cordillera Blanca	8	0	0	8
	Pico Coan	5	1	6	12
	Cordillera Vilcanota	2	4	2	8
	SUBTOTAL	19	5	14	38
	%	50	13	37	100
3. El Mirador	Nevado Huascarán	4	0	6	10
	Cordillera Central	7	1	0	8
	Nevado huandoy	7	0	3	10
	Cordillera Occidental	2	0	5	7
	SUBTOTAL	20	1	14	35
	%	57	3	40	100
4. Capitán FAP José Abelardo Quiñones	Chachani	6	0	5	11
	Cordillera Blanca	4	3	1	8
	Pico Palla Palla	6	1	2	9
	Cordillera Negra	5	1	3	9
	SUBTOTAL	21	5	11	37
	%	57	13	30	100
5. Jesús Artesano	Cordillera Occidental	1	0	1	2
	15 de Abril	7	1	2	10
	Cordillera Central	6	0	2	8
	Carhuarazo	3	0	2	5
	SUBTOTAL	17	1	7	25
	%	68	4	28	100
6. Humedal	Ciro Alegría	1	0	2	3
	12 de octubre	46	3	22	71
	Mariano Melgar	1	0	7	8
	Los Canelos	3	0	4	7
	Progreso	1	0	1	2
	SUBTOTAL	52	3	36	91
	%	57	3	40	100

Continued/

women, children and elderly residents who frequent the guerrilla gardens along soft edges. In contrast, despite their relatively good connectivity, sports-dominated parks like Capitán FAP José Abelardo Quiñones (57 per cent soft edges) and El Mirador still primarily cater to young men and constrain comfortable use with limited shaded paths (18.80 m and 33.34 m respectively) and narrow accesses (Figure 9).

Table 2. (*Continued*)

Parks	Streets	Edges permeability (No.)			Total building fronts per street
		Soft	Intermediate	Hard	
7. Micaela Bastidas	Nevado Coropuna	6	0	6	12
	Cordillera Negra	11	0	1	12
	Volcan Solimana	5	0	4	9
	Cordillera Oriental	4	0	1	5
	SUBTOTAL	26	0	12	38
	%	68	0	32	100
8. Capitán Juan Fanning García	Adjoining passage 1	4	0	4	8
	Adjoining passage 2	3	0	5	8
	Nevado Sara Sara	2	0	5	7
	Cordillera Vilcanota	0	0	1	1
	SUBTOTAL	9	0	15	24
	%	37	0	63	100

Figure 6. Guerrilla gardens in Defensores del Zigzag (a), El Mirador (b), Humedal (c) and Eriobotrya japonica planting (d) (source: photographs by architecture students P. Balboa, M. Pereda, K. Reduciendo, J. Corcuera and J. Cordero, 2024).

Figure 7. Ficus Benjamina (e), Phoenix dactylifera (f) and Myoporum laetum (g) (source: photographs by architecture students F. Bancayán, J. Cavero and I. Rivera, 2024).

Figure 8. View of Capitán Juan Fanning García, 2022. (source: J. Del Castillo)

Toward integrated green networks

The parks of Delicias de Villa embody the contradictions of informal urbanism. Their typo-morphological features, from the stark variations in green coverage (ranging from 6.56 per cent in Capitán FAP José Abelardo Quiñones to 100 per cent in Jesús Artesano) to the inconsistent pedestrian infrastructure, reveal how design barriers reinforce exclusion, even as grassroots adaptations suggest alternative possibilities (Table 3). This evidence underscores the need for policies that address

Figure 9. Sports academy in Jesus Artesano (a), baseball game in Humedal (b) and volleyball in Micaela Bastidas (c) (source: based on work undertaken for this study by architecture students F. Bancayán, M. Robles and E. Quintana, 2024).

shade provision, biodiversity, inclusive programming and balanced edge permeability. By leveraging existing community initiatives while addressing systemic gaps in planning, these spaces could evolve into a cohesive green network that better serves the neighbourhood's diverse needs. The data demonstrates that equitable urban design in informal settlements requires both respecting local adaptation patterns and introducing targeted improvements to spatial configurations.

Discussion

The findings from Delicias de Villa present a critical examination of how typo-morphological configurations mediate social equity in urban green spaces (UGS) within Lima's informal settlements. Three fundamental tensions emerge from our analysis that advance current understanding of public space dynamics in Latin American peripheries.

First, the data reveals a paradox between physical accessibility and social exclusion. While Jesús Artesano and Micaela Bastidas (each with 68 per cent soft edges) appear welcoming (Table 2), the 36 per cent average of impermeable edges creates socially restrictive spaces. This is particularly evident in Cordillera Central, where 1.35 m stair widths (Table 3) create barriers for elderly and disabled users, corroborating the findings of Wright Wendel *et al*. (2012) on exclusionary design in Santa Cruz, Bolivia.

