Advancing External Stakeholder Engagement in Complex Infrastructure Projects: Structured Approaches and Contextual Insights

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Abstract

Effective management of external stakeholders is critical for the success of complex infrastructure projects, where competing priorities and dynamic environments create significant challenges. Addressing this issue, this article examines structured approaches to stakeholder engagement, emphasizing governance frameworks that address the diverse concerns of external stakeholders such as communities and interest groups. Through a comparative multiple-case analysis across different concession programs in South America, this study explores how governance structures, regulatory environments, and cultural norms shape stakeholder behaviors and engagement practices. Insights are drawn from case studies of transportation projects, where multilateral banks and government agencies play important roles. Drawing on both theoretical foundations and empirical data, findings show how transparent communication, adaptive decision-making, and participatory mechanisms are important for aligning project objectives with stakeholder expectations. Conclusions highlight the critical role of harmonizing institutional policies with on-the-ground realities to minimize conflict and enhance project outcomes. Additionally, this study proposes actionable recommendations to advance the research agenda on external stakeholder management, while equipping practitioners with tools like community engagement metrics to navigate complexities in diverse infrastructure project settings.

Research Problem and Purpose

Effective management of external stakeholders is critical for the success of complex infrastructure projects, where competing priorities and dynamic environments create significant challenges. These challenges are analyzed through a stakeholder engagement

approach, defined as the "aims, practices, and impacts of stakeholder relations in businesses and other organizations" (Sachs & Kujala, 2021). The community is the most critical component of external stakeholders on complex infrastructure projects; therefore, motivating the study of Community Engagement (CE) as a strand of research in infrastructure projects.

Research on infrastructure such as Large-Scale Transportation (LST) projects has developed in two forms. On one side, the dynamics of CE are analyzed in specific projects (Chung et al., 2023; Ngampravatdee et al., 2023; Ninan & Yadav, 2023), on the other side, the stakeholder perceptions of the engagement process of projects are evaluated within a CE theoretical framework (Di Maddaloni & Derakhshan, 2024; Lehtinen & Aaltonen, 2020; Prebanić & Vukomanović, 2023). Implementing effective CE practices can foster the creation of institutional structures that enable significant involvement from stakeholders (Afieroho et al., 2023). Stakeholder involvement can result in the establishment of strong institutional frameworks for CE (Prebanić & Vukomanović, 2023). Moreover, successful collaborations between stakeholders can result in the establishment of institutional frameworks that promote CE in infrastructure projects (Malik et al., 2022). Likewise, a transformational CE encourages the joint creation of social value that can influence institutional frameworks (Caron et al., 2024). Moreover, Odziemkowska and Henisz (2021) demonstrate that differences in secondary stakeholder activism across countries can explain variations in corporate responsiveness even when institutional structures are similar. This evidence shows that successful community engagement and favorable stakeholder perceptions are essential for creating and institutionalizing CE frameworks in infrastructure projects. However, the institutional frameworks are not developing effective CE actions (Rowe & Frewer, 2005), for instance, the World Bank (WB) and Multilateral Development Banks (MDBs) like the Inter-American Development Bank (IDB) in their Environmental and Social Policy Framework (ESPF) established a procedure of requirements for stakeholder engagement during project preparation and implementation. These requirements are mere assessments of the lenders to participate financially in a project fostering CE but lacking mandatory actions to be implemented by organizing stakeholders (i.e., the government, and the private party) towards CE. In the United States, the National Environmental Policy Act (NEPA) mandates federal agencies to assess the environmental effects of their actions and engage the public through Environmental Impact Statements (EIS) and Environmental

Assessments (EA). However, the framework does not enforce specific actions for CE in LST projects.

