Narrative exploration of cultural ecosystem services in the ravines of Moyobamba

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The urban ravines of Moyobamba, despite being considered natural spaces, are fundamental spaces for citizen participation, related to a sociocultural issue of local identity, social interaction and community welfare. Despite this, their current state has been affected, which could lead to a negative perception of the uses of these spaces. Therefore, this research analyzes the articulation of the cultural ecosystem services (CES) of the ravines and their level of conservation and through a mixed method, combining quantitative and qualitative approach, through semi-structured interviews to residents and experts on the subject of conservation of the ravines and the perception of their valuation was evaluated, in addition, through direct observation and documentary review, the analysis of their current physical state was made. It was found that the residents who live near the ravines or make use of them, value these spaces for a sense of relevance, promoting social interaction that offer opportunities for ecotourism and recreational activities. However, it was identified that the physical condition presents moderate and severe environmental deterioration, which has reduced the influx of visitors and the quality of the residents' experience. The results show that the ravines should be preserved for their ecological, cultural and social condition. The loss of spatial quality limits activities and reduces the positive impact of community participation. It is recommended that public conservation policies be strengthened to increase public awareness to ensure the valuation of these ecosystems and the legacy for future generations.

KEYWORDS

ecosystem services, cultural ecosystem services, urban ravines, conservation status, Social Interaction

1 Introduction

Modern cities are constantly expanding, bringing with them a series of environmental and social challenges that can significantly impact the quality of life of their residents. One of the most pressing concerns is the steady loss of green spaces and the growing disconnect between people and nature—an issue that has been linked to physical and mental health problems, decreased social wellbeing, and a weakening sense of community belonging (Kosanic and Petzold, 2020).

Amid these challenges, urban forests stand out as vital spaces with immense potential to promote sustainability and enhance urban life. These green areas not only provide environmental benefits but also play a crucial role in fostering social interaction and

wellbeing. However, despite their significance, urban forests are often undervalued and neglected in city planning, leaving their full potential untapped. However, they provide a wide range of ecosystem services (ES) that directly benefit local communities (Gómez-Baggethun et al., 2019; Ocelli Pinheiro et al., 2021), The ES refer to the variety of benefits obtained from ecosystems, specifically from urban nature (Baumeister et al., 2020). They are defined as the goods and services that ecosystems provide to humans, which are essential for their wellbeing. These services include functions in urban areas that play a significant role in enhancing quality of life (De Luca et al., 2021; Pukowiec-Kurda, 2022). They are classified into four types: provisioning, regulating, supporting, and cultural (MEA, 2005, p. 40). Supporting services maintain the earth's living conditions through nutrient cycling, while provisioning services provide food, timber, and fuel. Regulating services contribute to temperature reduction and disaster prevention. All of these represent material benefits (Winkler et al., 2017), while cultural ecosystem services (CES) are unique in providing non-material values (Cheng et al., 2019) derived from residents' direct experiences with nature (green and blue spaces) (Kaltenborn et al., 2017). These experiences, whether cognitive or aesthetic (Montes-Pulido and Forero, 2021), are considered some of the most valuable ecosystem services due to their direct impact on human wellbeing (Hegetschweiler et al., 2022). They play a fundamental role in people's lives, contributing to physical and mental health, strengthening social bonds, reinforcing cultural identity, and fostering a deeper connection with nature (Wang et al., 2022).

In recent years, research on Cultural Ecosystem Services (CES) has gained prominence, emphasizing their importance in sustainable ecosystem management and overall human wellbeing. Numerous studies have explored CES in various urban settings, including forests, parks, rivers, and coastal areas (Holzer et al., 2022; Masiero et al., 2022). However, urban ravines remain an underexplored area in CES research. Due to their steep terrain and close integration with urban spaces, these environments pose unique challenges for assessment and management (Plieninger et al., 2013; Andersson et al., 2015).

A study on Amazonian cities in Peru revealed a significant deficit in public green spaces: only 10 out of the 22 cities analyzed had at least 1 m^2 of public green space per resident. Juanjuí had the highest availability (3.40 m^2/capita), while Chachapoyas recorded the lowest (0.09 m^2/capita) (Zucchetti and Freundt, 2020). Despite being surrounded by rich natural vegetation; these cities struggle with a lack of accessible public green spaces in their urban cores—an ironic contrast given their location within the tropical rainforest. As a result, they are losing valuable CES that could enhance residents' wellbeing, significantly impacting their quality of life. Moyobamba, considered an Amazonian city, has 1.31 m^2/capita of public green space, a large proportion of which is found in its ravines (156.74 ha of vegetation cover) (see Figure 1). Since 19 July 1996, these ravines have been designated as an "Intangible Zone for the Refuge of Animal and Plant Life, for reforestation, research, or ecotourism purposes" through Municipal Decree No. 68010-96-MPM/A. This network of ravines crosses the urban core and connects with nearby natural areas. However, their potential has been overshadowed by neglect and degradation caused by unregulated urban expansion, wastewater pollution, environmental deterioration, and a lack of urban planning (Inforegion, 2024).

In this context, it is essential to assess the CES present in Moyobamba's ravines and their relationship with the current conservation status of these spaces. This information is key to guiding management and conservation strategies, promoting their sustainable use, and strengthening community wellbeing. To understand the relationship between the valuation of CES in the ravines and their conservation status, three specific objectives were established: (1) to diagnose the conservation status of the ravines; (2) to identify and geolocate CES using thematic maps within the ravines; and (3) to evaluate residents' perception and valuation of CES in these areas.

