Land use for Socio-Economic Development

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Abstract

This study analyzes the relationship between land use configuration and socioeconomic development in the canton of La Libertad, province of Santa Elena, Ecuador. The research addresses the role of land use mix, urban facilities, and access to services as key factors influencing territorial equity, local economic dynamism, and quality of life. A mixed methodological approach was applied, combining spatial analysis through Geographic Information Systems, documentary review of planning instruments, structured observation, and semi-structured interviews with key actors. The findings reveal a territorial gradient in which the coastal zone concentrates greater functional diversity, services, tourism infrastructure, and better socioeconomic indicators, while peripheral areas show residential monofunctionality, limited facilities, higher illiteracy rates, informal land tenure, and reduced access to opportunities. The study concludes that socioeconomic segregation in La Libertad is not mainly caused by road isolation but by functional isolation, where the lack of mixed land uses limits local development. Strategic planning guidelines are proposed to promote neighborhood polycentrism, mixed-use incentives, public space provision, and inclusive territorial management.

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Statement of the problem

Contemporary urban planning has revalued the land use mix (LUM) as not only a tool for territorial planning but also a fundamental catalyst for the vitality and sustainability of cities. From Jacobs's (1961) classic postulates, which defended functional diversity as a driver of neighborhood security and economic prosperity, to modern visions of the "15-minute city" (Moreno et al., 2021), the proximity of housing, commerce, and facilities has been recognized as essential for urban efficiency. In this context, socioeconomic development (SED) is understood not only as financial growth, but also as the expansion of human capacities and equitable access to opportunities. According to Sen (1999), the physical configuration of the city acts as a facilitator or a barrier to these goals.

Despite the global consensus on the benefits of urban diversity, its implementation and effects vary drastically depending on the context. While the global north debates the regeneration of post-industrial spaces, Latin America faces the challenge of managing accelerated, often informal, urbanization. Regional studies indicate that the incorporation of public infrastructures and mixed uses has boosted social inclusion in cities such as Medellín and Bogotá (Dávila, 2013). However, in other scenarios, the lack of adequate regulation has led to service saturation or gentrification processes. This duality underscores the urgent need to analyze how the SSM interacts with the socio-spatial segregation dynamics characteristic of contemporary Latin American cities (Guzmán Ramírez & Hernández Sainz, 2013).

Ecuador is no stranger to these tensions, and the Canton of La Libertad in the province of Santa Elena is paradigmatic. La Libertad is an urban territory with high population density and an economy focused on commerce. However, it also has remarkable economic dynamism that coexists with persistent poverty and inequality in access to services (Anda et al., 2017). This suggests that the benefits of economic activity are not equitably distributed, raising the question of whether the current configuration of land uses and distribution of facilities contributes to mitigating or exacerbating these socioeconomic gaps.

The current scientific literature warns about the risks of reductionist approaches when measuring the mix of uses. Perspectives such as "assembly thinking" (Dovey & Pafka, 2017) criticize the simplification of urban reality, suggesting an analysis of dynamic interactions, or "mixtures of mixtures." Therefore, there is a knowledge gap regarding how these complex dynamics operate in coastal intermediary cities, where territorial regulations (PDOT/PUGS) often clash with an organically and rapidly constructed reality. The lack of studies triangulating objective spatial indicators with subjective perceptions of quality of life in these cities limits local governments' capacity to formulate effective public policies.

Formulation of the problem

In what way is the configuration of land uses, with an emphasis on the provision of equipment and services, related to the socioeconomic development indicators of the population in the canton of La Libertad in Santa Elena?

Justification

The present research on the importance of the determination of land uses in socioeconomic development, specifically analyzed in the Canton of La Libertad, is justified from multiple perspectives:

Scientific Justification (Theoretical and Epistemological): This research significantly contributes to scientific knowledge by addressing an epistemological gap in urban planning: the absence of correlational and causal studies on land use mix (LUM) in intermediate cities in developing countries. While the global literature (e.g., Jacobs, 1961; Gehl, 2010) validates the benefits of functional diversity in large metropolises, there is a lack of situated, empirical evidence explaining how these principles operate in contexts of organic urbanization, such as La Libertad.

Theoretically, the study enables us to contrast and recontextualize established paradigms regarding the "social value" of urban design (Alzahrani, 2017) and "organized complexity" (Jacobs, 1961) by evaluating their applicability to the local context. Thus, situated knowledge is generated that transcends theoretical generalizations, offering a nuanced understanding of how spatial configuration acts as a determining variable in reducing or exacerbating socioeconomic gaps.