Although considerable research has been dedicated to studying CE in large infrastructure projects, existing literature has not provided a full understanding of the practice of governments developing approaches fostering CE in LST projects (Kujala et al., 2022). These approaches fail to comprehensively analyze the engagement process through comprehensive case studies of projects in institutional frameworks developed by countries dealing with active communities. Neither is the effectiveness of these frameworks measured since the demonstrations in several countries implementing LST projects are increasing despite the institutional frameworks and legislation enhancement. Addressing this limitation, we examine structured approaches to stakeholder engagement, emphasizing governance frameworks that address the diverse concerns of external stakeholders such as communities and interest groups. This study adopts a stakeholder perspective grounded in Freeman's foundational work, which emphasizes that stakeholders are critical actors who must be managed in strategic alignment with organizational goals (Freeman et al., 2010), by analyzing institutional contexts across different countries and explores how governance structures, regulatory environments, and their interaction with cultural norms shape stakeholder behaviors and engagement practices. Insights are drawn from case studies of transportation projects, where Multilateral Development Banks (MDBs) and Government Agencies (GA) play important roles in defining CE procedures.

Drawing on theoretical foundations and empirical data, findings show how transparent communication, adaptive decision-making, and participatory mechanisms are important for aligning project objectives with stakeholder expectations. Conclusions highlight the critical role of harmonizing institutional mechanisms with procedures that evaluate project outcomes conducting actions for CE communication. This work proposes an understanding of institutional frameworks for CE. We also explore actionable recommendations to advance the research agenda on CE management, while showing practical implications to identify community interaction actions in diverse infrastructure project settings.

Brief Research Methodology and Approach

This study adopts a qualitative, multiple-case study design to explore how institutional frameworks influence Community Engagement (CE) in Large-Scale Transportation (LST) projects. Following Yin's (2009) approach, we selected comparable concession projects across Brazil, Chile, and Colombia to examine CE practices under different legal, cultural, and governance conditions. Through this structure, we analyzed how specific mechanisms—such as grievance systems, public hearings, and participatory planning—manifest in practice and impact stakeholder behavior. Our methodology integrates stakeholder engagement theory (Freeman et al., 2010), communication typologies (Rowe & Frewer, 2005), and engagement levels (Johnston & Taylor, 2018) to classify and assess institutional CE strategies. This framework allows us to derive both explanatory patterns and normative guidance on how institutional contexts shape, enable, or constrain meaningful community participation. The methodological steps below outline how we collected, analyzed, and interpreted data to arrive at the empirical and theoretical insights presented in the findings.

Step 1: Definition of the Research Questions

How do institutional contexts in different countries influence community engagement in Large-Scale Transportation (LST) projects?

What are the features to measure community engagement in LST projects?

Step 2: Selection of the Cases

Following Yin's (2009) case study procedure, we aimed to understand how institutional contexts in emerging economies influence Community Engagement (CE) in complex infrastructure projects and to identify the defining features for measuring CE within these contexts. Brazil hosts the largest infrastructure market in Latin America, actively promoting participatory budgeting. Chile's program represents a regional benchmark due to its advanced framework for managing complex infrastructure projects. Colombia provides an exemplary case with multiple phases, illustrating an iterative learning and improvement process for complex infrastructure projects.

The main considerations for studying projects in the three chosen jurisdictions included:

- All are emerging economies with national roadway programs developed over at least 30 years.
- Combined, their populations represent approximately 65.5% of South America's total population.
- Each country has developed mature road PPP markets, encompassing around 50 projects collectively valued at over USD 53 billion.
- The concession contracts in these countries primarily focus on road projects rather than other infrastructure types.
- Each country has a robust legal framework addressing CE practices in their concession programs.
- These national programs engage with numerous stakeholders, including users and local communities.
- Projects commonly face challenges such as public opposition, protests, resettlements, compensation, environmental impacts, and socioeconomic concerns.

The adopted research approach facilitated the analysis of three projects from each country based on common features: budget scale, project type (toll roads), contracting modality (concessions), and inclusion within the same national program. Table 1 resumes the projects analyzed as case studies for each national program of concessions.