2 Materials and methods

2.1 Study site

The study area is located in the district of Moyobamba, which is part of the province of Moyobamba, the capital of the San Martín region. It is situated on a plateau at 860 m above sea level and 90 m above the Río Mayo, which forms the Moyobamba valley, a typical mountainous territory.
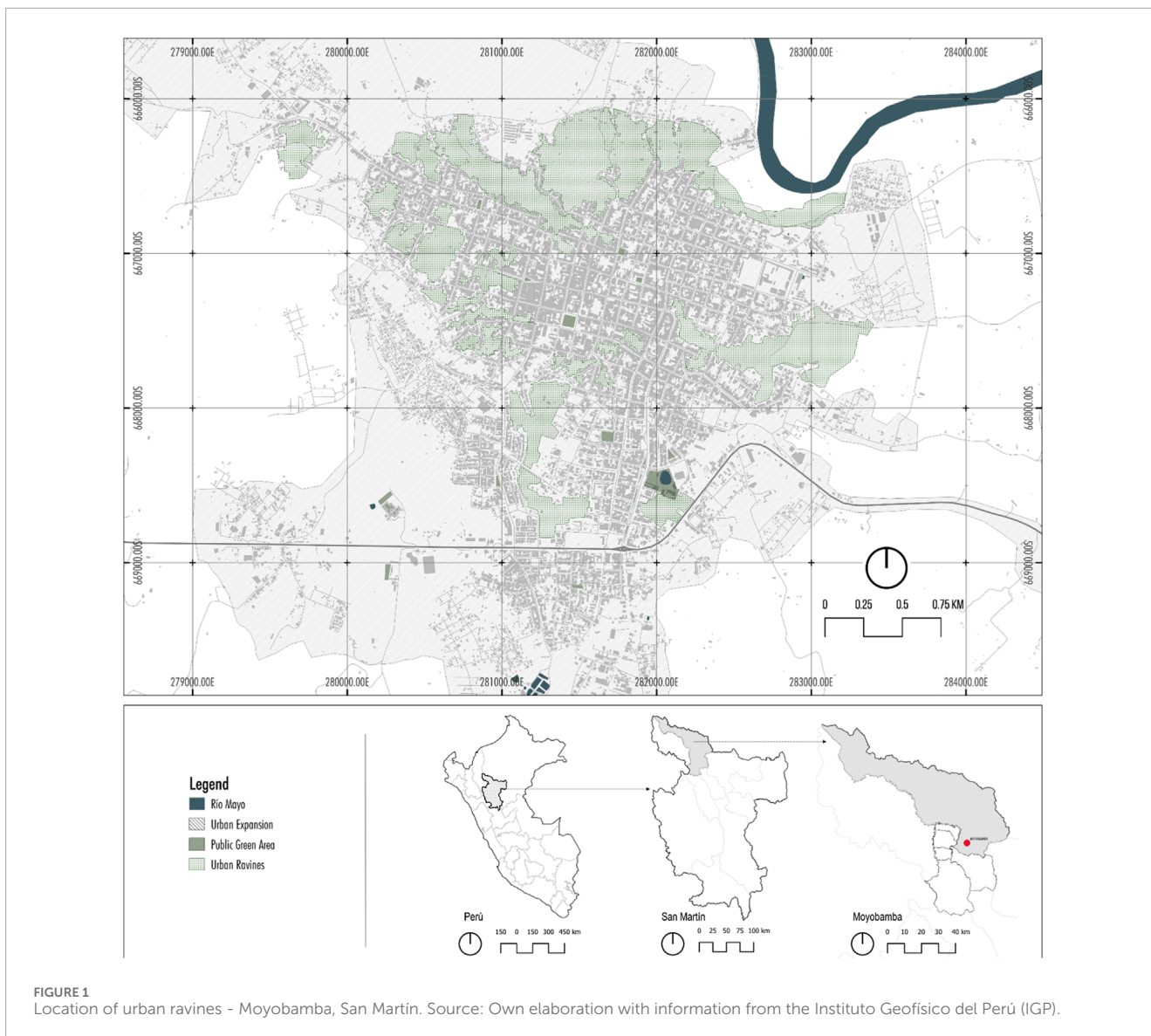
Seventy-four percent of this territory has slopes greater than 25%, giving rise to the so-called ravines that separate it from the forest, while the remaining 26%, mostly on the right bank of the Río Mayo, has a slope of 5% (INDECI, 2015). The ravines not only border the urban core but also form part of its internal structure. In recent years, they have been altered due to sheet erosion and large landslides. These landslides are a result of rainwater affecting vulnerable areas or critical points of the ravines, exacerbated by human activity such as the use of domestic and small-scale industrial wastewater dumping, solid waste disposal, construction debris, and deforestation. In some cases, areas have been filled to expand habitable urban space, resulting in the loss of green areas that could have been integrated (INGEMMET, 2005).

For the study, the city was divided into 4 zones based on the main neighborhoods, as shown in Figure 2. The ravines within each neighborhood in the urbanized locality represent 17.17% (26.91 ha of ravine) due to the unique topographical configuration of Moyobamba, generally oriented toward the Río Mayo, and the urban morphology that grows around the ravines, making it a distinctive characteristic.

2.2 Data collection

The study was conducted in two main stages. The first stage focused on diagnosis and data collection, divided into three phases, while the second stage involved processing the collected information, as shown in Figure 3.

Phase 1 of the first stage aimed to evaluate the current conservation status of the urban ravines and map the ecosystem services. To achieve this, the current conservation status of the ravines in each neighborhood was assessed, spatially identifying CES through observation sheets. These sheets considered categories and dimensions such as physical characteristics, quality of public space, and sustainable infrastructure, following MINAM (2016). Observations were carried out over 4 weeks on both weekdays and

FIGURE 1
Location of urban ravines – Moyobamba, San Martín. Source: Own elaboration with information from the Instituto Geofísico del Perú (IGP).

weekends. Additionally, the CES had been recorded and geolocated using Google Earth points.

