

# MEASURING MULTIDIMENSIONAL INTEGRATION IN PERIURBAN SETTLEMENTS: A LOCAL INDEX FOR INCLUSIVE URBAN POLICY

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This paper analyzes local integration processes of forced migrants in the Amazonian borderlands through the design and application of a Local Integration Index. The study examines four peri urban self-built settlements, two in Mocoa (Colombia), and two in Lago Agrio (Ecuador), drawing on survey data from 235 households and a proportional sampling design. The methodological framework builds on the Local Integration Index developed by previous studies, extending it with a fourth dimension of community action to capture practices such as self-construction, mutual aid, and neighborhood upgrading. Binary logistic regression was applied to validate the index and estimate the relative weight of legal, socioeconomic, sociocultural, and community factors. Findings show that integration is partial and uneven. In Mocoa, socioeconomic stability, reinforced by the national laws, provided a basis for integration. In Lago Agrio, the absence of a reparation framework shifted integration toward community cohesion and informal credit networks. Comparative analysis highlights the role of national policy regimes in shaping integration trajectories and emphasizes the centrality of community agency in sustaining permanence. The study contributes a methodological tool for multidimensional measurement and a policy-oriented perspective that recognizes self-built settlements as legitimate urban forms. It calls for aligning international development frameworks with local practices and prioritizing inclusive strategies grounded in capabilities and community cohesion in socially unequal territories.

*Keywords:* Durable solutions, Amazonian borderlands, Urban development policy, Local governance, Intercultural forced migration, Peripheral urbanization.

## 1 INTRODUCTION: LOCAL INTEGRATION AND PERIPHERAL URBANIZATION

Urban local integration of forced migrants (FM) is one of the central challenges in the fields of international migration and development. While immediate humanitarian assistance remains essential, the broader question concerns how to ensure conditions of dignified permanence in host territories by balancing access to rights, socioeconomic incorporation, and community cohesion. This debate brings together approaches to durable solutions, critical theories, and urban sociology contributions that examine how urban settlements absorb, resist, or transform migratory flows. In this context, measuring integration has evolved from approaches centered on objective indicators, toward methodologies that incorporate relational dimensions.

This paper addresses the Colombian-Ecuadorian Amazon as a critical site to explore these questions. In two intermediate cities, Mocoa (Colombia) and Lago Agrio (Ecuador), mass displacement between 2000 and 2020 gave rise to self-built settlements that functioned as platforms

for residential stabilization, incremental access to rights, and the creation of social networks. These hybrid peripheries provide an entry point to analyze local integration, institutional action, and the interplay of legal frameworks, socioeconomic conditions, and collective practices of self-construction and mutual aid.

The study presents the design and results of a Local Integration Index (LII-C) adapted to the Amazonian borderlands. The LII-C combines three classical dimensions, legal, socioeconomic, and sociocultural, with a fourth dimension of community action, introduced to capture collective agency (Molina Bolívar 2024). The empirical base is a household survey of 235 families across four peri-urban settlements, implemented through proportional sampling and validated with binary logistic regression analysis.

The research has a dual objective. First, it contributes to global debates on local integration by offering an instrument that captures both individual achievements and collective capabilities. Second, it provides context-specific evidence for policymaking in the Amazon, where inclusive urban strategies must recognize self-built settlements as legitimate forms of city-making and promote durable solutions based on community cohesion in fragile and unequal territories.

## 2 LITERATURE REVIEW

The construction of metrics for local integration in forced migration contexts has followed distinct trajectories in literature. At the global level, Ager and Strang (2008), Agier (2019), Bermúdez and Cuberos–Gallardo (2025), conceptualized integration as a multidimensional process involving rights, employment, housing, health, education, and social belonging. From a critical perspective, Sayad (1999), Pollock (2013), Jacobsen and Howe (2008) and Aliaga Sáez (2018) emphasized the political and relational nature of migration, arguing that integration must be understood as a two-way relationship shaped by migrant agency and opportunity structures.