Methodological Justification: The phenomenon under study is complex, linking a tangible spatial variable (land use) with a multidimensional, subjective construct (socioeconomic development). This requires a mixed methodological approach that transcends mere statistical data collection. This research is justified by its methodological triangulation strategy, which combines the rigor of quantitative spatial analysis using Geographic Information Systems (GIS) and official census data with the hermeneutical depth of qualitative techniques, such as structured observations and semi-structured interviews.

This instrumental choice is deliberate and necessary. While GIS modeling makes it possible to diagnose the physical distribution of facilities ("hard data"), interviews with key stakeholders and residents allow us to understand the "lived experience" and informal socioeconomic dynamics that statistics do not capture. This justifies prioritizing an explanatory approach that seeks to understand meanings and causal relationships ("the

why and how") through discourse, rather than limiting ourselves to a frequency description that a survey could offer. This results in a more holistic understanding of the "organized complexity" of the territory.

Social and Economic Justification: From a social perspective, this study is imperative because its findings have the potential to directly influence public policy towards equity. By identifying the effects of the distribution of equipment and services on community cohesion and safety, the local administration (Municipal GAD) is provided with technical evidence to transition from restrictive zoning to inclusive territory management, which would substantially improve access to fundamental rights (health, education, and recreation) for the most vulnerable sectors.
In the economic realm, the research aims to bolster the resilience of the local economy. By determining which land-use configurations are conducive to entrepreneurship and commercial vitality, the study can formulate guidelines that optimize existing infrastructure and reduce travel costs for families. This will transform urban planning from a bureaucratic procedure into an engine of development that energizes neighborhood microeconomies and attracts sustainable investment.

Feasibility of the Study: The execution of this research is considered feasible for the following reasons:

• **Access to Information:** Access to the necessary information sources for developing the study is guaranteed. Regarding secondary sources, unrestricted access is granted to the current planning instruments, such as the Development and Land Use Plan (PDOT) and the Land Use and Management Plan (PUGS), as well as to the base cartography and official statistical data from the National Institute of Statistics and Census (INEC). Regarding primary sources, the necessary communication channels have been established with the La Libertad Municipal GAD to facilitate interviews with key officials. There is also physical accessibility to collect information in situ through structured observation sheets and interviews with community members.

• **Resources:** The research is economically viable since it will mainly be developed with the researcher's own resources (self-financing). The methodological design does not require expensive equipment or specialized software licenses; it is based mainly on intellectual capital and operational fieldwork. The schedule of activities has been rigorously planned to align with the academic deadlines established by the Master's Program, ensuring the project's completion within the stipulated timeframe without significant logistical challenges.

• **Experience and previous knowledge:** The technical feasibility is based on the author's professional profile, which includes previous training and experience in architecture, urban planning, and local development. This knowledge base facilitates the proper use of data collection instruments (e.g., map reading, spatial analysis, and normative interpretation) and the critical, in-depth analysis of the socio-spatial phenomena to be addressed in the canton.

• **Accessibility to the geographical context:** The Canton of La Libertad is a compact, delimited territorial unit with high urban density, which allows for efficient field logistics. Its proximity to and accessibility of the selected sectors and neighborhoods facilitate travel for collecting qualitative data and verifying land uses, optimizing resources and ensuring representative coverage of the study area.

General and specific objectives
General Objective
To analyze the configuration of land use and its impact on the socioeconomic development of the canton of La Libertad, province of Santa Elena.

Specific Objectives
- To theoretically substantiate the relationship between the mix of land uses, urban facilities and socioeconomic development in contexts of intermediate cities.
- To diagnose the current spatial configuration of land uses in the canton of La Libertad, identifying the distribution of activities in relation to current territorial regulations.
- To determine the relationship between the typology of land uses (and their level of mixing) with local socioeconomic development indicators (employment, trade and access to services).
- Propose strategic guidelines for territorial planning that optimize land use to promote inclusive socioeconomic development in the canton.

Hypothetical approach
For this research, the development of Scientific Questions is chosen, which allow an open and in-depth exploration of the incidence of the territorial configuration on the well-being of the population, guiding the research process towards the fulfillment of the objectives set:
1. What are the relevant theoretical and methodological approaches to analyze the relationship between land use mix and socioeconomic development in the context of intermediary cities?
2. What is the current spatial configuration of land uses in the canton of La Libertad and how are the facilities distributed in relation to current regulations?

3. How is the typology of land uses (and their level of mixing) related to local socioeconomic development indicators, specifically in terms of employment, commercial dynamics and access to basic services?
4. What territorial planning guidelines would allow optimizing the configuration of land uses to favor a more equitable socioeconomic development in the canton?