In phase 2, the objective was to assess residents' perception of the Cultural Ecosystem Services (CES) present in each ravine. To achieve this, structured interviews were conducted with 40 residents per neighborhood, exploring their daily interactions with the identified CES in these spaces. This approach provided a qualitative perspective on how residents value and use the ravines, offering a better understanding of the social and cultural dynamics surrounding them.

To ensure an informed perspective and facilitate comparisons over time, at least 50% of the interviewees had to have lived in Moyobamba for more than 10 years. This participant selection strategy highlights the importance of well-defined inclusion criteria for obtaining relevant and reliable data in qualitative studies.

The sample randomly included individuals from different age groups and socioeconomic levels, factors that can clearly influence the perception and valuation of CES. Given that Moyobamba is the capital of San Martín and an important tourist destination, future research could analyze visitors' perceptions and contrast them with those of residents. This would allow for a broader exploration of the multiple dimensions of CES and a better understanding of their impact on both the local community and tourism. Additionally, future studies could incorporate complementary methodologies, such as large-scale surveys or longitudinal analyses, to strengthen the validity of the findings.

Phase 3 consisted of a focus group aimed at complementing the assessment with insights from professionals with extensive experience in urban conservation projects. Notably, this included the former Minister of the Environment of Peru and experts with in-depth knowledge of the city's management and its natural surroundings, providing a specialized and well-founded perspective on the situation of the ravines. In the second stage, the collected information was processed and analyzed as follows:
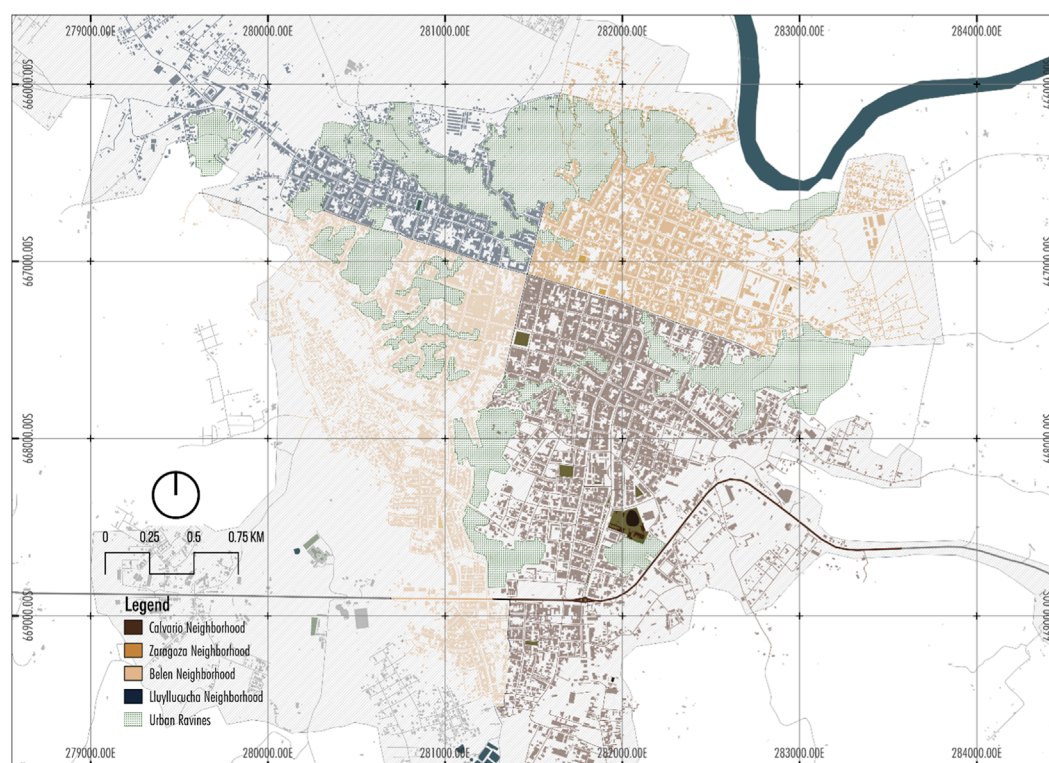
FIGURE 2
Location of the main neighborhoods of Moyobamba. Source: Own elaboration with data from the Plan de Desarrollo Urbano (PDU).

First, maps were created from the identified CES using QGIS 3 software to understand their density and influence on each sector of the city.

Scores were established for each dimension and indicator, recorded in Ms Excel, allowing for the determination of the conservation status of the ravines by summing the scores assigned to each dimension and finally, statistical graphs were created based on the results obtained.

The relationship between residents' valuations of the CES and the evaluated conservation status of the ravines in each neighborhood was analyzed using ATLAS.ti software.

2.3 Focus group for collecting specialized experiences

During the diagnostic phase, a focus group was held with professionals and community representatives, including the former Minister of the Environment of Peru, who is originally from Moyobamba. The discussion focused on the crucial role of the ravines as spaces with significant ecological, cultural, and social value for the city. Participants highlighted their key contributions, such as urban temperature regulation, biodiversity conservation—home to primate and bird species—and their role in maintaining environmental balance and enhancing the quality of life for residents.

The participants shared their experiences and concerns regarding the deterioration of these areas. Specific cases were mentioned where ravines had been filled in or repurposed for urban infrastructure projects without considering their essential natural functions.

