

Territorial Diagnosis of Urdesa and Bases for the PDOT Partial Plan

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Abstract—The territorial study of Urdesa, located in the Tarqui parish of the Guayaquil canton, is designed to describe its current condition through five subsystems: biophysical, sociocultural, economic, human settlements, and political-institutional. Territorial management and land-use planning are essential to address current challenges such as uncontrolled growth, inequality in access to services, pressure on ecosystems, and exposure to climate risks. In Ecuador, these functions are grounded in the Constitution and national regulatory frameworks and are implemented through instruments such as the PDOT and partial plans, supported by technical guidelines from the National Secretariat for Planning.

In the Urdesa sector, multiple problems converge. For example, low elevation and insufficient stormwater drainage increase exposure to flooding, while commercial pressure is reflected in traffic congestion. At the same time, the area retains strategic assets, social networks, opportunities for active mobility, and an edge with restoration potential. This document provides the technical basis for the Partial Plan and contributes to the Current Territorial Model by organizing findings and delimiting the intervention area.

An initial portfolio of guidelines is proposed, including water management through Sustainable Urban Drainage Systems (SuDS), multimodal mobility, recovery of urban voids, and regulatory measures to promote renewal processes. These guidelines are articulated with existing cantonal instruments and aligned with local public policies. In addition, the study incorporates interinstitutional coordination and citizen participation with continuous monitoring.

Keywords: Territorial planning, urban planning, environmental diagnosis, land management, territorial sustainability.

INTRODUCTION

Territorial planning in Ecuador constitutes a public mandate to organize development and regulate land use, promoting long-term sustainability and equity. Instruments such as the PDOT and PUGS, together with partial plans, structure the actions of local governments under national technical leadership and the legal framework of the COOTAD and the LOOTUGS. In the urban context, planning addresses uncontrolled expansion, gaps in basic services, environmental risks, and the effects of climate change. By articulating public and private decisions in the territory, it reduces land-use conflicts and guides development toward sustainability and resilience goals.

Within the Ecuadorian framework, the Buen Vivir (Sumak Kawsay) approach incorporates rights, social participation, and protection of nature, requiring that territorial plans align with the National Development Plan and the National Territorial Strategy, in accordance with the guidelines of the national planning authority.

The PDOT defines the development model and land-use organization of the canton and is prepared in accordance with the PDOT Guide 2023–2027. Its regulatory component is implemented through the PUGS, which governs land uses, densities, and development rights. At a smaller scale, the Partial Plan enables intervention in specific areas—urban regeneration, risk management, or reconfiguration of uses—while maintaining full coherence with the PDOT/PUGS and using the land-management instruments established in the LOOTUGS.

Table 1. Institutional and Regulatory Framework for Urdesa’s Planning

Level	Instrument	Functional Application
National	LOOTUGS & COOTAD	Legal mandate for land management, use, and municipal competencies.
Cantonal	PDOT 2023–2027 / PUGS	Strategic categorization of Urdesa as a consolidated central commercial corridor.
Local/Sectoral	Partial Plan (Proposed)	Specific tactical instrument for flood resilience and urban renewal.

The territorial diagnosis is conducted because the selected area (Urdesa) exhibits problems, risks, and potentialities that must be identified and analyzed prior to formulating land-use and management proposals. This document constitutes the technical basis of the Partial Plan and a key intermediate phase of the final project, providing inputs for the Current Territorial Model and for the design of strategies and projects.

This research aims to construct a Current Territorial Model of Urdesa based on five subsystems—biophysical, sociocultural, economic, human settlements, and political-institutional—in order to identify problems, risks, and potentialities, delimit the intervention area, and organize the evidence that will support the design of the Partial Plan and, subsequently, the Desired Territorial Model.

