

Partial Land-Use Plan for La Alborada Third Stage, Guayaquil: A Sustainable Response to Socio- Environmental Vulnerability

Raúl Icaza Muñoz¹

¹ Universidad Laica Vicente Rocafuerte; [ORCID 0000-0001-6906-7359](https://orcid.org/0000-0001-6906-7359); ricazam@ulvr.edu.ec

Abstract— This territorial diagnosis was conducted with the objective of obtaining comprehensive and up-to-date knowledge of the study area (La Alborada Third Stage), providing the technical foundation necessary for territorial management and local development planning. The analysis is based on the need to identify problems, risks, and potentialities affecting the current dynamics of the territory, as well as opportunities for transformation.

The general objective is to describe the current condition of the territory through the examination of five territorial subsystems: biophysical-environmental, human settlements, socioeconomic, infrastructure and services, and institutional management. The methodology follows a mixed qualitative–quantitative approach that combines statistical analysis, thematic mapping, and GIS tools, along with regulatory review, institutional analysis, and local opinion collection.

Key findings highlight challenges such as widespread urban expansion, inequality in access to basic services, environmental vulnerability, and urban fragmentation, as well as potential opportunities arising from planned integrations, development of public facilities, and strengthening of local governance.

Overall, this diagnosis represents a significant contribution to the formulation of the Partial Plan and the definition of the desired territorial model, providing technical criteria to guide spatial development policies, public investment, and sustainable land-use planning.

Keywords: Territorial planning, urban sustainability, land-use management, socio-environmental vulnerability, urban mobility.

INTRODUCTION

Territorial planning represents a fundamental instrument for achieving sustainable urban development and improving the quality of life within contemporary cities. In rapidly urbanizing Latin American contexts, territorial management has become increasingly important due to accelerated population growth, informal urban expansion, environmental degradation, and growing pressure on public infrastructure and urban services.

La Alborada Third Stage, located within the metropolitan area of Guayaquil, Ecuador, constitutes a consolidated urban territory characterized by high population density, mixed land use, commercial expansion, and increasing environmental vulnerability. Its strategic location within the city has generated important economic opportunities while simultaneously producing territorial conflicts associated with mobility, infrastructure saturation, environmental risks, and progressive transformation of residential spaces.

According to Gómez Orea (2007), territorial diagnosis consists of the systematic analysis and interpretation of territorial systems to identify problems, risks, opportunities, and development potentialities. This process supports evidence-based decision-making and contributes to the formulation of sustainable planning strategies capable of balancing economic growth, environmental protection, and social equity.

Within Ecuador, territorial planning is guided by legal and institutional frameworks such as the Código Orgánico de Organización Territorial, Autonomía y Descentralización (COOTAD), the Ley Orgánica de Ordenamiento Territorial, Uso y Gestión de Suelo (LOOTUGS), and the national and municipal Territorial Development and Planning Plans (PDOT). These instruments promote sustainable territorial governance aligned with the constitutional principles of Buen Vivir and territorial equity.

The present study seeks to characterize the current territorial conditions of La Alborada Third Stage through the examination of five territorial subsystems: biophysical-environmental, sociocultural, economic, human settlements, and political-institutional. The research aims to identify the principal territorial conflicts affecting the sector while proposing sustainable planning considerations for future urban interventions.

In addition, this study incorporates the APEIR analytical framework as a methodological tool to examine the relationships between urban actors, territorial pressures, environmental effects, population impacts, and institutional responses. The framework facilitates an integrated understanding of how urban dynamics influence territorial sustainability and socio-environmental vulnerability.

LITERATURE REVIEW

Urban territorial planning has evolved into a multidisciplinary field integrating environmental management, urban governance, infrastructure development, and socioeconomic sustainability. Contemporary urban planning approaches emphasize the importance of resilient cities capable of adapting to environmental risks, population growth, and infrastructural pressures (UN-Habitat, 2022).