Secondly, the vegetation analysis exposes a governance vacuum. The stark variation in green coverage (6.56–100 per cent in Table 1) reflects systemic neglect comparable to conditions in the peripheral parks of Buenos Aires (Guida, 2019). Yet the guerrilla gardens (Figure 6) demonstrate community capacity

to cultivate native species like molle (*Schinus molle*) with minimal resources, an important finding that aligns with Kim *et al.*'s (2020) concept of informal green infrastructure but remains underutilized due to institutional disengagement. The reliance on local materials such as earth, stone, concrete and metal arches ensures low maintenance costs and homogeneity, but it also underscores a lack of innovation and investment in UGS design. This contrasts sharply with evidence that the public prefers more complex, vegetation-rich spaces (Liang *et al.*, 2023), which presents a challenge to improve the quality and functionality of these spaces.

Thirdly, the functional analysis reveals a participation imbalance. While sports facilities respond to local demand (Takano and Tokeshi, 2007), their male-dominated design perpetuates spatial inequities (Hernández García, 2013) with limited areas dedicated to women, children or elderly users. This contrasts sharply with Ignatieva and Mofrad's (2023) evidence on the benefits of inclusive park design, and underscores the need for multifunctional, safe and accessible spaces (Kefale *et al.*, 2023). On the other hand, while commercial and educational are the most frequent urban facilities and could improve the accessibility to UGS (McCarthy and Russo, 2023), the encroachment of a church and school on parkland exemplifies the neighbourhood's informal origins and weak regulatory frameworks.

Our typo-morphological approach proves particularly valuable in bridging the gap between physical analysis and social equity concerns identified by Schroeder (2024). The methodology demonstrates how quantitative metrics (Tables 1–3) can reveal pedestrian-scale barriers to inclusion while highlighting community-driven solutions like the guerrilla gardens that could inform policy.

Conclusions

This study advances the discourse on urban green spaces (UGS) in informal settlements by synthesizing typo-morphological analysis with social equity considerations, yielding three key conclusions with theoretical and practical implications. First, pedestrian-scale design critically influences social inclusion. The morphological evidence demonstrates how seemingly minor design elements (such as stair widths and impermeable edge conditions) disproportionately restrict accessibility for marginalized groups, including the elderly and disabled. Conversely, parks with 60–70 per cent soft edges exhibit higher social diversity, reinforcing the need for inclusive design standards that prioritize permeable boundaries and pedestrian-friendly infrastructure. These findings advocate for targeted retrofits to mitigate exclusionary spatial practices in Lima's informal settlements.

Secondly, community-driven innovations demand institutional recognition. The guerrilla gardens, thriving with drought-resistant native species, exemplify the untapped potential of informal green infrastructure. However, their ad-hoc nature reflects systemic governance gaps. The promotion of formalized alliances that integrate local knowledge with municipal support could enhance biodiversity, reduce maintenance costs, and foster socio-ecological resilience in arid urban contexts.

Thirdly, integrated planning is essential to address spatial inequities. The encroachment of institutional structures (churches and schools) into parkland and the dominance of male-oriented sports facilities reveal the consequences of fragmented planning. To counter this, the study proposes a neighbourhood-scale green network model, which prioritizes the protection of existing community-led initiatives, retrofitting of exclusionary design features, and collaborative design of multifunctional zones to accommodate diverse user needs.

Future research is needed to explore the transferability of these findings to other arid, informal urban contexts, with emphasis on climate-adaptive vegetation strategies and participatory design methodologies. The typo-morphological approach employed here offers a replicable framework for such comparative studies, bridging physical design analysis with equity-oriented urban governance. By prioritizing both community agency and

Table 3. Parks comparative analysis according to typological and morphological features.