State of the art

The relationship between land use and socioeconomic development is an increasingly popular topic in urban planning and development studies. At the international level, authors such as Jane Jacobs (1961) laid the groundwork by arguing that diversity of use is fundamental to urban neighborhoods' vitality, security, and economic prosperity. More recent work, such as that of Gehl (2010), has reinforced the importance of multifunctional, people-centered urban spaces in improving quality of life and sustainability. Reports such as the Office of the Deputy Prime Minister's (ODPM, 2006) in the United Kingdom have analyzed the practice and potential of mixed-use developments. These reports highlight the contributions of mixed-use developments to urban center revitalization and housing provision. However, they also point out the variability of their results. Researchers like Alzahrani (2017) have delved into the "social value" that these developments can generate, emphasizing the importance of user experience and programmatic aspects over mere aesthetic form.

In the Latin American context, positive results have been achieved in terms of economic dynamization and social inclusion by implementing mixed-use developments in cities such as Bogotá and Medellín (Dávila, 2013). However, important challenges related to regulation, gentrification, and service saturation in high-density or rapidly transforming contexts remain (Ingallina & Fevre, 2018).

In Ecuador, particularly in intermediate cities like those in the Province of Santa Elena, studies on the multidimensional impact of mixed land use on socioeconomic development are still in their infancy. While there are diagnoses of general urban and socioeconomic problems (Anda et al., 2017) and studies analyzing the importance of state planning in the development of Ecuadorian intermediary cities (Castro Herrera & Miranda, 2021), a detailed understanding of how specific land use planning, particularly the integration of facilities and services, contributes to equitable development in these contexts is lacking.

Current approaches to analyzing this relationship tend to be more critical and contextual, recognizing that there is no single formula for mixed-use development. Perspectives such as assembly thinking (Dovey & Pafka, 2017) propose methodologies that capture complexity and "mixtures of mixtures" instead of reducing the phenomenon to simple indices. There is a need to evaluate not only mixed-use "products" (buildings) but also "results" at the area or neighborhood level, considering quantitative and qualitative indicators that reflect the community's experience and perception (ODPM, 2006).

Conceptual framework

The conceptual framework is the theoretical foundation of this research. It identifies, defines, and delimits the fundamental concepts that articulate the problem under study. It also explores the theoretical interrelations between these concepts based on consolidated scientific literature and contemporary approaches. This conceptual scaffolding clarifies key terms and guides the design of the methodology, data collection, and subsequent analysis. It ensures the internal coherence and relevance of the study (Miles & Huberman, 1994; Ravitch & Riggan, 2017).

The key concepts for this research are defined below:

- Land Use Mix (MUS):

Conceptual Definition: It refers to the coexistence and functional interrelation of various urban activities (residential, commercial, light industrial, institutional, recreational, and crucially services and equipment) within the same building, plot, block or delimited geographical area. It implies functional diversity that seeks to generate synergies, optimize the use of land and infrastructure, reduce the need for motorized travel and promote urban vitality (Grant, 2005; ODPM, 2006). The MUS can vary in intensity (degree of mixing), grain (scale of the mix), and type of combined uses (Dovey & Pafka, 2017).

Operational Definition: The operationalization of Land Use Mix (MUS) in urban research is approached from multiple approaches to capture its inherent complexity. The specialized literature highlights the use of Geographic Information Systems (GIS) as a standard tool to identify, categorize and quantify land uses, as well as to analyze proximity and accessibility, being essential to apply various SSM metrics (Song et al., 2013; Dovey & Pafka, 2017). Authors such as Cervero and Kockelman (1997) and Frank et al. (2005) have popularized the use of entropy or diversity indices to measure the degree of equilibrium and variety of uses within defined spatial units, methods that continue to be analyzed and compared in recent studies (Iannillo & Fasolino, 2021). In addition, built environment audit instruments, such as those used in walkability studies, frequently incorporate measures of the diversity of destinations and land uses as a key component (Forsyth, 2015). For this research in the Canton of La Libertad, and in line with these established approaches, the MUS will be measured and characterized by:

- Analysis of territorial regulations (PDOT and PUGS) to identify designated areas or areas that allow mixing.
- GIS mapping of the spatial distribution of land uses (residential, commercial, services, facilities) by block or census tract in selected urban areas.