MATERIALS AND METHODS

A mixed-methods approach was employed, integrating documentary-regulatory analysis and statistical evidence with field reconnaissance (direct observation and photographic documentation). To operationalize the spatial diagnosis, vector and raster datasets were processed using QGIS to cross-reference cadastral data with environmental variables. The diagnostic structure is methodologically grounded in the APEIR framework, systematically categorizing the territorial dynamics into five sequential components: Actores (Actors), Presión (Pressure), Efecto (Effect), Impacto a la población y paisaje (Impact on population and landscape), and Respuesta (Response). This multi-criteria analysis facilitated the precise delimitation of the intervention polygon and the formulation of the Current Territorial Model.

The COOTAD (territorial competencies and organization), the LOOTUGS (land-use planning and management instruments), the PDOT Guide 2023–2027 (procedures, content, and participation), and the 2022 Census results (INEC) were used for cantonal-level sociodemographic context. Municipal publications on the PDOT 2023–2027/PUGS update and academic studies on water quality in the Estero Salado were also consulted.

The study area is located in Urdesa, within the Tarqui parish of the Guayaquil canton. It is a consolidated urban fabric with commercial and residential corridors connecting the north and center of the city. Analytical tools included thematic organization by subsystems, problem–cause–effect matrices, systematization of potentialities, regulatory comparison with PDOT/PUGS and LOOTUGS, and integration of INEC census data

with environmental evidence related to the Estero Salado.



Figure 1. Territorial context and delimitation of the Urdesa intervention area and its proximity to the Salado Estuary.

RESULTS

Results and Discussion

The results of the territorial diagnosis of Urdesa are organized by the five subsystems to characterize current dynamics, identify critical issues, and contribute to research in the same field.

Biophysical Subsystem

The territory presents predominantly flat relief and alluvial soils. Low elevation and proximity to the Estero Salado condition water accumulation during the rainy season when drainage capacity is insufficient. Local literature documents water-quality impacts and eutrophication in estuarine sections adjacent to areas such as Urdesa–Miraflores.

Urdesa shows high susceptibility to flooding due to inadequate stormwater drainage and limited surface retention, affecting mobility and accelerating road-infrastructure deterioration. Degradation of estuarine water quality—associated with untreated urban discharges and runoff—is also observed.

Field reconnaissance revealed that many existing containment structures and industrial/residential perimeter walls average a critical height of 3.20 meters. During extreme high-tide events coupled with intense precipitation, this containment scale proves insufficient, creating severe bottlenecks in the drainage infrastructure and exacerbating surface runoff accumulation.

Table 2. Biophysical Vulnerability Matrix (APEIR Analysis)

Component	Pressure	Effect / Impact
Hydrology	Estero Salado tidal influence.	Backflow into the drainage network and flooding.
Topography	Flat relief (< 2% slope).	Inefficient natural runoff and water logging.
Ecosystem	Urban discharge and runoff.	Eutrophication and loss of estuarine biodiversity.