Table 1. Summary of the Case studies for CE in LST projects

Program/Project features	**4ECB ANTT (Brazil)**		
Project	**Concession ViaSul**	**Concession ViaCosteira**	**Concession Ecovias do Cerrado**
Investment (USD)	$332 M	$158 M	$349 M
Length	472 Km	221 Km	437 Km

CE stages and community interaction	Information through a regulatory agenda. Opposition against tolling.	Information through a regulatory agenda. Opposition against tolling.	Information through a regulatory agenda. Opposition against tolling.
Concession conditions	Awarded in 2019, operating from 2020 for +30 years	Awarded in 2020, operating from 2021 for +30 years	Awarded in 2019, operating from 2020 for +30 years
Program/Project features	**Concessions developed by the MOP under law 19.460/1994 MOP and concessioned for a second period (Chile) – CMOP**		
Project	**Ruta 78 Santiago – San Antonio**	**Corridor Chillán – Collipulli**	**Corridor Los Vilos - La Serena**
Investment (USD)	$892 M	$600 M	$379 M
Length	131.4 Km	169 Km	244.5 Km
CE stages and community interaction	Territorial study as a CE instrument during the preliminary assessment and implementation phase. Community meetings.	Territorial study as a CE instrument during the preliminary assessment phase. Community meetings.	Territorial study as a CE instrument during the preliminary assessment phase. Community meetings.
Concession conditions	Operating since 1997, with a second concession started in 2022 for +30 years.	Operating since 1997, with a second concession started in 2023 for 30 years.	Operating since 1997, with a second concession started in 2023 for +30 years.
Program/Project features	**4G toll road program ANI (Colombia)**		
Project	**Conexión Pacífico III**	**Cartagena – Barranquilla Circun. de la Prosperidad**	**Autopista al Mar 1**
Investment (USD)	$440 M	$402 M	$554 M
Length	146 Km	146,7 Km	181 Km
CE stages and community interaction	Social responsibility and information are defined in the contract. Demonstrations against the project.	Social responsibility and information are defined in the contract. Demonstrations and blockades against the project. Audiences with community participation.	Social responsibility and information are defined in the contract. Blockades of communities to the project.
Concession conditions	Awarded in 2014, operating from 2024 for 25 years.	Awarded in 2014, operating from 2022 for 25 years.	Awarded in 2015, operating from 2022 for 25 years.

Identification of the elements that reflect the case against the subject of the study.

This study addresses the analysis of several elements. First, we need to understand the characteristics of the communities that oppose the operation of the toll road corridors and their relationship with the project's impact on the communities surrounded by the road corridors. Second, understand the relationship between the factors that generate opposition in the operation of LST projects and the community management strategy of the road concessions program in the cases of Brazil, Chile, and Colombia. Finally, understand the effectiveness of the different legislation mechanisms promoting the participation of communities impacted by road concession projects.

Step 3: Data collection

Two main data sources structured our case study analysis. Data on institutional frameworks were gathered from studies conducted by GAs and MDBs. Literature on CE theory was analyzed by conducting a systematic review across peer-reviewed journals from 2000 to 2024 (Castelblanco et al., 2021; Cui et al., 2018; Guevara et al., 2020). Overall, the gathered information outlines the CE process within each analyzed country's institutional context. Specifically, CE practices for three toll road projects per country were analyzed, highlighting key engagement features common to emerging economies. The data was retrieved from the national agencies databases, a publicly accessible repository. Additionally, MDBs documentation and grey literature for CE implementation were extracted from their websites. The sources provide comprehensive project documents such as environmental impact assessments, feasibility studies, stakeholder engagement reports, and project planning records. The information was used to triangulate project goals, community consultation practices, and stakeholder management strategies with the theory from the literature. A full list of the documents consulted, along with their sources, is provided in Appendix A to enhance transparency and allow replication.

The retrieved information is expected to delineate the CE process in the institutional context of the countries analyzed as case studies, responding to the first question. Likewise,

the analysis aims to reflect the features of CE in LST projects, thus addressing the second research question.

Step 4: Data Analysis

To analyze the data collected we used: (1) Pattern Matching: A comparison of the data from different cases to identify patterns and differences; (2) Explanation Building: The development of explanations for the observed patterns and differences; (3) Cross-Case Analysis: Comparison of findings across cases to identify common themes and variations. The institutional frameworks of Brazil, Chile, and Colombia are analyzed in the specific case studies defined in this work.