In Latin America, accelerated urbanization has generated significant territorial challenges, including informal settlements, inadequate infrastructure, environmental degradation, and unequal access to public services (Borsdorf & Hidalgo, 2010). These conditions frequently contribute to spatial fragmentation and social inequality within metropolitan areas.

Socio-environmental vulnerability in urban contexts is commonly associated with inadequate drainage systems, uncontrolled land-use transformation, reduction of green spaces, and increased exposure to flooding and climate-related risks (Hardoy, Mitlin, & Satterthwaite, 2001). Urban sustainability therefore requires integrated territorial management strategies that balance economic activity with environmental protection and social inclusion.

The concept of sustainable urban mobility has also gained importance within territorial planning literature. According to Cervero (2013), cities characterized by mixed land use and high commercial concentration often experience transportation saturation, pedestrian insecurity, and deterioration of public space when mobility planning is insufficient.

Within Ecuador, territorial planning policies have increasingly emphasized decentralization, participatory governance, and sustainable land-use management through instruments such as the PDOT and LOOTUGS. These frameworks seek to improve coordination between municipal institutions and local communities while promoting environmentally responsible urban development.

The present study contributes to this body of literature by examining the territorial dynamics of a consolidated urban sector in Guayaquil and evaluating how socio-environmental vulnerability, infrastructure limitations, and institutional governance interact within the context of sustainable territorial management.

Estuarine Vulnerability and Soil Sealing

Concurrently, the biophysical stability of these consolidated settlements is threatened by the progressive degradation of their environmental matrices. In estuarine environments, the historic occupation of floodplains and the systematic sealing of the urban soil—driven by progressive informal construction and lot paving—drastically reduce the territory's natural permeability. This disruption of the "blue infrastructure" eliminates natural runoff buffers. When combined with flat topographies and tidal backflow events (such as the aguaje phenomena in the Salado Estuary), the loss of ecological corridors exacerbates surface water accumulation, increasing the physical vulnerability of the built environment and accelerating the deterioration of public infrastructure.

MATERIALS AND METHODS

This research employed a mixed-methods approach integrating qualitative and quantitative techniques for territorial diagnosis and spatial analysis. The methodology combined field observations, documentary review, thematic mapping, and statistical analysis to obtain a comprehensive understanding of the territorial dynamics within La Alborada Third Stage.

Study Area

The study area corresponds to La Alborada Third Stage, a consolidated urban sector located within the metropolitan area of Guayaquil, Ecuador. The territory is characterized by flat topography, dense urban development, residential and commercial land use, and increasing infrastructural pressure associated with urban growth.

Data Collection

Primary data were collected through:

- Direct field observation
- Environmental reconnaissance
- Informal interviews with local residents
- Photographic documentation
- Spatial verification through satellite imagery

Secondary data sources included:

- INEC Census 2022
- Municipal planning documents
- PDOT 2020–2025
- COOTAD and LOOTUGS regulations
- Geographic information obtained from Google Earth Pro and municipal geoportals

Spatial delimitation was obtained through satellite imagery interpretation (Google Earth Pro) and field verification. The analysis is structured around five subsystems:

- Biophysical subsystem: climate, urban vegetation, drainage systems, and environmental hazards (especially flooding).
- Sociocultural subsystem: demographic characteristics, education levels, community organization, and safety conditions.
- Economic subsystem: household-based commerce, employment levels, and local economic

structure.

- Human settlements subsystem: housing conditions, population density, urban fabric integration, and basic services.
- Political-institutional subsystem: existing regulations, land administration, and institutional capacity of the municipal GAD.

Data sources included the national PDOT (2020–2025), INEC Census 2022 data, COOTAD, LOOTUGS, and municipal ordinances, complemented by field observations and informal interviews with residents. Mapping tools included Google Earth Pro, the IGM Geoportal, and the city geoportal. Excel was used for data tables, and a causal problem matrix supported integrated territorial interpretation.

Territorial Subsystems

The territorial diagnosis was structured through five interconnected subsystems:

Biophysical-Environmental Subsystem

Analysis of climate conditions, drainage systems, vegetation coverage, environmental risks, and flooding vulnerability.