• Calculation of indices of functional diversity (e.g. adapted entropy index) and proximity to key facilities and services: The operationalization of SSM in urban research often involves quantifying the diversity, intensity and scale of different land uses within defined spatial units.
• Direct observation and qualitative characterization of existing mix typologies (e.g. vertical in buildings, horizontal at street level) as instruments for auditing the built environment.

Theoretical Indicators (derived from the literature):
Diversity of uses: Functional diversity indices, such as the entropy index, will be calculated. Although these indices have been criticized for their simplification (Dovey & Pafka,
2017), remain a standard tool for a first quantitative approach to the variety and balance of uses (Cervero & Kockelman, 1997, cited in multiple sources on planning)
Intensity of mixing: (Proportion of built area or land dedicated to each use within a zone). It is also captured by entropy indices that consider the proportion of each use (Dovey & Pafka, 2017).
Grain of the mixture: (Scale of the parceling and how the uses are interspersed, e.g. fine, with many small and diverse lots, or coarse, with large monofunctional plots). This concept, highlighted by Jacobs (1961), will be evaluated qualitatively through observation and cartographic analysis.
Functional integration: (Degree of complementarity and synergy between the present uses, beyond mere coexistence). Although more difficult to quantify, it will be explored qualitatively through the observation of dynamics and user perceptions, as suggested by "place-making" and social value approaches (Alzahrani, 2017).
Pedestrian accessibility to different uses and services. (Distance and ease of walking to different destinations). It is a key indicator of the functional success of the SSM and a frequent component in studies of walkability and healthy built environments (ODPM, 2006; Alzahrani, 2017). It will be measured using proximity analysis in GIS.
• Socio-economic Development (DSE):

Conceptual Definition: Socioeconomic Development (OSD) is understood as a multidimensional and progressive process that goes beyond simple economic growth, seeking the sustained improvement of the general well-being and quality of life of all members of a community. It involves the expansion of people's real capacities and freedoms (Sen, 1999), meeting their basic needs, reducing poverty and inequalities, equitable access to opportunities (employment, education, health, basic services), strengthening social capital and community cohesion, and creating a safe, healthy, and sustainable living environment (Stiglitz et al., 2010; UNDP, 2020). In the urban context, ESD is intrinsically linked to the way in which territory is planned and managed, depending on the nature of citizen participation processes and the power dynamics that shape local development policies (Hickey & Mohan, 2005).

Operational Definition: The operationalization of socioeconomic development is inherently complex due to its multidimensional nature. In the literature, it is approached through the combination of quantitative and qualitative indicators that seek to capture its various facets. Authors such as Alkire and Foster (2011) have developed multidimensional poverty indices that consider dimensions beyond income, such as health, education, and standard of living. The reports of the United Nations Development Program (UNDP) operationalize human development through the Human Development Index (HDI) and its components. In urban studies, statistical data on employment, income, and access to services (Glaeser et al., 2001) are usually analyzed, complemented by assessments of the quality of life and well-being perceived by citizens through surveys and participatory methods (Das, 2008; Diener & Suh, 1997). For this research in the Canton of La Libertad, and recognizing this multidimensionality, the DSE will be operationalized through:

• Analysis of secondary socioeconomic data: Existing statistical data from the National Institute of Statistics and Census (INEC), GAD Municipal de La Libertad, and other official sources on employment, income levels, poverty, economic activity (business cadastre), access to education, and health will be collected and analyzed.
• Structured Observation: A structured observation guide will be designed and applied in the selected study areas to systematically record:
Local Economic Dynamism Indicators: Typology and diversity of active businesses, operating hours, influx of customers (counting in specific periods), state of commercial premises, presence of informal commerce.

Indicators of Use and Quality of the Urban Environment: State and maintenance of facades of homes and public spaces, cleanliness, presence of urban furniture, use of public spaces by different age groups, types of recreational and social activities observed, interactions between passers-by.

Indicators of Access and Use of Equipment and Services: Affluence to facilities (schools, health centers, markets), state of visible conservation of the facilities, architectural barriers to access.

Perceived Safety Indicators (indirect): Public lighting, presence of people on the street at different times, signs of vandalism or abandonment.

• Semi-Structured Interviews with Key Actors and Selected Residents/Merchants: Interviews will be conducted with municipal officials, community leaders, representatives of the commercial sector and a selection of residents and merchants from the study areas. These interviews will seek to deepen the perception of quality of life and well-being.