These interventions have not only led to environmental and biodiversity loss but have also significantly impacted families seeking to settle in these areas. One example is the Tumino ravine, which suffered severe damage after being filled in, and the San Francisco ravine, where municipal interventions have transformed it into a commercial space, displacing native species and altering its natural ecosystem. The involvement of government entities, such as the Instituto Geofísico del Perú (IGP) was discussed in relation to their efforts and responsibilities in conserving these ecosystems. It was emphasized that, although there are previous studies with diagnoses presented by the IGP and other entities, such as support from the Sistema de Información para la gestión de Riesgo de Desastres (SIGRID), local authorities have yet to implement notable and sustainable effective actions. Concerns were also raised about the actions of officials who have allowed the improper privatization of ravine areas, favoring private interests over the common good of the city and its residents. Moreover, the lack of adequate policies and resources from authorities to protect these spaces was highlighted, despite existing legislation that permits the creation of Áreas de Conservación Ambiental (ACA). The need for all ravines to be registered as state zones was mentioned as a crucial step toward their transformation into ACAs. Locally, initiative groups have formed, providing a pathway to manage ACAs within the ravine areas; however, the local government's response has been limited and slow, indicating a bottleneck in environmental

FIGURE 3
Research Framework. Source: Author's own elaboration.
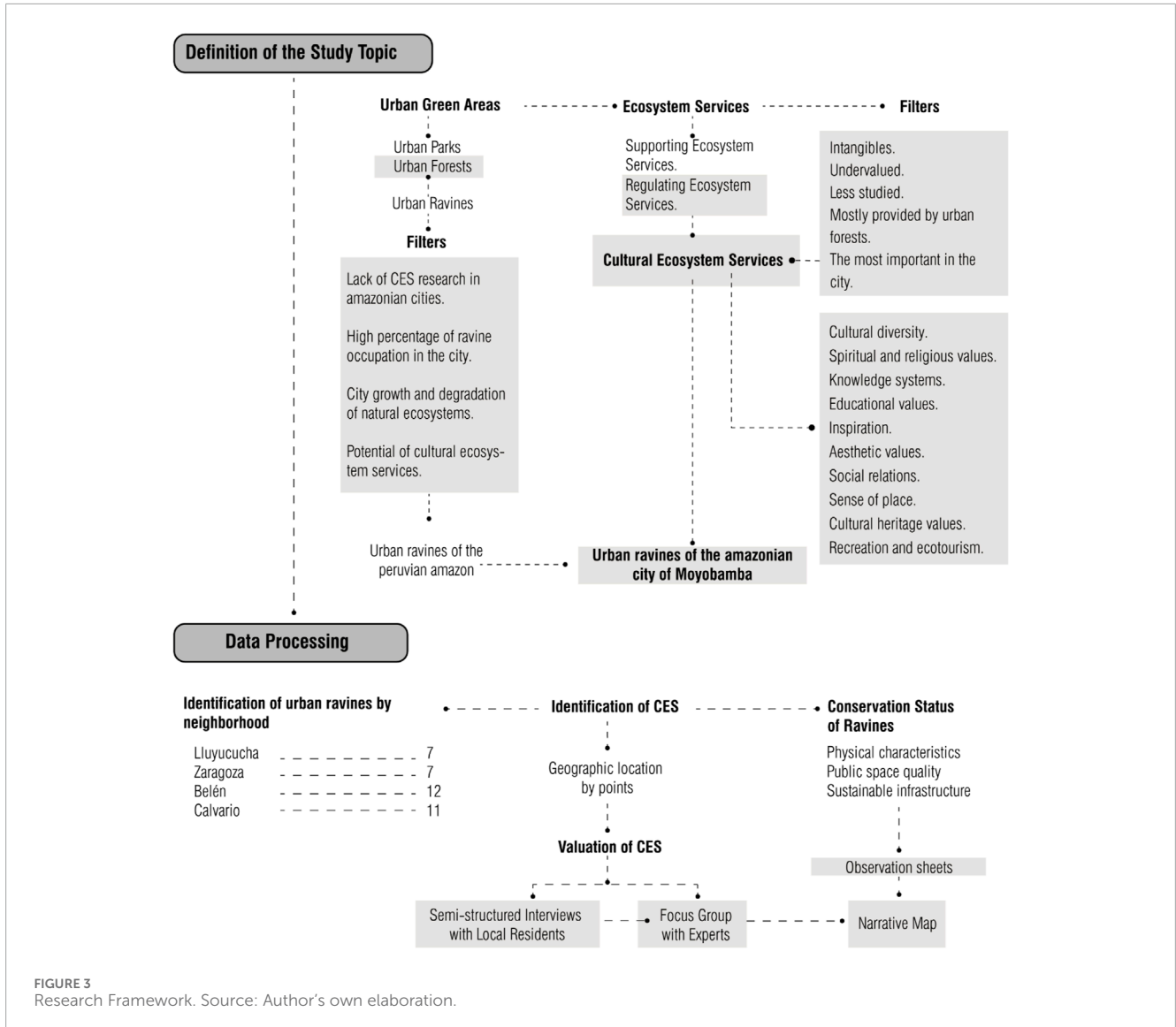
management. Finally, the necessity of educating the public about the value of the ravines for their preservation and sustainable use was raised, suggesting ecotourism and cultural activities to engage new generations. Positive conservation examples were mentioned, such as reforestation projects and the creation of ecotourism routes in some ravines, which are becoming sustainable spaces. However, it was also warned that without strong support from local authorities and the community, the deterioration of these spaces could continue, jeopardizing the future and quality of life for new generations.

3 Results

3.1 Conservation status of the ravines

Following direct observation, several issues were identified in the ravines. Despite being designated as "Intangible Zone for the Refuge of Animal and Plant Life, for the purpose of reforestation, research, or ecological tourism" according to Municipal Decree No.

010-96-MPM/A, reports from the city up to 2022 indicate a low level of compliance with this policy by the authorities. Local media have highlighted various assaults against the ravines, such as the depletion of their flora, the dumping of solid waste, and illegal encroachments, with the latter being the most concerning. Figure 4 clearly illustrates these identified problems. Furthermore, the observation sheets helped identify other anthropogenic activities, such as construction waste dumping, wastewater discharge, and soil erosion.