Brazil employs citizenship participation audiences through the ANTT, in these consultation processes the communities can formulate requirements for the toll road projects defined by the government. The National Environment Council (CONAMA) also integrates public participation in environmental licensing processes. In Chile, the MOP has ensured CE in infrastructure projects through participatory planning since Law 20.500 of 2011 and the enactment of the Presidential Instructive for Participation and Public Management in 2014, which defines citizen participation, entitling the central government to constant dialogue with the Municipal Councils of Civil Society (COSOC). In contrast, CONADI oversees the promotion of public consultations with Indigenous peoples following the International Labor Organization (ILO) Convention 169/1989 process. Similarly, Colombia applies the ILO Convention principles for public consultation with Indigenous communities. Regarding the institutional framework in Colombia, the institutions in the country include the Ministry of Environment and Sustainable Development (MADS), which oversees public participation in environmental decision-making. Complementary to this process, the ANI, apart from structuring and delivering the project, is the GA interacting with communities in the Social Prosperity Department (DPS). The scenarios of interaction for public participation in Colombia are the Departmental Government Assemblies (AD), including departmental deputies, community representatives, Ministry of Transport, and ANI servants.

By analyzing these frameworks, researchers can identify the best practices and develop guidelines to enhance public participation and CE in infrastructure projects globally. Additionally, this analysis serves as the basis for the development of case studies that reflect

the institutional process of public participation and CE in LST projects. For this purpose, we developed an inductive approach based on governance structures, regulatory environments, and cultural norms.

Step 5: Validation and Reliability

To ensure the validity and reliability of this study, we use techniques such as (1) Content analysis: Collecting information from diverse sources, such as academic journal articles on CE, official documents from institutions responsible for CE, and interviews with stakeholders involved in the CE processes. This approach allows for a comprehensive understanding of CE practices across different institutional contexts; (2) External Validity: Ensuring that the findings can be generalized to other similar contexts; (3) Internal Validity: Ensuring that the findings accurately reflect the cases studied (Widner et al., 2022).

Content analysis includes an analysis finding relationships between the literature on CE, the practice proposed on the institutional frameworks of the case study, and the reports of the national agencies developing CE. For external validity, we established causal relationships between concepts of the literature and the evidence analyzed on the multiple case study experiences. This involves analyzing factors that could affect the relationship between institutional frameworks and CE processes. To ensure external validity we chose cases that are representative of a broader population or that vary along dimensions relevant to the study's objectives. This strategy enhances the likelihood that the findings can be generalized to similar contexts of the region of study, and emerging economies. Additionally, detailed contextual descriptions of the institutional frameworks and CE processes in each case were conducted to allow other researchers to assess the applicability of the findings to different settings. Finally, consistent data collection procedures were applied by implementing standardized protocols for data collection across all cases to maintain consistency and reduce variability that could compromise the study's internal validity.

Step 6: Reporting Findings

By analyzing the CE practices we classify the flow of information in public engagement (Rowe & Frewer, 2005). This flow is classified concerning its direction in public communication (from the government to the community); public consultation (from the community to the government); and public participation (reciprocal between the government

and the community). One of the expected findings is the definition of the features that promote CE in LST projects, by analyzing the different institutional contexts of this work within the selected case studies. The analysis of these features is expected to be used as a deductive process promoting the discovery and delineation of metrics, assessing the socio-economic and cultural contexts in which engagement occurs.

Step 7: Analysis of Theoretical and practical implications

This step synthesized the empirical insights generated through the multiple-case study method to respond to the two research questions. For the first question—how institutional contexts influence CE practices—we used a comparative analysis across Brazil, Chile, and Colombia to examine how formal engagement rules translate into stakeholder behaviors. Drawing on the frameworks of Johnston & Taylor (2018) and Rowe & Frewer (2005), we categorized engagement levels based on observed information flow (communication, consultation, participation) and CE interaction intensity (low to high). These classifications were grounded in empirical indicators, such as the frequency of stakeholder interactions; the existence of grievance mechanisms; regulatory transparency tools; and early-stage planning instruments.

For the second research question—how to measure CE effectiveness—we mapped these observations to six CE features (e.g., stakeholder inclusion, trust, socio-economic benefit) using the literature from Reed et al. (2018), Bryson et al. (2013), and others relevant works on such features. Each feature was assessed for presence and depth across the cases to propose practical engagement metrics and a synthetic sequencing model. This allowed us to identify task-level heuristics for CE, adapted to different stages of project development, and consistent with Bingham & Eisenhardt's (2011) learning-based process logic.