In the Colombian-Ecuadorian Amazon, early work by Celi *et al.* (2009) in Sucumbíos provided a characterization of forced migration and its links with international cooperation and neighborhood integration in Lago Agrio. In Mocoa, surveys on rights verification and settlement studies (Buitrago *et al.* 2021) documented living conditions and community organization, laying empirical foundations for the design of urban–territorial indicators. A key methodological contribution came from the study developed by Córdova and Janssen (2017) in Ecuador. This tool established three dimensions: legal, economic, and sociocultural, and combining objective indicators with subjective perceptions of integration, applying household surveys and binary logistic regression to generate a replicable measurement protocol. Building on this accumulated knowledge, Molina Bolívar (2024) proposed extending the framework to the cross-border scale by linking the Cities-of-Refuge model with local integration. The main innovation was the addition of a fourth dimension: community agency, defined as the collective capacity of migrants to self-organize, engage in self-construction, generate mutual support networks, and sustain neighborhood upgrading initiatives. This dimension captures the factors explaining permanence in peri-urban settlements, where integration unfolds through both the pursuit of individual rights and the strengthening of territorial cohesion.

## 3 METHODOLOGY: DESIGN OF THE LOCAL INTEGRATION INDEX

The LII-C was developed to test the hypothesis that self-organized settlements in the peripheries of Mocoa and Lago Agrio, formed by FM, embody patterns consistent with the Cities-of-Refuge model, where self-organization establish the foundations for permanence and urban development. The dependent variable was perceived local integration, measured through the question: “Do you consider that you and your family are integrated into the community where you live?” (1 = yes, 0

= no). This perception served both as an indicator of inclusion in community life and as the outcome variable in the logistic regression model.

Independent variables were organized into four dimensions of the LII-C: (i) The legal dimension captured access to regularization mechanisms (such as registration in Colombia or migration documents in Ecuador), tenure status, and participation in protection programs. (ii) The socioeconomic dimension included employment, income, housing quality, access to services, health, education, formal credit, and internet. (iii) The sociocultural dimension measured relations with compatriots, neighbors, and community leaders, perceptions of discrimination, and intentions to remain, return, or resettle. (iv) The community agency dimension, introduced as an innovation, reflected collective practices such as neighborhood improvements, frequency of activities, participation in organizations, solidarity savings, mutual aid, and informal credit.

In this framework, legal and socioeconomic dimensions were treated as structural determinants, while sociocultural and community agency dimensions. Together, they allowed both institutional access to rights and bottom-up practices of settlement consolidation.

### 3.1 Sample Selection, Data Collection and Logistic Regression Model

The LII-C was based on a survey structured through a 32-item questionnaire (six legal, ten socioeconomic, eight sociocultural, and eight community), combining objective indicators (employment, housing, services) with subjective ones (trust, belonging, and integration). The reference universe comprised 601 households across four settlements. Applying the finite population formula ( $N = 601$ ,  $Z = 1.96$ ,  $p = 0.5$ ,  $e = 0.05$ ), the required sample size was set at 235 households, proportionally distributed as 97 in Paraíso and 62 in Porvenir (Mocoa), and 43 in ACER and 34 in Nuevo Recinto (Lago). The survey achieved a 5% margin of error at a 95% confidence level.

Data collection occurred between January and May 2024 through respondent-driven sampling (Heckathorn 1997), appropriate for populations with limited accessibility and survey distrust. Inclusion criteria required at least five years of residence in the settlement, legal adulthood, and continuous presence in the city. Fieldwork was deployed sequentially, with an additional control round in May to complete pending cases, ensuring balanced coverage and consistency.

Additionally, all independent variables were recoded into binary format (0/1). Estimation was conducted through binary logistic regression, appropriate for explaining the probability of integration based on categorical predictors. The procedure included four phases: (i) initial estimation with all variables, (ii) selection of predictors with significance at  $p < 0.05$ , (iii) consistency verification in a second regression, and (iv) calculation of relative weights using odds ratios  $\exp(b)$ . Statistical validity was confirmed through pseudo- $R^2$  (Cox and Snell, Nagelkerke) values ranging from 0.25 to 0.31, consistent with explanatory models in social sciences (Appendix A.). The Wald test confirmed the significance of coefficients, with adequate employment, housing quality, community participation, and trust-based relations emerging as the most robust predictors of integration.