Dimensions and Theoretical Indicators (derived from the literature):

Economic Dimension: Employment Opportunities: (Employment/unemployment rate, type of employment –formal/informal–, self-employment). The availability and quality of employment are fundamental for the DSE (Todaro & Smith, 2020).
Income Level and Poverty Reduction: (Average household income, percentage of households below the poverty line). Central in most DSE measurements (Sen,
1999).
Local Economic Dynamism: (Number and diversity of commercial and service establishments, merchants' perception of sales volume, new investments). It reflects the economic vitality promoted by functional urban environments (Jacobs, 1961; ODPM, 2006).
Social Dimension: Access and Quality of Basic Services and Equipment: (Coverage and distance to educational, health, cultural, recreational centers; perceived quality of these services). Key to capacity development (UNDP, 2020; Frank et al., 2006).
Conditions of Housing and Residential Environment: (Quality of housing, overcrowding, access to basic home services, satisfaction with the residential environment). It directly impacts quality of life (UN-Habitat, 2022).
Citizen Security: (Reported crime rates, perception of security in the neighborhood and public spaces). A safe environment is a prerequisite for well-being (Alzahrani,
2017).
Social Cohesion and Community Interaction: (Perception of belonging, support networks, participation in community activities, interaction between neighbors). An aspect of the "social value" (Alzahrani, 2017) and of the social capital that contributes to the DSE.
Dimension of Well-being and Perceived Quality of Life: General Satisfaction with Life and the Environment: (Self-assessment of well-being, satisfaction with the neighborhood and with the canton). Subjective measures of the ESD (Stiglitz et al., 2010; Diener & Suh, 1997).
Access and Use of Public and Recreational Spaces: (Availability, quality and frequency of use of parks, squares and recreation areas). It contributes to physical and mental well-being (Gehl, 2010).

Methodology

In the field of scientific research, methodological design is essential to ensure the validity and reliability of the results. As Somekh and Lewin (2005) point out, research methodology encompasses both the "rules" that apply and the "principles, theories, and values" that underpin it. Next, the paradigm, approach, type of research, population and sample, as well as the methods, techniques and procedures of data collection, processing and analysis that will guide this study on the impact of the mixture of land uses on the socioeconomic development of the Canton of La Libertad are described.

Research Paradigm

The postpositivist paradigm was adopted for the research. According to this paradigm, although an objective reality exists that can be studied, the researcher's understanding of it is inherently imperfect and approximate (Guba & Lincoln, 2020; Creswell & Creswell, 2023). Knowledge generated under this paradigm is considered a "probable truth," which is subject to empirical evidence and critical analysis. This paradigm recognizes the influence of multiple factors and context on social phenomena (Picasso & Gracia,
2021). The study was based on the premise that although the territorial configuration of the Canton of La Libertad is an objective and measurable reality, its impact on socioeconomic development is mediated by complex dynamics requiring contextual interpretation. Thus, the study incorporated the critical analysis of empirical evidence in addition to the collection of "hard" data.

Focus and Type of Research

In line with this paradigm, a mixed research approach was employed. The nature of the problem demanded methodological triangulation, which combines:
Quantitative component: Aimed at the objective measurement of the spatial distribution of land uses, accessibility to facilities and the analysis of official statistical indicators (INEC Censuses, Projections).
Qualitative Component: Focused on understanding, through direct observation and the discourse of key actors, how these spatial configurations affect the life and economic experience of the population.
As Creswell and Plano Clark (2018) point out, the mixed-methods approach aligns with postpositivist epistemology, which strives for approximate objectivity while recognizing the influence of the researcher's values. The qualitative part of the mixed-methods approach is inductive, moving from cases and data to results and theory (Hernández-Sampieri & Mendoza Torres, 2018). Combining both approaches provides a broader, more reliable overview of the problem raised.

Type of Research: The study is of the type:
Descriptive: The current situation of the Canton of La Libertad was characterized in terms of distribution of land uses (with emphasis on the mixture and public facilities), economic activities and quality of life of the inhabitants. This made it possible, as mentioned by Underwood and Saughnessy (1978, cited in Abalde & Muñoz, 2005), to identify important phenomena and suggest factors for further studies.
Correlational: The relationship between the typology of land use (degree of mixing) and the indicators of commercial dynamism and access to services in the sectors analyzed was established.
Explanatory (with causal intent): The causes by which certain urban configurations promote or inhibit local socioeconomic development were interpreted, transcending the mere description of data.