85% of the ravines have at least one anthropogenic activity, and 50% have two or more. The major threats include solid waste dumping and wastewater discharge. Consistently, the ravines with better care and less pollution are those that have some intervention along their edges or within them.

The total number of interventions is seven, as shown in Figure 5, averaging 1.75 interventions per neighborhood, though the individual realities vary widely among them. The area with the most interventions is Zone 2, with three interventions, located near the Río Mayo. Zones 1 and 3 each have two interventions, while Zone 4 has only one improvised recreational intervention.

FIGURE 4
Identified Issues – Ravines. Note: This was based on direct observation using satellite imagery, and the continuity study of their shape suggests that in the past there may have been only six larger ones located within the four main neighborhoods: Belén, Zaragoza, Llullucucha, and El Calvario.

The common denominator of the interventions, as shown in Figure 6, is integration with the natural environment and the use of local or adapted materials to minimize environmental impact in the ravines of Moyobamba.

In all these interventions, such as the Puente Peatonal Cococho, the Cancha Deportiva Electroriente, and the Puente Vehicular Tipinillo, there is a concern for utilizing the natural characteristics of the ravines, whether by providing shade through existing vegetation or adapting infrastructure to respect slopes and landforms. Additionally, there is an effort to use materials that blend with the surroundings, such as wood and steel for railings or concrete for platforms, thereby ensuring a harmonious connection between infrastructure and the surrounding nature. This approach reflects an attempt to maintain a sustainable and environmentally respectful intervention, a common characteristic across all observed interventions.

In several interventions, such as the Cancha Deportiva Electroriente and the Puente Vehicular Tipinillo, a limited amount or absence of urban furniture was observed, reducing the functionality and comfort of the spaces for users. The lack of elements such as benches with backrests and sufficient lighting for nighttime use is a recurring issue.

Although some interventions take advantage of existing vegetation, others, such as the Puente Vehicular Tipinillo, lack sufficient shade, affecting the quality of the space and thermal comfort for users, especially in a tropical climate like that of Moyobamba.

Several interventions face accessibility challenges, particularly those dealing with elevation changes. For example, in the Cancha Deportiva Electroriente, there is a forced mismatch in street level without adequate ramps or stairs to ensure universal accessibility. This indicates a lack of comprehensive consideration for all users, including those with reduced mobility.

The ravines in the four neighborhoods cover a total of 29.91 ha, representing 17.17% of the total urban area, and soil profile studies clearly show how these areas occupy the depressions of urban soil and create discontinuities in the terrain morphology, as evidenced in Figure 7. Slopes can reach up to 27.8%, which transforms them into rainwater runoff cores, according to environmental experts.

3.2 Geolocation of cultural ecosystem services in the ravines

An analysis was conducted on the distribution of Cultural Ecosystem Services (CES), dividing the urban area into four zones. This allowed for the identification of the density and concentration of these services in each zone, as shown in Figure 8. Processing the information with QGIS software revealed that Zones 1 and 2 exhibited a higher density of CES, suggesting a greater number of

FIGURE 5
Observation Sheet of Interventions in the Ravines by Neighborhood. Source: Author's own elaboration.

natural elements and public spaces that favor the maintenance of these services in the ravines.

Zone 1 stood out for its notable concentration of CES related to aesthetic value, recreation, and ecotourism. In Zone 2, a higher density of services promoting a sense of place and social relations was observed, indicating greater interaction and community engagement in these spaces. Zones 3 and 4, although they showed some presence of CES, had a significantly lower density, which may be associated with fewer green areas or a lack of infrastructure that promotes the use of these services.

The bubble representation in the graph facilitated the analysis and visualization of the relative intensity of each service in the different zones, highlighting how the distribution and valuation of

CES varied based on the structure of the urban landscape and the specific characteristics of each analyzed area.