## 4 RESULTS: LOCAL INTEGRATION IN PERI URBAN SETTLEMENTS

The calculation of the LII-C produced average integration levels of 53.8% in Mocoa and 43.2% in Lago Agrio. These values indicate medium integration in the Colombian case and low integration in the Ecuadorian context, even though most households had lived in the settlements for more than five to ten years.

In Mocoa, the index was driven mainly by socioeconomic factors (51.4%), followed by sociocultural (31.7%), community agency (11.6%), and legal stability (5.2%). Economic stability,

housing, and employment thus formed the structural foundation of integration. Paraíso revealed weaker performance in employment and financial access, with only 36% of households reporting adequate employment, 3% accessing formal credit, and 25% with internet. Yet community participation remained significant, with over 40% engaged in collective activities. Porvenir showed a more consolidated profile, with 71% reporting adequate employment, 71% with internet access, and 65% linked to organizations. Weekly participation in community initiatives reached 47%, reinforcing cohesion. Overall, Mocoa’s settlements illustrate how socioeconomic stability anchored integration, strengthened by dense forms of collective action (Fig. 1).

In Lago Agrio, integration followed a different pattern. The sociocultural dimension carried the highest weight (39.2%), followed by socioeconomic (30.7%), community action (21.5%), and legal (8.6%). ACER displayed stronger conditions, with 44% of households reporting home ownership, 62% with a salaried worker, and 49% with internet. Community relations were robust, with 98% participating in neighborhood improvements, though reliance on informal credit was widespread (78%). Nuevo Recinto, however, reflected sharper vulnerabilities: only 18% of households considered their housing adequate, 97% lacked internet, and most relied on rental or loan arrangements. Employment reached 65% but was concentrated on a single earner, while 94% of households depended on informal lending. These results confirm that in Lago Agrio, permanence was sustained primarily by community participation and trust-based networks, compensating for fragile economic and legal bases (Fig. 1).

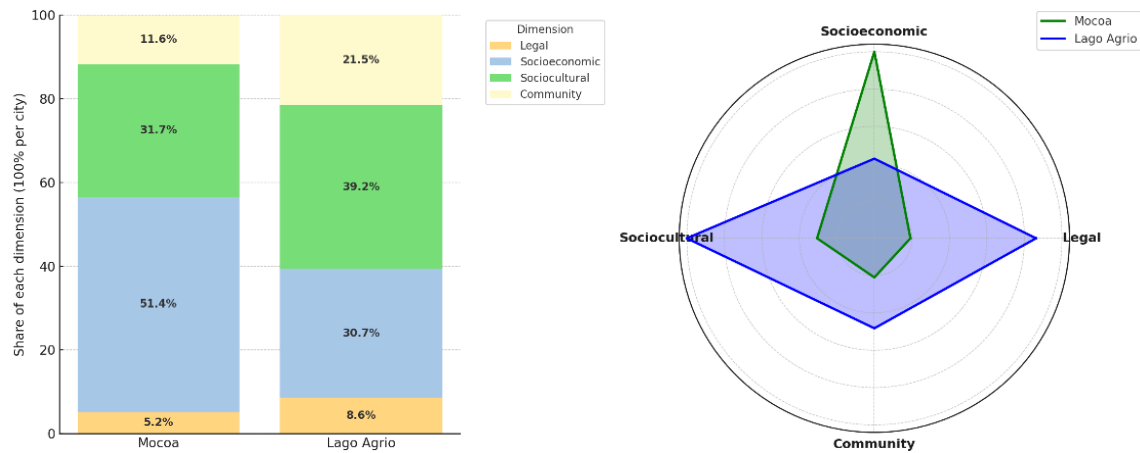


Fig. 1. Local Integration Index Results in Mocoa and Lago Agrio.