Population, Sample and Type of Sampling
Spatial analysis units: Representative urban areas of the Canton of La Libertad were selected that presented different types of occupation (consolidated commercial zones, residential areas in transition and peripheral areas)
Units of human analysis: A non-probabilistic intentional sampling was applied. We worked with officials from the Municipal GAD (Directorate of Planning and Community Development), neighborhood leaders and merchants established in the study areas, who provided privileged information on the management and dynamics of the soil.
Documentary analysis units: Development and Territorial Planning Plan (PDOT), Land Use and Management Plan (PUGS) of the Canton of La Libertad, municipal cadastre, cartography and statistical reports from INEC, historical satellite photos, historical cartography, previous studies and relevant scientific literature
Sample and Type of Sampling: Selection of Study Areas: An intentional or cluster sampling will be carried out to select a representative number of neighborhoods or urban sectors within the Canton of La Libertad that present different degrees and typologies of mixture of land uses. The selection criteria (Patton, 2015) will include variability in the SSM and, where possible, socioeconomic diversity.
Selection of Participants for Structured Observation and Interviews:
For structured observation in the selected areas, observation points and schedules were systematically defined to ensure the representativeness of daily dynamics (Angrosino, 2007).

Data Collection Methods, Techniques, and Procedures
Following the premise of Somekh and Lewin (2005), who establish that the methodology encompasses both the rules of procedure and the principles and theories that support them, the following methods and techniques were applied to ensure the validity of the results obtained:

Research Methods
Descriptive Method: This method was used to characterize the current situation of the Canton of La Libertad, detailing the distribution of facilities and the commercial dynamics observed. Its application made it possible, as suggested by Underwood and Saughnessy (1978, cited in Abalde & Muñoz, 2005), to identify important phenomena and suggest key factors for analysis, providing a detailed "snapshot" of the territorial reality in relation to regulations.
Correlational method: It was used to establish the degree of association between the study variables. Following Abalde and Muñoz (2005), this method made it possible to determine how the mixture of land uses and socioeconomic indicators are related to each other, without necessarily manipulating the variables, but measuring their interaction in the real context.

Harvesting Techniques
Documentary Review and Analysis of Secondary Data: Official sources were analyzed, including the INEC censuses (2010 and 2022) and the current planning instruments (PDOT and PUGS). This technique was fundamental to establishing the quantitative and spatial baseline of the study.
Structured Observation: Systematic visits were made to the selected study areas. To guarantee the rigor of this technique, the observation points and schedules were defined systematically, ensuring the representativeness of the daily dynamics as recommended by Angrosino (2007).
Semi-structured interviews: Interviews were applied to key actors (officials, neighborhood leaders and merchants). For the selection of participants, an intentional sampling was used looking for a diversity of profiles (length of residence, type of business), following the criteria of Bernard (2017).

Data Processing and Analysis Procedures
Data triangulation: Once the quantitative (GIS/Statistics) and qualitative (Interviews/Observation) information had been processed, the findings were compared. This process was based on **Denzin and Lincoln (2018),** and was used to validate, complement, and enrich interpretations of the impact of the mix of uses on socioeconomic development.
Convergent analysis: An approach was adopted where quantitative and qualitative data were analyzed to converge in the final interpretation, following the guidelines of Creswell and Plano Clark (2018) for mixed-method designs, allowing a holistic understanding of the phenomenon.

Results

The analysis of the canton of La Libertad revealed a highly complex and contrasting urban scenario. According to official data processed during the study, the canton has an estimated population of 112,247, with a population density of 44.4 inhabitants per hectare. This density is concerning when compared to optimal planning standards (estimated at 120 inhabitants per hectare) because it suggests horizontal expansion. As Calthorpe (2017) and Gehl (2010) have warned, this expansion tends to hinder the efficient provision of services and dilute the urban vitality necessary for socioeconomic development.

In the physical environment, 42.6% of the territory is a plain with fragile desert shrub ecosystems (Jama-Zapotillo lowlands), which lack formal protection despite being home to over 900 native species. This pressure on the natural environment reflects the tensions typical of accelerated urbanization in intermediary cities, where, as Castro Herrera and Miranda (2021) point out, state planning often lags land occupation.

Occupation patterns: One of the fundamental findings of this diagnosis was that the spatial configuration of La Libertad does not respond to a balanced concentric or polycentric model. Rather, it exhibits gradient-type behavior, with proximity to the sea as the starting point of greater consolidation.