Sociocultural Subsystem

Examination of demographic characteristics, education levels, safety conditions, community organization, and social dynamics.

Economic Subsystem

Evaluation of local economic activities, informal commerce, employment conditions, and commercial concentration.

Human Settlements Subsystem

Assessment of housing conditions, land use, urban density, infrastructure access, and public services.

Political-Institutional Subsystem

Review of territorial governance, regulatory enforcement, municipal planning instruments, and institutional coordination.

APEIR Analytical Framework

To systematically decode the urban frictions within the study area, this research applies the APEIR methodological framework. This systemic model allows for the tracing of causal chains between human activities and territorial degradation, structured across five interconnected dimensions:

- Actors (Actores): The primary agents driving territorial transformations, encompassing both regulatory bodies (e.g., municipal authorities) and socioeconomic forces (e.g., real estate developers, informal merchants, and local residents).
- Pressure (Presión): The specific urban dynamics and anthropogenic demands exerted on the territory, such as unregulated commercial expansion, vehicular saturation, and the progressive sealing of permeable surfaces.
- Effect (Efecto): The immediate, measurable physical or environmental alterations resulting from these pressures, including the loss of urban tree canopy, the transformation of residential lots into informal parking, and the reduction of natural drainage capacity.

- Impact on population and landscape (Impacto a la población y paisaje): The ultimate, long-term consequences affecting the quality of life and the urban ecosystem. This includes heightened vulnerability to flooding, the fragmentation of community cohesion, the degradation of the visual landscape, and the localized urban heat island effect.
- Response (Respuesta): The proposed spatial planning guidelines, regulatory frameworks, and urban design interventions (such as the integration of pocket parks and eco-corridors) required to mitigate impacts and restore territorial equilibrium.

RESULTS

Biophysical Subsystem

General Characterization

The study area presents predominantly flat terrain, facilitating urban occupation and internal mobility. The climate is tropical, with warm temperatures throughout most of the year and significant rainfall during the early months. No water bodies were identified within the polygon, and vegetation cover is limited to scattered trees and small green areas.

Identified Problems

- Reduction of green areas and minimal vegetation coverage
- Water accumulation during the rainy season due to flat terrain and insufficient drainage infrastructure

Potentialities

- Availability of areas suitable for urban ecological interventions
- Stable terrain conditions favorable for infrastructure development
- Potential creation of community green corridors and public spaces

Sociocultural Subsystem

General Characterization

The population is composed predominantly of working-age residents, children, and adolescents. Educational attainment is concentrated primarily at the basic and secondary education levels. The area demonstrates moderate socioeconomic vulnerability.

Identified Problems

- Safety concerns and perceived insecurity
- Limited cultural and recreational infrastructure
- Weak participation in community planning initiatives

Potentialities

- Strong community identity and neighborhood cohesion
- Large productive-age population capable of supporting local economic initiatives

Economic Subsystem

General Characterization

Economic activity within the territory is based primarily on small businesses, family-operated commerce, workshops, and informal trade. Commercial activities are concentrated along principal transportation corridors.

- Dependence on informal economic activities

- Limited economic diversification
- Commercial saturation affecting mobility and residential quality

Potentialities

- Strategic location connected to major urban corridors
- Established local commercial networks
- Opportunities for organized commercial development

Human Settlements Subsystem

General Characterization

The area is a consolidated settlement with dense urban fabric and progressive housing construction. Most homes are one or two stories, built with mixed materials. Lots are small and closely spaced, resulting in intensive land use.

- Identified Problems
- Insufficient basic services
- Housing with structural deficiencies
- Lack of green and recreational areas

Potentialities

- Availability of land for public spaces
- Direct access to major roads

Political–Institutional Subsystem

General Characterization

La Alborada Third Stage is part of Guayaquil's metropolitan system, connected to major corridors such as Francisco de Orellana and Benjamín Carrión. Governance requires coordinated policies to manage infrastructure pressure and population growth.