Key Findings

Institutional Mechanisms and Legal Frameworks

The flow of information for CE and the level of engagement in the analyzed case studies present several variations between countries. The World Bank (WB) and MDBs like the Inter-American Development Bank (IDB) in their Environmental and Social Policy

Framework (ESPF) established a procedure of requirements for stakeholder engagement during project preparation and implementation. These requirements are associated with some of the stages of the institutional frameworks of the case studies. In Brazil the ANTT provides several means of social control and participation such as a Feedback process (TS); Participatory Meetings; Public Consultations and Public Hearings; in addition to an Internal Consultation. Regarding the allocation of social responsibility, the ANTT contracts of the 4ECB (case study projects) mention the management of risk-related responsibilities to communities and inhabitants as a responsibility of the conceding party (the Brazilian government). Overly, managing these responsibilities includes the required process for fulfilling social requirements on these concessions.

The ANTT has made significant efforts to provide a transparent process of the participatory mechanism developed for CE. These mechanisms include publishing the schedule of public audiences, the meetings being classified as open to public participation or limited to a specific audience (e.g. public servants) being broadcasted live via YouTube, and their recordings being left freely available. Additionally, the public audiences are moderated by public servants of the ANTT. Public audiences are a mechanism fostering CE through public participation to receive feedback on the project's impacts and perceptions of the community. However, the criteria for integrating community opinions are not clearly defined by the ANTT.

In Chile, the regulatory framework is supported in the Decree with law force DFL 850, Decree Law 900, Resolution No. 425, together with the Charter of Rights and Duties of Citizens of the MOP Direction of Public Works. In Figure 1 the MOP Manual for Public Participation (PPM) defines four steps for conducting a public participation process in LST projects.

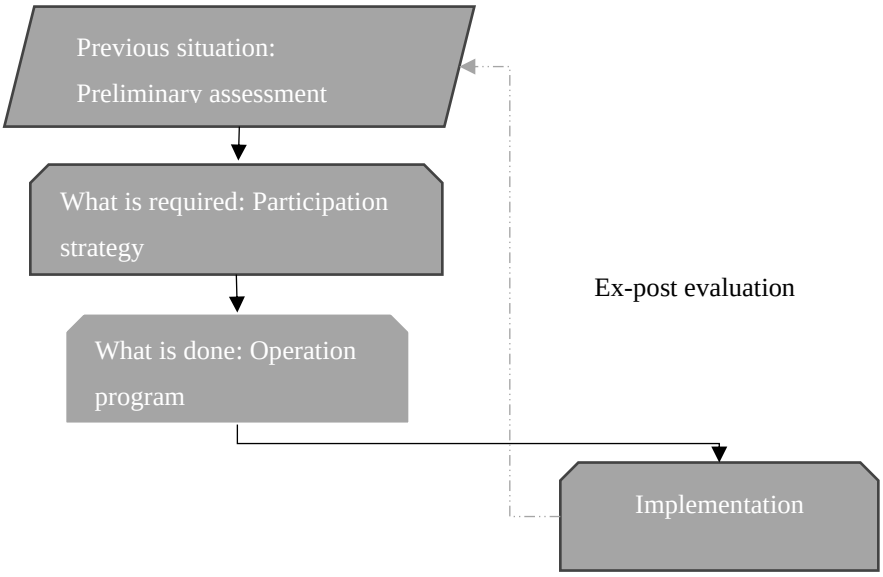

Figure 1. Structured process for public participation MOP

The process in Chile is the most aligned with the requirements of the ESPF of MDBs since the implementation and ex-post evaluation in Chile include a scope like the engagement before and during project implementation and external reporting established by the ESPF. Complementary, public participation is identified based on the purpose of each as informative, consultative, managerial, or empowerment.

Comparative analysis between the citizen participation processes in the monthly reports of the concessions and the approach outlined in the MOP's PPM defines five steps to CE through citizen participation as follows.

1. Structure and Methodology: While the concession reports adopt a more situational and activity-based approach, the MOP Manual emphasizes systematic integration of citizen input at every project stage, with predefined methodologies and evaluation mechanisms.