This phenomenon manifests as a linear stratification of decreasing urban quality and functional mixture from the coastal edge (northwest) to the periphery (southeast). Analyzing this configuration through the lens of Dovey and Pafka's (2017) "assembly thinking" reveals how the intensity and variety of land uses gradually decrease as one move away from the coast, creating three distinct territorial zones:

- Coastal Zone (Consolidated): Concentrates on the tourist infrastructure, services and the greatest economic vitality. Here, Jacobs' (1961) premise about diversity as an engine of security and prosperity is fulfilled, observing a dynamic overlap of commercial and residential activities. It also concentrates on the greatest richness and functional diversity. The regulations fully coincide with reality: it is an area of high mix. This is where tourism infrastructure (hotels), key institutional facilities and public support services are agglomerated. It has the highest levels of quality of life. The demographic and educational analysis showed that in this sector the illiteracy rates are less than 3% per census sector.
- Intermediate Zone (Transition): It functions as a commercial and service hinterland but begins to present habitability problems. According to the geospatial data analyzed (IGM/INEC), the predominant socioeconomic level is medium with a tendency to medium-low. Despite its commercial dynamism, this area presents indicators of critical overcrowding. Sectors were identified where the number of people per room is high (range of 2.41 to 6.12 people), which suggests a precarious residential densification hidden behind the commercial façade. Illiteracy in this group oscillates around 5%. This contradicts the principles of urban quality of life set forth by Sen (1999), as it shows that proximity to commerce does not guarantee decent housing conditions by itself.
- Peripheral Zone (Unconsolidated): Characterized by predominantly residential uses and a marked lack of facilities. In this sector, a drastic drop in the mix of uses was observed, with a monofunctional residential use predominating. The socioeconomic gradient is much more distant from the starting point, which is the northern zone: while in the northern zone illiteracy is less than 3% and a high socioeconomic level is calculated, in these southern sectors it reaches up to 9% illiteracy and low and very low socioeconomic ranges. The provision of equipment is deficient and not very diverse. The structured observation highlighted that the predominant facility is almost exclusively of a religious type (worship), lacking formal recreational or cultural spaces.

One of the most relevant and counterintuitive findings of the study, based on Spatial Syntax analysis, was that socioeconomic segregation in the Canton of La Libertad is not a consequence of physical or road isolation. Spatial integration models showed that the canton is "very well connected" in terms of road compactness and road formation. There are high rates of physical accessibility between the center and the periphery.

However, this infrastructure connectivity has not translated into effective integration or territorial equity. This contradiction is explained by the Spatial Mismatch Hypothesis, as outlined in the scientific literature. As Kain (1968) postulated, the functional disconnection between the residences of working-class individuals and centers of economic opportunity acts as a structural factor that triggers unemployment and chronic poverty.

Applying this theoretical framework to La Libertad, it's clear that although the roads exist, the lack of mixed land uses in the third strip or peripheral zone (southern zone) creates a significant functional disconnection. As Kain (1968) warns, when the low-income labor force is trapped in residential areas far from employment and service centers, the costs of finding work and commuting increase, systematically reducing their net income and development opportunities. Therefore, segregation in the canton is not a problem of "road isolation" but of "functional isolation." The southern population does not have low development indicators due to a lack of streets to reach the north but rather because its immediate surroundings lack the necessary diversity of uses to activate local micro-economies and reduce dependence on commuting.

Regarding urban occupation and density, the analysis of La Libertad Canton's territorial indicators reveals an extensive occupation model that compromises local development sustainability. According to processed official data, the canton has a gross population density of 44.4 inhabitants per hectare, drastically lower than the optimal density of 120 inhabitants per hectare suggested by local planning standards. This low density, dispersed in horizontal expansion, validates Calthorpe's (2017) theoretical concern that low-density urbanism exponentially increases infrastructure costs and hinders the financial viability of public transportation and basic services. In La Libertad, this "diluted" configuration hinders the urban vitality described by Jacobs (1961) because the population density per block is insufficient to support a variety of local shops and services, perpetuating dependence on vehicles and long journeys.

This reality is also evident in the deficit of public space and informality in land tenure, which promote the gradient-type behavior of the socioeconomic development of the canton.

One of the most alarming findings of the analysis is the precariousness of the public space system. A quantitative deficit of 98.5 hectares of green space was identified relative to the current population. This data is not merely statistical; it represents a violation of the "right to the city." According to Borja and Muxí (2003), the absence of quality public spaces in La Libertad means the absence of places for citizenship and social cohesion—essential elements for reducing segregation. Additionally, it contravenes Gehl's (2010) principles of "cities for the people" because the lack of parks and squares restricts social life to the private sphere or congested commercial streets. This directly affects public health and the psychosocial well-being of inhabitants, especially in peripheral areas where the deficit is more acute.

A study of the cadastral structure revealed a deep fracture in urban formality: 12,903 properties were found to be unregistered or in an irregular situation. This figure shows that a significant part of La Libertad's urban fabric has been produced outside state planning.