Identified Problems

- Non-compliance with construction regulations
- Weak enforcement and delayed inspections
- Limited community participation
- Poor inter-institutional coordination

Potentialities

- Emerging community leadership
- Existing legal framework (COOTAD, LOOTUGS)
- Favorable location for integrated urban projects

DISCUSSION

The territorial diagnosis conducted in La Alborada Third Stage demonstrates how rapid urbanization and unregulated land-use transformation can intensify socio-environmental vulnerability within consolidated urban sectors. Similar territorial dynamics have been identified in several Latin American metropolitan areas where commercial expansion, population growth, and insufficient infrastructure generate conflicts associated with mobility, environmental degradation, and spatial fragmentation. The findings of this study indicate that territorial sustainability depends not only on physical infrastructure improvements, but also on integrated institutional governance and long-term urban planning strategies.

One of the most significant findings involves the relationship between urban growth and flooding

vulnerability. The reduction of permeable surfaces, limited drainage infrastructure, and progressive soil sealing contribute directly to water accumulation during intense rainfall periods. These findings align with previous urban sustainability studies indicating that inadequate territorial management increases environmental risk exposure within tropical urban environments. The occupation of highly urbanized zones without corresponding environmental mitigation measures has intensified pressure on drainage systems and reduced the territory's natural resilience capacity.

The study also identified important tensions between residential land use and informal commercial expansion. Commercial concentration along major corridors has contributed to increased vehicular congestion, pedestrian mobility limitations, and deterioration of public spaces. According to Cervero (2013), urban sectors characterized by mixed land use without integrated mobility planning often experience transportation saturation and reduced urban functionality. The territorial dynamics observed within La Alborada Third Stage reflect these broader urban planning challenges frequently observed in rapidly urbanizing Latin American cities.

From a sociocultural and institutional perspective, the findings demonstrate that community cohesion remains an important territorial strength despite the presence of insecurity perceptions and limited recreational infrastructure. At the same time, the research identified weaknesses related to regulatory enforcement, delayed municipal inspections, and limited inter-institutional coordination. Although Ecuador possesses an important territorial planning framework through COOTAD, LOOTUGS, and municipal PDOT instruments, implementation challenges continue to affect local territorial management processes. Strengthening institutional coordination, improving regulatory compliance, and promoting participatory planning mechanisms are therefore essential components of sustainable urban development.

The APEIR analytical framework contributed significantly to the interpretation of territorial conflicts by facilitating the identification of relationships between urban actors, territorial pressures, environmental effects, and long-term impacts on the population and urban landscape. The framework allowed for a more integrated understanding of how environmental vulnerability, mobility problems, and institutional limitations interact within the study area. Despite the challenges identified, La Alborada Third Stage presents important opportunities for sustainable territorial intervention due to its strategic location, existing infrastructure network, and consolidated urban fabric. Future urban interventions should prioritize green infrastructure, modernization of drainage systems, recovery of public spaces, and sustainable mobility initiatives. One limitation of this study involves the restricted availability of updated environmental indicators and geospatial statistical data at the neighborhood level. Future investigations should incorporate advanced GIS analysis, hydrological modeling, and longitudinal urban growth assessments to strengthen territorial planning proposals.

CONCLUSIONS

The territorial diagnosis of La Alborada Third Stage revealed complex interactions between environmental, economic, sociocultural, infrastructural, and institutional dynamics. The territory currently faces important sustainability challenges associated with flooding vulnerability, reduction of green spaces, informal commercial activity, infrastructure pressure, and weak regulatory enforcement.

At the same time, the area possesses strategic territorial advantages including consolidated urban infrastructure, strong community identity, commercial connectivity, and institutional planning instruments capable of supporting sustainable urban transformation.

The study demonstrates the importance of integrated territorial planning approaches that combine environmental management, mobility planning, public space recovery, and citizen participation. Sustainable

urban interventions should prioritize resilience, spatial equity, ecological restoration, and institutional coordination.

The research contributes technical and methodological criteria that may support municipal planning processes and future territorial management initiatives within Guayaquil and other rapidly urbanizing Latin American cities.

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