2. Inclusion and Accessibility: The MOP Manual provides a more inclusive and equity-driven framework compared to the concession's approach, which appears more localized and immediate in addressing issues.

3. Objectives and Outcomes: The Manual's focus on systemic and strategic objectives contrasts with the concession's narrower emphasis on immediate community engagement and problem-solving.

4. Monitoring and Evaluation: The MOP Manual offers a more advanced approach to evaluating the impact of participation, enabling continuous improvement.

5. Integration of Community opinions: The Manual's early-stage integration of community opinions represents a more proactive and participatory approach than the reactive model observed in the concession reports.

The MOP's manual provides a more comprehensive and strategic framework for citizen participation, ensuring inclusivity, systematic monitoring, and integration of community feedback at all project stages. In contrast, the practices detailed in the concession reports focus on immediate and localized engagement, reflecting a narrower scope of application. This comparative analysis underscores the potential benefits of aligning concession practices more closely with the MOP's PPM to achieve more sustainable and participatory infrastructure development.

In Colombia, the legislation provides different spaces for political and administrative participation. Regarding the latter, the law provides procedures such as the right to public information, the right to petition, public hearings, popular actions, group actions, and consultations. For the former, the mechanisms are the plebiscite, the referendum, the programmatic vote, the open town hall, and the popular consultations. For conflict resolution, the law includes settlement, amicable composition, the justices of peace, conciliation, mediation, and arbitration. Lastly, to allow participation in social and civic life and social development, there are citizen security support networks, citizen oversight bodies or social control associations, control members for public services, non-governmental organizations (NGOs), community action boards and housing boards, local administrative boards, indigenous and black communities, community homes, disaster prevention committees.

Additionally, the ANI contracts include a technical and social Annex establishing requirements for the concessionaire to guarantee social responsibility through different instruments such as programs for social responsibility, information, and community

participation. These requirements are rooted in the Equator Principles, defining the instruments of social engagement for compensation in infrastructure projects developed by the ANI in Resolution 545 of 2008. A plan compliance is defined as a requisite from the contract, defining their terms in the contract annex. ANI assigns the surveillance of the plan to an independent firm acting as a contract comptroller. Comprising this plan, different participatory mechanisms are defined by ANI to promote CE such as Petitions, Complaints and Claims (PQRs), a social communication program, and labor force enrollment of the community. Social and property management includes compensation for assessed landowners. The risk in the concessions analyzed as case studies is assigned to the private party. Quantification of metrics was conducted by the comptroller and the ANI focusing on measuring PQRs effectiveness. Compensation diligence should be included as a metric of the performance of the plan.

Information Flow Classification

For its part, a process for community resettlement is defined in Resolution 077 of 2012. Although the legislation in Colombia provides an ample range of mechanisms for social engagement and social risk mitigation, process compliance is not mandatory. Thus, there is a lack of a clear and enforcing procedure that fosters effective implementation of the different mechanisms of the law for stakeholder engagement in LST projects. After examining the engagement procedures of the case studies. In Table 2, we developed a synthesized analysis of the CE actions of the studied intuitional frameworks by using the conceptual tier classification of Johnston & Taylor (2018) for engagement communication and the classification of the information flow for participation developed by Rowe and Frewer (2005).

Table 2. CE conceptual analysis of information flow for participation within the communication engagement level

	CE of concession programs within their Institutional Framework			
	Communication Engagement	**Classification of the information flow for participation**		
		Public (GA to C)	**Consultation (C to GA)**	**Participation (Reciprocal)**

Level of communication engagement				
Low	Potential: Presence, occurrence, and manifestation	Awareness and visiting (4ECB, CMOP, 4GC) Indicators of activity (4ECB, CMOP, 4GC) Issuing information (4ECB, CMOP, 4GC)	Reading (4ECB, CMOP, 4GC)	Monitoring, social media (4ECB, CMOP, 4GC)
	Mid-level: Understanding and connection	Antecedents and outcomes plan (CMOP) Indicators of relationship quality, and engagement (None)	Voice of communities (4ECB, CMOP, 4GC)	Trust, reciprocity, credibility (CMOP). Dialogue and openness (4ECB, CMOP, 4GC)
	High-level: Action and Impact	Recognition of diverse perspectives (CMOP). Coordinated actions for engagement (CMOP).	Indicators of social embeddedness (None). Social change indicators (None). Social awareness and civic indicators (CMOP)	Diversity and empowerment (partially in CMOP). Environment for participation of community organizations (only through legislation in 4ECB, and CMOP).
High				

Note: The country-level programs are defined as the Fourth stage of concessions in Brazil (4ECB), Concessions of MOP Chile (CMOP), and the Fourth generation of concessions in Colombia (4GC). GA stands for Government Agency and C for Community.