This phenomenon of mass informality aligns with Dreifuss-Serrano and Maqueira-Yamasaki's (2019) statement about "informal adaptations," in which self-construction exceeds the state's regulatory capacity. However, beyond urban planning, this irregularity has a devastating socioeconomic impact. According to Sen's (1999) capabilities approach, the absence of property titles prevents thousands of families from converting their homes into collateral for loans, severely limiting their opportunities for entrepreneurship and economic improvement. Informality in La Libertad is not only a legal issue; it is also a structural mechanism that perpetuates poverty.

Conclusions And Recommendations

The following conclusions are derived based on the objectives set and the analyses carried out.

- It was possible to develop a theoretical framework that validates the applicability of Jacobs' (1961) postulates and Kain's (1968) theory of spatial mismatch in the context of Latin American intermediary cities. Theoretically, it was concluded that in La Libertad, segregation does not operate by physical isolation (lack of roads), but by "functional isolation," where the absence of mixed uses acts as a structural barrier to development. This confirms that urban diversity is an economic variable, not just an urban one.

- The diagnosis revealed that La Libertad does not undergo homogeneous development but exhibits a "territorial gradient" pattern descending from the coast to the periphery. The analysis revealed a significant historical discrepancy between the PUGS regulations and the actual situation: while the regulations expand residential areas, the reality is a "dormitory city" in the south with a shortage of 98.5 hectares of green spaces and amenities, while the coastal area is overcrowded with services and tourism. It should be noted that the latest PUGS update has corrected this issue at the regulatory level; however, it will require time to observe its impact.

- A direct and positive correlation was determined between the typology of uses and indicators of well-being. Data show that areas with a high mix of uses (the first third) have illiteracy rates of less than 3% and greater economic dynamism. Conversely, the residential monofunctionality of the third third is spatially correlated with the largest pockets of poverty and educational backwardness. This validates the idea that housing isolated from economic activities inhibits social development. This third is the receptacle of the diagnosed negative externalities. This area concentrates untitled properties, has deceptively low density (empty lots), and presents intra-lot overcrowding (caves). There is also an almost total lack of equipment. Structured observations confirmed that the predominant facility is for religious worship, indicating a "subsistence monofunctionality" that, as Guzmán Ramírez and Hernández Sainz (2013) warn, consolidates urban fragmentation and social segregation.

- Based on these findings, it is imperative to transition from a restrictive zoning model to a flexible management model, as proposed in the recent update to the PUGS. It is also concluded that the implementation of strategic guidelines aimed at "neighborhood polycentrism" and intelligent densification is required. This demonstrates that the GAD's priority intervention should not only be road infrastructure but also the reassignment of land uses, especially those that allow employment and commerce to be brought closer to vulnerable peripheral areas.

In light of the results obtained, and with the aim of maximizing the impact of territorial planning on the socioeconomic development of the Canton of La Libertad, the following is suggested.

- It is recommended that the Municipal GAD reformulate the regulatory files of the Territorial Intervention Polygons (PIT) located in the "third third," or southern peripheral zone. The rigid residential zoning must be replaced with an "incentivized mix" regulation that allows and subsidizes the implementation of neighborhood shops and professional services on the ground floor. This will correct the "functional isolation" that has been identified and will bring economic opportunities to the most depressed sectors.

- - Given the estimated shortage of 98.5 hectares of green space, the public works budget should prioritize the creation of a network of parks and civic facilities (libraries and training centers) in the southeastern zone. These investments should be strategic, not decorative, breaking the area's current monofunctionality (dominated by cult equipment) to generate new nodes of centrality that attract pedestrian flow and economic activity.

- - Given that approximately 12,903 properties lack property titles, it is recommended that the mass legalization process not be limited to the administrative delivery of deeds. The GAD should require the

implementation of basic partial plans that reserve land for public spaces and future commerce to avoid consolidating settlements that will structurally function as disconnected "ghettos."

- Considering the current population density of 44.40 inhabitants per hectare, which is well below the optimum of 120 inhabitants per hectare, it is suggested that building incentives be implemented along road axes with high integration (identified in the spatial syntax analysis). These incentives would allow for greater height and would be conditioned on projects including mixed uses. This will allow the existing infrastructure to be optimized without expanding urban sprawl.
- For academia and future researchers, it is recommended that they deepen their study of the informal economic dynamics occurring within homes (e.g., unregistered neighborhood stores). Quantifying this "invisible trade" is crucial to understanding the economic resilience of vulnerable sectors and designing public policies that formalize and enhance these microeconomies without penalizing them.

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