3.3 Valuation of CES in the ravines

An analysis was conducted on the Cultural Ecosystem Services (CES) in the ravines within the area of influence, using interviews to understand respondents' valuation of these spaces. As shown in Figure 9, the left side displays the four studied zones, each with different levels of conservation. On the right, the most frequently mentioned words and expressions by respondents during interviews, such as "Nature Observation," "Photography," "Trekking," and "Ecotourism," reflect their experiences and
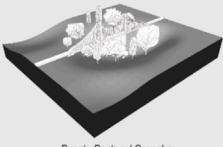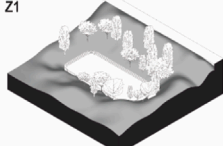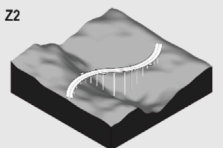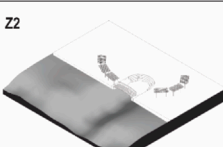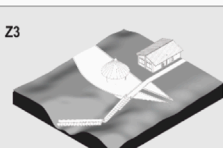
INTERVENTIONS / AREAS	DIMENSION / INDICATOR					
	Public Space Quality			Sustainable Infrastructure		
	Urban Furniture Condition	Amount of Urban Furniture	Level of Urban Furniture	Material Ecology	Infrastructure Condition	Impact on the Surroundings
Z1 Puente Peatonal Cococho	Concrete benches in good condition, without backrests.	8 benches and 4 streetlights	Light shade due to nearby lush fruit trees.	Iron handrails and metal mesh railings. Concrete railings along the path leading to the bridge. Wooden terraces with corrugated metal roofing.	Optimal	Respect for the Ravines Slope through Hanging Structure
Z1 Cancha deportiva Electroriente	No presence of urban furniture.		Around the field, the bamboo and vegetation provide the necessary shade.	Wooden goals. Dirt field.	Uneven sports area, with no apparent mainte-nance.	Very natural, at the lowest part of the ravine
Z2 Puente Vehicular Tipinillo	Benches in good condition. Streetlights in good condition. Waste bins in good condition.	Six benches. Twenty streetlights. Two waste bins.	Deficient shade level. Furniture lacking sun protection.	Steel railings with metal mesh. Metal benches with wood. Steel and glass streetlights. Plastic waste bins.	Floors and Railings in Good Condition.	Non-invasive Structure. Utilization of Natural Views
Z2 Mirador Punta de Tahuishco	Recessed streetlights.	20 benches, 6 recessed streetlights, 12 streetlights on metal poles.	Medium. Trees with sparse foliage and palms. Presence of bougainvil-leas.	Steel and glass streetlights. Concrete and metal railings. Bridge with steel structure. Concrete benches. Concrete shelters with steel and tile roofing. River stone flooring. Concrete platform with tile roofing.	Good	Elevated Bridge. Local Materials. Adaptation to the Slope.
Z3 Mirador Punta de San Juan	Streetlights in good condition. One streetlight without a fixture. Playground equipment in good condition. Benches without backrests.	Streetlights along the path. Few benches.	High level of shade provided by lush trees.	Concrete and iron in the railings. Wood in the covered railings. Stairs with flagstone. Concrete benches. Concrete platform with thatched roofs.	Cracked flooring due to soil settlement. Lookout in poor condition.	Non-invasive structure. Utilization of views to nature.
Z3 Mirador San Francisco	Deteriorated streetlights. Benches with no apparent maintenance.	4 benches, 1 event space with chairs and tables, 1 stage, 6 streetlights on metal poles.	Medium. Trees with sparse foliage that protect the perimeter.	Steel and glass streetlights. Concrete and metal railings. Wood and steel benches. Concrete event space with metal roofing. Concrete stage with metal roof. Concrete flooring.	Cracked flooring due to soil settlement. Event space in good condition.	Infrastructure on fill. Utilization of views. Alteration of the ecosystem due to noise

FIGURE 6
Observation Sheet of Interventions in the Ravines by Neighborhood. Source: Author's own elaboration.

concerns. In the center, the four analyzed CES categories are presented: Sense of Place, Recreation, Social Relations, and Aesthetic Value.

The results indicated a deep emotional connection with the ravines (Sense of Place), where respondents valued their experiences from youth, though they also expressed concern over the deterioration they observed, attributing it to a lack of clear conservation policies. Regarding recreational use, a decline was noted, shifting from regular visits to sporadic interactions, which, according to respondents, might be due to a lack of incentives to revitalize these spaces. In the Social Relations category, they mentioned that the ravines used to be gathering places for group activities, but the lack of maintenance has reduced such interactions. In the Recreation and Ecotourism category, opinions were divided: some perceived ongoing potential for leisure, while others believed recreational activities had diminished due to the state of conservation of the ravines. Finally, the Aesthetic Value was appreciated by all respondents, emphasizing the flora, fauna, and beauty of the landscape, suggesting that, with proper investment, these spaces could become significant ecotourism corridors.

FIGURE 7
Map of Soil Morphology in Urban Ravines. Source: Author's own elaboration.

4 Discussion

The results obtained showed agreement among local residents, community leaders, and conservation experts on the importance of CES for the cultural identity, wellbeing, and development of the Moyobamba community. This aligns with the definitions proposed by Fisher et al. (2010), Martín-López et al. (2014) which highlight the role of these services in culture and human wellbeing. The most prominent dimensions of CES, such as sense of place, social relations, and recreation and ecotourism, reflected the importance of these services in daily life and the social fabric of the community (Valdivia Díaz, 2017).

Furthermore, Baur et al. (2016) highlight the crucial role of local communities in supporting and integrating Cultural Ecosystem Services (CES) into land management practices. Our findings align with this assertion, demonstrating that the residents of Moyobamba are the primary beneficiaries and protectors of CES in the city's ravines.

However, the observed deterioration of these spaces has negatively impacted CES, diminishing their aesthetic value, social interactions, and opportunities for recreational and ecotourism activities, with sense of place being the most valued aspect. These results are consistent with previous studies conducted in other countries, such as the research by La Rosa et al. (2016), which identified recreational, cultural, and educational values as the most significant CES and emphasized the importance of cultural capital.

In this context, interviews revealed that the ravines in neighborhoods 1 and 2 were the most mentioned and also the best preserved. This demonstrates how public opinion regarding CES plays an important role in the conservation of these spaces, similar to the case of ravine parks in the city of Toronto, where user opinions were highlighted as significant in management and public planning efforts (Oviedo et al., 2022). Likewise, the importance of valuing CES can be extrapolated from studies of peri-urban forests, such as community forests in the Himalayas in India, where both community values and priorities were essential for restoration, preservation, and management (Bhatt et al., 2024). This result would prove that local residents are the ones who support and should be involved in the conservation of cultural ecosystem services (CES) within the management practices of the territory: proposals for the sustainable use of ravines, environmental education programs and volunteer programs that strengthen the sense of belonging and co-responsibility in their care.

A notable detail is that two of these ravines underwent municipal filling works to create roads that interconnected the neighborhoods, which was well received by most respondents as it improved accessibility. However, these interventions were not entirely environmentally friendly, despite being in good condition and positively valued by the community.