The CE conceptual analysis shows that all institutional frameworks analyzed achieve a basic to middle engagement level of communication, predominantly from community participation (Consultation), whilst high levels of CE communication are only reached by the Chilean institutional framework within the studied concessions. For example, the Corridor 78 in Chile has developed 90 meetings with external stakeholders of the project such as presidency delegates, majors, Ministerial Regional Secretaries (Seremis), Community Development Directions (Didecos), neighborhood councils, and community representatives

and leaders, covering the solicitudes of 14 communes connected along the corridor. The process has been developed in five stages from July of 2023 to achieve the inclusion of every interested stakeholder. Thus, developing a process that includes a variety of stakeholders but without complex definitions, just meetings addressing the parties' interests. These structured interactions strengthened stakeholder trust and reduced escalation of opposition during project execution.

The last finding contrasts harshly with the ample mechanisms present mostly in the Colombian legislation for community participation. It shows the ineffectiveness of this legislation in bringing a higher level of CE communication. Also, such ineffectiveness correlates with the higher proportion of social opposition present within the Colombian and Brazilian cases compared with the Chilean case. Thus, institutional frameworks improve their CE effectiveness by developing actions like an environment for the participation of community organizations and coordinated actions for engagement based on an outcomes plan like the structured process developed by the MOP manual of public involvement in Chile. For instance, MOP has conducted territorial studies to measure outcomes and promote community dialogue and trust as defined in the PPM. However, similar clarity is absent in Brazil's ANTT protocols and Colombia's ANI procedures. The latter limits transparency and weakens community understanding and trust. Despite the stated achievements of these processes, the development of indicators for performance is still lacking within the institutions of these frameworks, and even within the body of knowledge (Xiao & Hao, 2023), envisaging an avenue of research. The multiple case study analysis allowed an understanding of the first research question defined for this study, i.e., how institutional contexts in different countries influence community engagement in LST projects.

Cultural norms emphasizing collective decision-making and public trust in municipal-level governance structures in Chile contrast with more adversarial community-government relations observed in Brazil and Colombia. The Chilean context, supported by formal engagement channels and indigenous consultation practices (ILO 169 compliance), helped institutionalize trust, whereas in Brazil and Colombia, weaker enforcement and lower transparency led to communities engaging in reactive behaviors such as protests and roadblocks. Specifically, in Colombia's Autopista del Caribe, despite the inclusion of social

responsibility clauses in concession contracts, persistent blockades and demonstrations illustrated that the absence of strong complaint mechanisms and transparent expectation management can exacerbate community opposition.

Regarding the second research question addressed in this study, we developed a deductive approach rooted in the findings of the CE analysis of information flow for communication engagement participation in the context of the case studies (see Table 2). Using this approach, we identified CE features linked to the literature on CE that fostered a discovery and delineation of metrics for community engagement in LST projects. Following the theory of participation we extracted the metrics that represent the engagement factors proposed by Reed et al. (2018). These metrics attempt to evaluate stakeholder inclusion and participation to synthesize the empirical findings across the case studies.

Key Features for Effective Community Engagement

Several critical features were identified across Brazil, Chile, and Colombia as essential for effective Community Engagement, supported by practical evidence from the studied cases. These features are presented in Table 3.