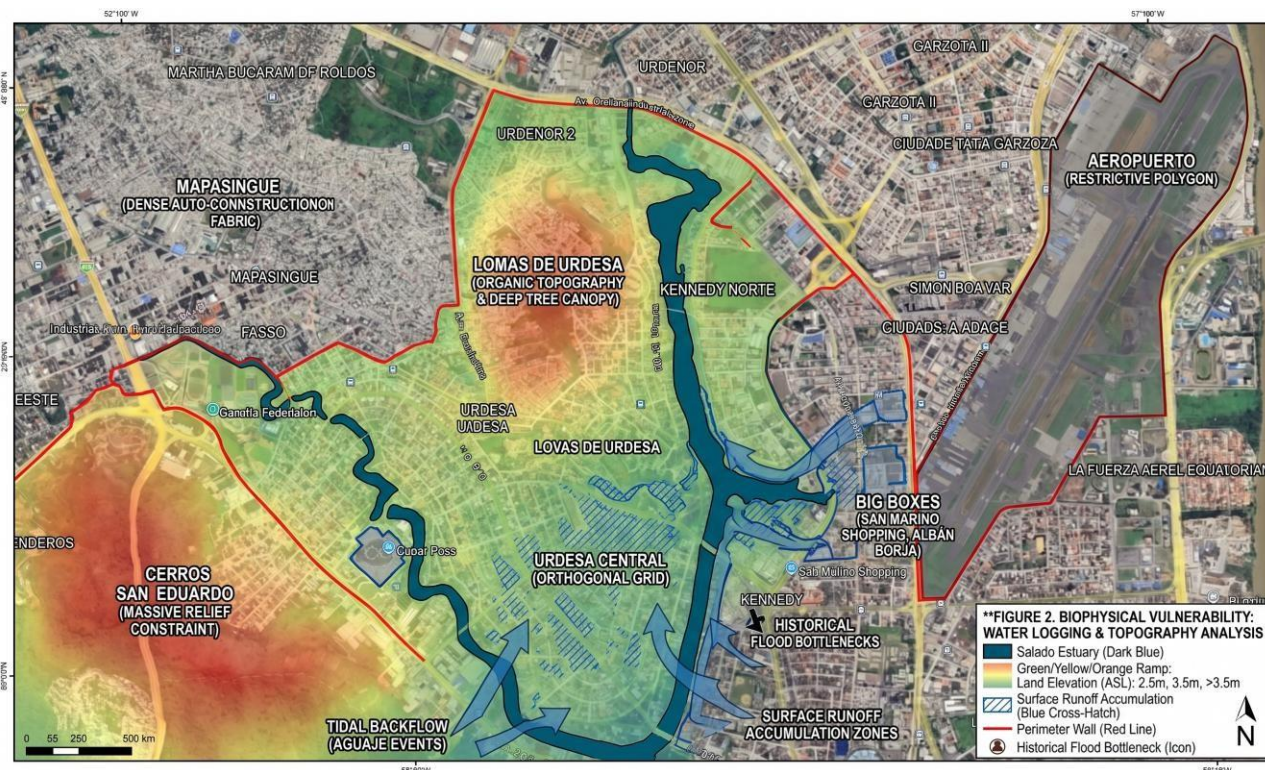


Figure 2. Biophysical vulnerability analysis: Topography, surface runoff accumulation zones, and tidal backflow influence from the Salado Estuary.

Sociocultural Subsystem

Guayaquil is the most populous canton in the country according to the 2022 Census (2,746,403 inhabitants), predominantly urban, with high coverage of services such as electricity. These data provide general context for public-space and mobility demand in Urdesa.

Observed issues include perceptions of insecurity and inadequate lighting along internal corridors, reducing nighttime use of public space. Pressure from transient populations linked to commerce and services generates

coexistence conflicts (noise, waste accumulation, and occupation of public space), as identified through field observation.

Economic Subsystem

Urdesa concentrates tertiary activities (gastronomy, healthcare services, offices) with strong metropolitan attraction. Recent municipal urban policy emphasizes commercial corridors and planned densification, requiring accessibility criteria and management of urban loads.

The most visible problems include traffic congestion and saturated parking along commercial axes, with spillover into residential streets. Pressure on residential balance—driven by land-value increases and unmitigated land-use changes—highlights the need for regulation and land management consistent with the LOOTUGS.

Human Settlements Subsystem

This is a consolidated urban fabric with high coverage of basic services at the cantonal level. However, traditional residential functions coexist with new high-rise development along corridors, generating additional demand for green areas and facilities.

A deficit of public space and green areas is evident, linked to the transition from single-family housing to mixed uses and higher building intensity. Vacant houses and urban voids persist, affecting safety and urban landscape. In several segments, insufficient stormwater drainage affects habitability during rainy periods.

Table 3. Urban Saturation and Settlement Indicators

Indicator	Observation	Territorial Impact
Land Use Change	Residential to Gastronomy/Health.	Loss of neighborhood identity and residential flight.
Mobility	High demand for on-street parking.	Traffic congestion and reduced pedestrian safety.
Urban Voids	Abandoned properties/vacant lots.	Security risks and missed densification opportunities.



Figure 3. Spatial analysis of land use dynamics in Urdesa. The map delineates the intense commercial pressure along the main corridor (Av. Víctor Emilio Estrada) and the peripheral metropolitan nodes, contrasting with the traditional residential fabric that currently experiences non-mitigated land-use transitions and a deficit of public green areas.