On the other hand, the lack of prompt management of the ravines in Moyobamba can be attributed not only to a lack of political will but also to the bureaucratic complexity that municipalities face in executing
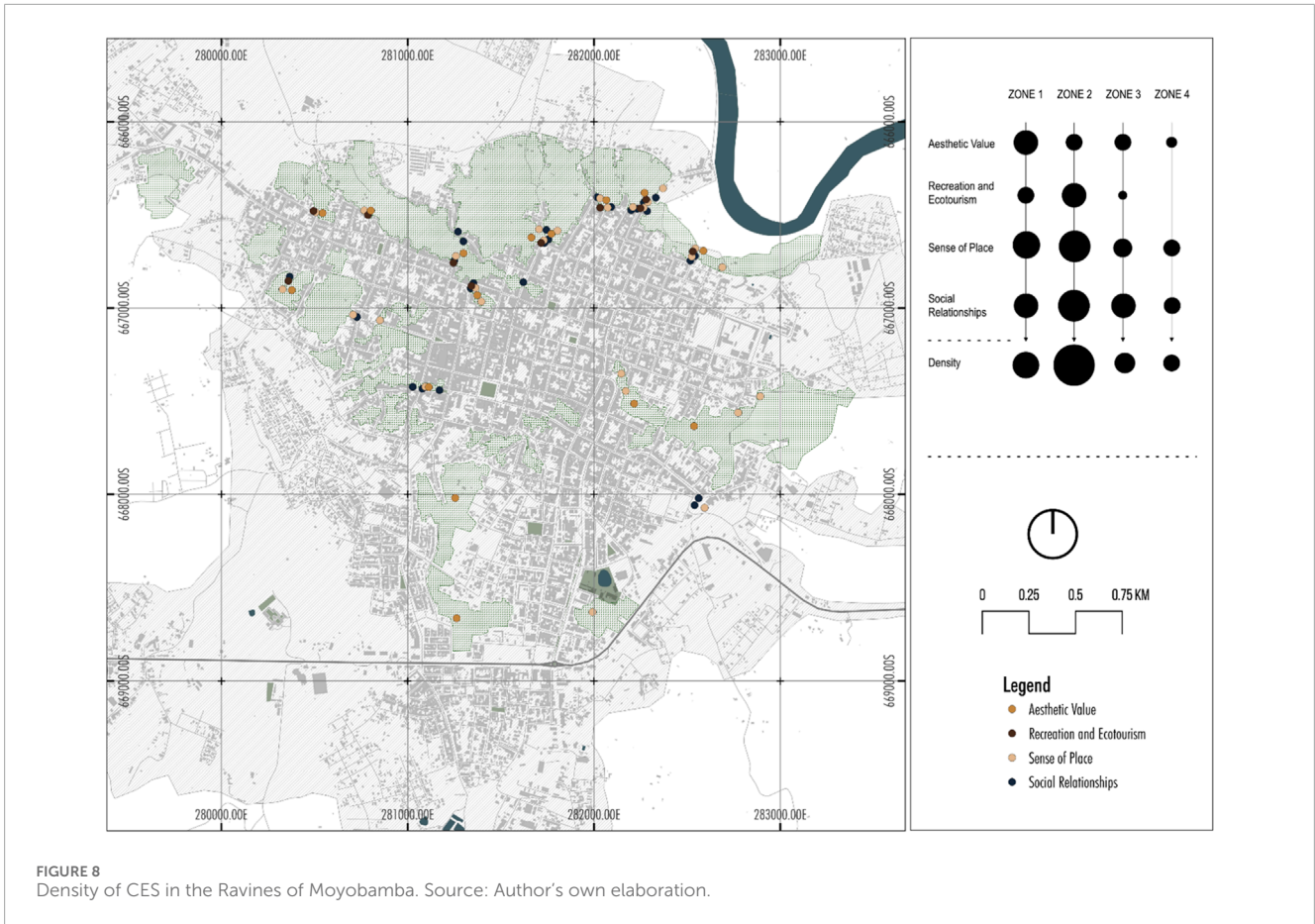
FIGURE 8
Density of CES in the Ravines of Moyobamba. Source: Author's own elaboration.

conservation projects. Administrative procedures are often lengthy, slowing down effective management of Environmental Conservation Areas (ACA), despite clear provisions in Peru's Organic Municipalities Law (Law No. 27972), which grants local governments the authority and responsibility to protect the environment and conserve natural resources such as the ravines (Congreso de la República del Perú, 2023). Additionally, another key factor contributing to this sluggishness is the allocation of financial resources to areas that municipalities perceive as priorities in terms of short-term visible impact, urban regeneration, or tourism. La Torre et al. (2024) noted the following in their research: "Often, environmental conservation is relegated to a secondary priority, reducing the necessary investment to protect critical ecosystems. This trend shows that municipalities are more focused on projects that yield visible benefits quickly." This reaffirms the findings that necessary actions to preserve natural resources in the long term are given lower priority.

To address these challenges, it is essential to integrate ravine conservation into urban planning and environmental policies, ensuring its long-term protection. Establishing a dedicated municipal fund for conservation efforts, as well as implementing tax incentives or subsidies for sustainable projects, would encourage private and community participation in maintaining these spaces. Moreover, promoting the ravines as key assets for ecotourism and local economic development would not only enhance their ecological value but also create economic incentives for their preservation. Finally, streamlining administrative processes for

environmental initiatives would help overcome bureaucratic obstacles, allowing for a more effective and timely implementation of conservation measures.

5 Conclusion

The urban ravines of Moyobamba exhibit a medium-low level of conservation, with residents perceiving clear signs of deterioration in these areas. The lack of maintenance and absence of well-defined policies from local authorities have led to a decline in both the use and appreciation of Cultural Ecosystem Services (CES). As conservation conditions worsen, the perceived value of CES also decreases, weakening emotional connections and the community's sense of belonging.

A key finding of the study is the strong relationship between the physical conditions of the environment and residents' connection to the place, a recurrent theme in respondents' answers. Well-maintained spaces foster stronger emotional connections and identity value, reinforcing the need for conservation efforts.