Category	Feature	Conventional Analysis Link	1. Cordillera Central	2. Defensores del Zigzag	3. El Mirador
Morphology	**Edge permeability**	*Gehl (1986):* Soft edges enhance accessibility/ social interaction; hard edges create barriers.	Soft 66%, Intermediate 12%, Hard 22%	Soft 50%, Intermediate 13%, Hard 37%	Soft 57%, Intermediate 3%, Hard fronts 40%
	Form (shape)	Kropf (2017): Irregular forms reflect adaptive, incremental urban growth.	Trapezoid. Irregular	Square. Regular	Pentagon. Irregular
	Pedestrian accesibility	Wright Wendel et al. (2012): Access inequalities and barriers exclude elderly/disabled users	Stairways width: 1 × 1.80 m. Shaded paths: 15%	Stairways width: 11 × 2.00 m. Shaded paths: 5%	Stairways width: 1 × 1.50 m; 2 × 2.00 m. Shaded paths: 3%
Typology	**Function**	*Hernández García (2013):* Sports-dominated (male-centric), reinforces gendered exclusion; lacks multifunctionality.	Sports activities. Religious ceremonies. Alcohol and drug use. Dump. No monument.	Sports activities. Folk dances. Passive recreation. Guerrilla gardens. No monument	Sports activities. Religious ceremonies. Passive recreation. Guerrilla gardens. With monument
	Materiality	*Caquimbo Salazar et al. (2017):* Local materials reflect low-cost, informal adaptations.	Earth, Stone, Concrete, Vegetation, Metal	Earth, Stone, Concrete, Vegetation, Wood, Metal	Earth, Stone, Concrete, Vegetation, Metal
	Vegetation	*Liang et al. (2023):* Native species support biodiversity; exotic species may lack resilience.	*Prosopis pallida, Mangifera indica, Delonix regia, Schinus molle, Agave fourcroydes, Myoporum laetum, Ficus Benjamina, Browningia candelaris, Sapindus saponaria, Musa paradisiaca L., Sabal Palmetto*	*Eriobotrya japonica, Ficus Benjamina, Ficus elastica, Lantana camara, Geranium, Agave fourcroydes, Musa paradisiaca L., Tagetes minuta, Plantago major*	*Ficus Benjamina, Yucca gloriosa, Browningia candelaris, Schinus molle, Brugmansia, Dichondra*
Hybrid features	**Architectural Landmarks**	Schroeder (2024): Encroachment reflects weak governance but adaptive reuse.	Church inside the park. 4 shops.	5 shops	Private school. 3 shops

4. Capitán FAP José Abelardo Quiñones	5. Jesús Artesano	6. Humedal	7. Micaela Bastidas	8. Capitán Juan Fanning García
Soft 57%, Intermediate 13%, Hard 30%	Soft 68%, Intermediate 4%, Hard fronts 28%	Soft 57%, Intermediate 3%, Hard fronts 40%	Soft 68%, Intermediate 0.00%, Hard 32%	Soft 37%, Intermediate 0%, Hard 63%
Trapezoid with curved side. Irregular.	Rectangle. Regular	Hexagon. Irregular	Square. Regular	Rectangle. Regular
Stairways width: 3 × 2.00 m. Shaded paths: 2%	Stairways width: 4 × 2.20 m; 2 × 2.70 m. Shaded paths: 1%	No stairways. Shaded paths: 5%	Stairways width: 1x 1.50 m; 4 × 2.50 m. Shaded paths: 5%	Stairways width: 2 × 1.80 m; 1 × 2.00 m; 1 × 2.80 m; 2 × 3.00 m. Shaded paths: 12%
Sports activities. Passive recreation. Children's games. With monument	Sports activities. Sports academies. Religious ceremonies. Passive recreation. Street food. Garbage collection. With monument	Sports activities. Municipal events. Passive recreation. Street food. Neighborhood councils. Guerrilla gardens. Ecological tourism. Research. No monument	Sports activities. Passive recreation. Children's games. No monument	Sports activities. Passive recreation. Children's games. With monument
Earth, Stone, Concrete, Vegetation, Wood, Metal	Concrete, Vegetation, Synthetic Grass, Metal	Earth, Stone, Concrete, Vegetation, Metal	Earth, Stone, Concrete, Vegetation, Metal	Earth, Stone, Concrete, Vegetation, Wood, Metal, Rubber
Bougainvillea, Pinus, Yucca gloriosa, Ficus Benjamina, Axonopus compressus	*Phoenix dactylifera, Ficus Benjamina, Sapindus saponaria, Axonopus compressus*	*Casuarina equisetifolia, Sapindus saponaria, Tradescantia, Distichlis spicata, Schoenoplectus californicus, Washingtonia*	*Agave fourcroydes, Aloe vera, Croton, Sisymbrium officinale, Ficus Benjamina, Ehrharta erecta, Schinus molle, Primula*	*Ficus Benjamina, Opuntia ficus-indica, Aloe vera, Schinus molle, Trichocereus macrogonus var. Pachanoi*
Private school. 4 shops	Parish. Early childhood education center. Health center. Community premises. 5 shops	Accounting firm. Legal firm. 8 shops	Early childhood education center within the park. 9 shops	Naval base high school. 3 shops

institutional accountability, this research contributes to a more nuanced understanding of how UGS can foster social inclusion in rapidly-urbanizing peripheries.

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