Political-Institutional Subsystem

Planning and land-use regulation are responsibilities of local autonomous governments. At the cantonal level, Guayaquil updated its PDOT 2023–2027 and PUGS, emphasizing centralities, conservation areas, and sustainable mobility, and recognizing the need for partial plans in specific sectors.

The main issue identified is insufficient regulatory control over land-use changes and development standards in sensitive areas, along with limited multi-actor coordination for parking, facilities, and environmental management projects.

DISCUSSION

Urdesa's territorial system reflects an unsatisfactory condition resulting from the convergence of short-term economic pressures, environmental fragilities, growing mobility and public-space demands, and still-limited urban control capacity. Planning must balance public interest with private dynamics, ensuring carrying capacity and ecosystem functions. Strategic assets—urban centrality and connectivity, neighborhood social capital, available land for facilities, and the Estero Salado ecological corridor—exist alongside an updated legal and technical framework that enables regulation of densities, uses, and sustainable mobility at the cantonal scale.

Based on the evidence gathered, the structural 'Response' within the APEIR framework justifies the immediate formulation of a Partial Plan for Urdesa. This instrument must deploy specific tactical interventions aimed at mitigating environmental vulnerabilities while managing urban density. Table 4 outlines the strategic portfolio of guidelines designed to transition Urdesa from its Current Territorial Model to a resilient and sustainable Desired Territorial Model.

Table 4. Strategic Guidelines for the Urdesa Partial Plan

Intervention Axis	Proposed Action / Guideline	Expected Territorial Outcome
Water Management	Implementation of Sustainable Urban Drainage Systems (SuDS).	Reduction of surface flooding and mitigation of runoff entering the Estero Salado.
Multimodal Mobility	Prioritization of pedestrian networks, bike lanes, and peripheral parking.	Decongestion of commercial corridors and promotion of active mobility.
Public Space Recovery	Rehabilitation of vacant lots and underused properties into pocket parks.	Mitigation of the public space deficit and reduction of neighborhood insecurity.
Regulatory Control	Enactment of an urban-renewal ordinance for mixed uses and densities.	Balanced commercial pressure and preservation of residential carrying capacity.
Urban Safety	Deployment of an integrated urban lighting program based on CPTED principles.	Enhanced nighttime habitability and revitalization of local public spaces.

CONCLUSIONS

This study provides a comprehensive characterization of Urdesa's territorial system through analysis of five subsystems, enabling understanding of interactions among biophysical, sociocultural, economic, human-settlement, and political-institutional factors. This approach supports formulation of the Partial Plan with technical and methodological evidence, helping to delimit the intervention area, identify critical issues, and recognize strategic potentialities.

A second contribution is the preliminary proposal of guidelines focused on water management, multimodal mobility, recovery of urban voids, and regulatory measures, articulated with existing cantonal instruments and useful for applied research in urban regeneration and climate resilience. Finally, the study underscores the need to strengthen interinstitutional coordination and citizen participation as essential components of territorial planning.

Limitations include the preliminary nature of results, based on field observation and documentary analysis without hydrological modeling or urban carrying-capacity studies, limiting future-scenario precision. Gaps in updated environmental and mobility data also constrain projections. These limitations open opportunities for future research to:

- Evaluate the effectiveness of nature-based solutions in consolidated urban contexts
- Analyze densification impacts on public-space and facilities demand
- Develop territorial-governance indicators to measure regulatory control and multi-actor coordination

Overall, this work provides a technical and methodological contribution to territorial planning in complex urban areas, offering inputs that can be expanded in subsequent phases to consolidate a sustainable and resilient urban model.

Conflict of Interest Statement

The authors declare no conflicts of interest regarding the research, authorship, and/or publication of this article.

Ethical Approval / Informed Consent Statement

This study used documentary and regulatory information, public statistical data, and field observation in open spaces, without involving human subjects or identifiable personal data. Therefore, individual informed consent was not required. All information was handled in accordance with research ethics principles and good practices, avoiding disclosure of sensitive data and respecting regulations on access to public information.

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