To address these challenges, it is recommended that the local government implement a structured conservation and maintenance plan, including periodic actions to prevent further deterioration. Community engagement through citizen participation programs would enhance environmental awareness and a shared sense of responsibility. Additionally, sustainable infrastructure should

FIGURE 9
Relationship Between Conservation Zones and Categories of Cultural Ecosystem Services (CES) Based on Respondents' Perceptions. Source: Author's own elaboration.
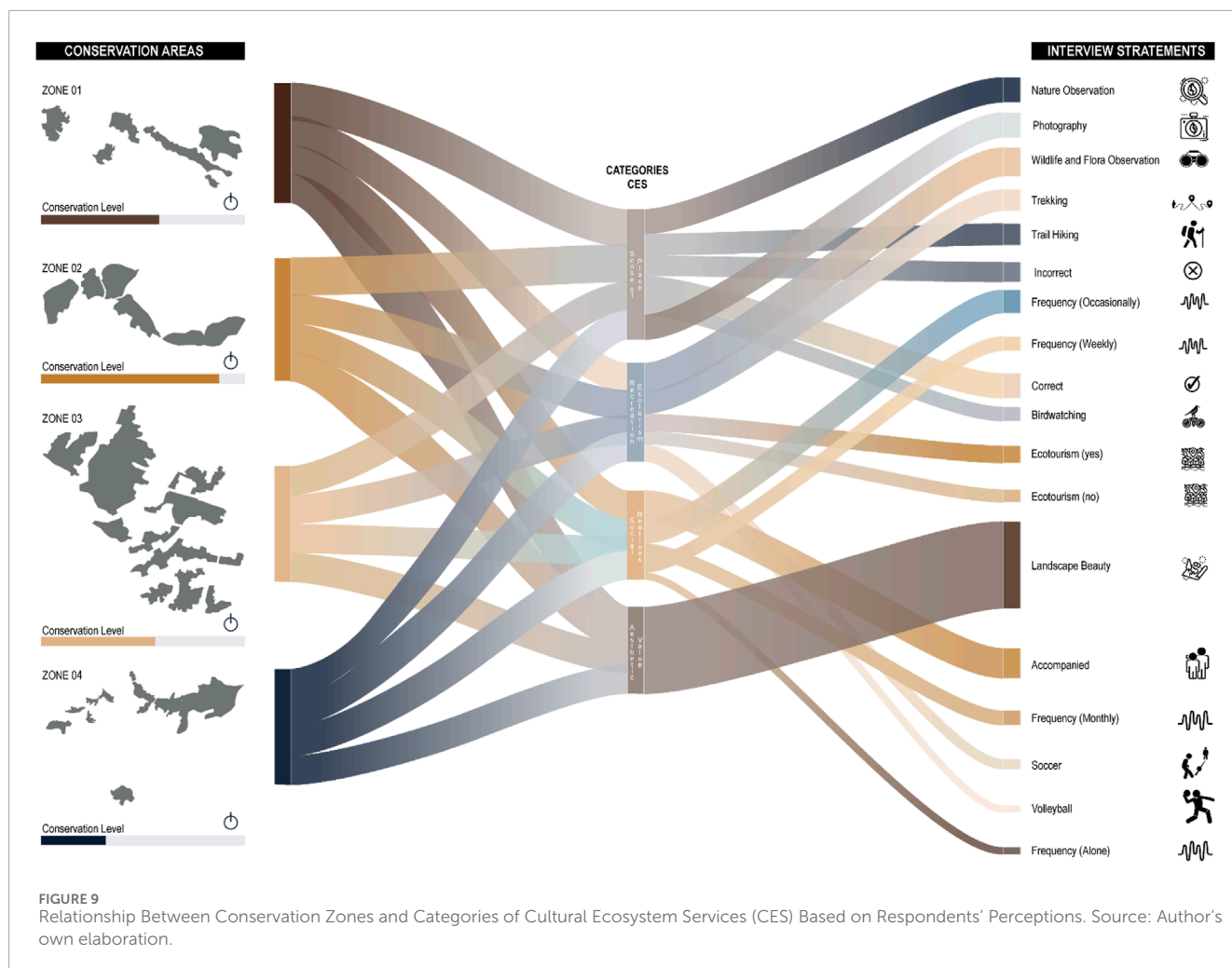
be integrated, respecting ecological dynamics while creating opportunities for recreation and ecotourism.

Future research should analyze the direct impact of conservation efforts on residents' wellbeing, exploring how improved spaces contribute to healthier lifestyles and increased social interaction. Another relevant area is the feasibility of ecotourism programs, ensuring that ravine conservation supports both environmental preservation and local economic development.

If no immediate action is taken, these ravines face irreversible loss of ecological, cultural, and recreational value, affecting both residents' quality of life and biodiversity. Furthermore, continued degradation could reduce tourism appeal, limiting sustainable ecotourism opportunities and reinforcing a cycle of neglect and deterioration.

Although this study focuses on Moyobamba's ravines, its findings are relevant to other Amazonian cities facing urban expansion, green space loss, and ecosystem degradation. The mixed-method qualitative and quantitative approach used here can be applied in similar urban Amazonian contexts to better understand human-nature interactions and CES valuation. Additionally, the correlation between conservation status and CES perception can serve as a reference for environmental management strategies in cities with ravines, gullies, or other high-value ecological areas.

Finally, while general trends were identified, future studies should conduct comparative research across different Amazonian locations to validate these findings and refine conservation strategies.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Ethics statement

Written informed consent was obtained from the individual(s) participating in the study.

Author contributions

JL: Data curation, Investigation, Methodology, Visualization, Writing–original draft, Writing–review and editing. DU: Conceptualization, Data curation, Formal Analysis, Investigation,

Methodology, Writing–original draft, Writing–review and editing. CA: Supervision, Validation, Writing–original draft, Writing–review and editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

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