The comparison between Mocoa and Lago Agrio confirms that the drivers of integration vary according to institutional frameworks and living conditions in each country. In Mocoa, the socioeconomic dimension (employment, housing, and access to services) explained more than half of the index, while in Lago Agrio the most relevant contributions came from the sociocultural and community dimensions. Logistic regression confirmed this divergence: in Colombia, adequate employment and housing tenure were the most significant predictors, whereas in Ecuador the key factors were migration regularization, relations with community leaders, and reliance on informal credit as a support network. These results demonstrate that local integration is not a homogeneous process. In Mocoa, stabilization was anchored in access to livelihoods and services, partially supported by legal frameworks. In Lago Agrio, integration depended on community organization and social networks but was constrained by economic barriers and the absence of legal security in land tenure.

Fig. 2 summarizes the correlations between the dimensions of the Local Integration Index and the outcome variable (integration), defined as the self-reported perception of household integration in the studied settlements (A). In Mocoa, the results confirm that the socioeconomic dimension is the principal determinant of integration ( $r = 0.64$ ), reinforced by partial legal protection. In Lago Agrio, by contrast, correlations were lower and more dispersed (0.42–0.46), showing that integration relied primarily on community agency and trust-based networks. The comparison reveals differentiated expressions of the Cities-of-Refuge model: in Colombia, integration rests on a stronger structural foundation, while in Ecuador it emerges from community resilience as a strategy of permanence.



Fig. 2. Correlation of integration dimension with Outcome (integration). Source: Field survey in Mocoa and Lago Agrio (Molina Bolívar 2024). The outcome (integration) corresponds to the self-reported perception of local integration.

## 5 CONCLUSIONS: INTEGRATION AS FRAGMENTED STABILITY

The local integration in Amazonian borderland contexts is uneven, shaped by unequal institutional frameworks yet sustained by community strategies. In Mocoa, socioeconomic stability was the main foundation, supported by employment and housing, and partially reinforced by legal instruments. In Lago Agrio, where no reparation framework exists, integration relied on community cohesion and informal credit networks, which compensated for fragile economic and legal bases. Policy implications show how programs focused on individual entrepreneurship or formal microcredit are insufficient for sustaining permanence. By contrast, practices such as informal credit networks, collective works, and self-built settlements represent forms of social integration that must be recognized and incorporated into planning.

From the Cities-of-Refuge perspective, self-built settlements emerge as central actors in peripheral urbanization and in advancing bottom-up solutions. Migrants consolidated neighborhoods through self-organization and territorial appropriation, with community participation proving as significant as legal regularization or social programs. National frameworks shaped divergent outcomes: Colombia enabled limited stabilization, while Ecuador’s initial openness to regularization was undermined by the lack of legal recognition for settlements.

A key methodological contribution of this study is the incorporation of the community agency dimension, extending previous methodologies to capture collective practices of self-construction, solidarity savings, and neighborhood upgrading. This addition connects with findings of Buitrago *et al.* (2021) on self-organization in Mocoa, and echoes the critique of Amazonian development

policies. The results also align with Celi *et al.* (2009) and Medina Carillo (2018), who highlighted the tension between external assistance and local strategies, reinforcing that integration must be understood as the interplay of policy, migrant agency (Bermúdez and Cuberos–Gallardo 2025), and community organization.

Ultimately, the Local Integration Index demonstrates that self-built settlements in the Colombian–Ecuadorian Amazon represent legitimate forms of peripheral urbanization where integration is fragile yet resilient. Durable solutions require policies that combine access to rights, socioeconomic stability, and strengthened community agency. Recognizing this rootedness advances debates on capabilities, forced migration, and urban peripheries, and provides a framework for designing inclusive strategies in borderland contexts

### Appendix A. Logistic Regression Coefficients and Dimension Weights in The Local Integration Index (Mocoa and Lago Agrio)

Dimension	Exp(B) range (Mocoa)	Weight % (Mocoa)	Exp(B) range (Lago Agrio)	Weight % (Lago Agrio)
Legal	2.67 – 3.02	5.2%	4.96 – 7.07	8.6%
Socioeconomic	3.55 – 15.69	51.6%	4.21 – 5.58	30.7%
Sociocultural	2.68 – 5.93	31.7%	4.45 – 8.51	39.2%
Community action	2.64 – 3.29	11.6%	6.24 – 7.03	21.5%
<b>Total</b>	—	100%	—	100%

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