Table 3. Community Engagement features to measure stakeholder interactions in the case studies

Key Feature	Description	Case Study Evidence	Reference
Stakeholder Inclusion and Participation	Meaningful and systematic stakeholder involvement.	Brazil's ANTT structured public audiences integrate community inputs directly into project development processes.	Reed et al. (2018)
Communication and Information Transparency	Clear messaging on project impacts with feedback mechanisms.	Chile's MOP facilitates frequent dialogues and territorial studies ensuring transparent and informed participation.	Rowe & Frewer (2005)
Community Perception and Trust	Building community satisfaction, legitimacy, and trust.	Colombia's Departmental Assemblies promote legitimacy through inclusive interactions involving ANI and community representatives.	Bryson et al. (2013)
Social and Economic Impacts	Tangible socio-economic benefits like job creation, mobility, and sustainability.	Chilean and Colombian concession contracts explicitly define responsibilities for community benefit provision.	Laursen & Svejvig (2016)
Institutional and Policy Integration	Aligning national and international	Chile adheres closely to MDBs' ESPF guidelines, while Brazil applies	Ngampravatde e et al. (2023)

	engagement policies and frameworks.	comprehensive PPP legal frameworks aligning with international standards.	
Conflict Resolution and Adaptability	Effective mechanisms for grievance management, adaptability, and proactive conflict resolution.	Brazil's ANTT and CONAMA processes address licensing disputes proactively; Colombia's Assemblies effectively manage conflicts through active community engagement.	Li et al. (2012)

The key features are critical to effective Community Engagement in complex infrastructure projects. Stakeholder inclusion was identified in mechanisms such as Brazil's structured public audiences, while information transparency was exemplified by Chile's use of territorial studies. Trust building efforts were visible in Colombia through Departmental Assemblies promoting inclusive decision-making. Socio-economic benefit commitments, particularly around employment and mobility, were explicitly included in Chilean and Colombian concession contracts. Furthermore, policy alignment with international standards was most evident in Chile's adoption of MDBs' ESPF guidelines, while proactive conflict resolution was partially achieved through Brazil's environmental licensing and Colombia's social risk management programs.

Implications

This study presented an integrated understanding of the mechanisms of CE through a methodology based on case studies of comparable projects within the infrastructure programs of Brazil, Chile, and Colombia. In this sense, the contributions of this study are the delineation of the process for stakeholder engagement through a multiple case study analysis of the institutional frameworks in countries with extensive use of concession contracting models for LST projects. Derived from this analysis, this work compiles the procedures of CE in LST projects through the evaluation of the process of community participation in a multiple case study of institutional frameworks delivering LST projects. Additionally, this article proposes an analysis of metrics of CE process assessment in LST projects because of the identified need to study the development of metrics assessing the effectiveness of institutional frameworks for CE.

Building on Bingham & Eisenhardt (2011), we developed the concept of rational heuristics and sequential learning from process experience, thus proposing an idealized sequencing of community engagement practices. Rather than identifying which countries are

most conducive to engagement, we synthesize exemplary practices from different national contexts into a dynamic, task-level model. This approach highlights what best practices should happen first, second, and third for optimal community engagement.

In the early stage, Chile's emphasis on early stakeholder mapping and risk analysis offers a foundational heuristic: identifying key actors and potential points of conflict proactively. During the mid-stage, Brazil's use of participatory workshops and co-creation sessions presents a model for maintaining stakeholder trust and integrating community feedback iteratively. Finally, at the late-stage, Colombia's structured grievance redress mechanisms and transparent communication channels illustrate effective post-decision accountability practices.

To synthesize the empirical findings across the case studies, Table 4 presents a summary of the best engagement practices for specific institutional context within the case study. Three heuristics — stakeholder identification (Chile), iterative participation (Brazil), and grievance compensation (Colombia) — can be synthesized into a task-sequencing framework that may serve as a testable ideal for future empirical research. This proposed sequencing contributes theoretically by moving beyond static country comparisons toward a dynamic, actionable model of community engagement, echoing the developmental learning logic identified by Bingham & Eisenhardt (2011).

Table 4. Best engagement practices found on the institutional context

Stage of Engagement	**Ideal Practice**	**Source Country**
Early	Stakeholder Mapping and Risk Analysis	Chile
Mid	Participatory Co-Creation Workshops	Brazil
Late	Grievance Compensation and Transparent Communication	Colombia

The paper proposes a new heuristic framework for ideal community engagement as presented in Figure 2. This contribution advances theoretical understanding by offering a testable model of engagement sequencing.

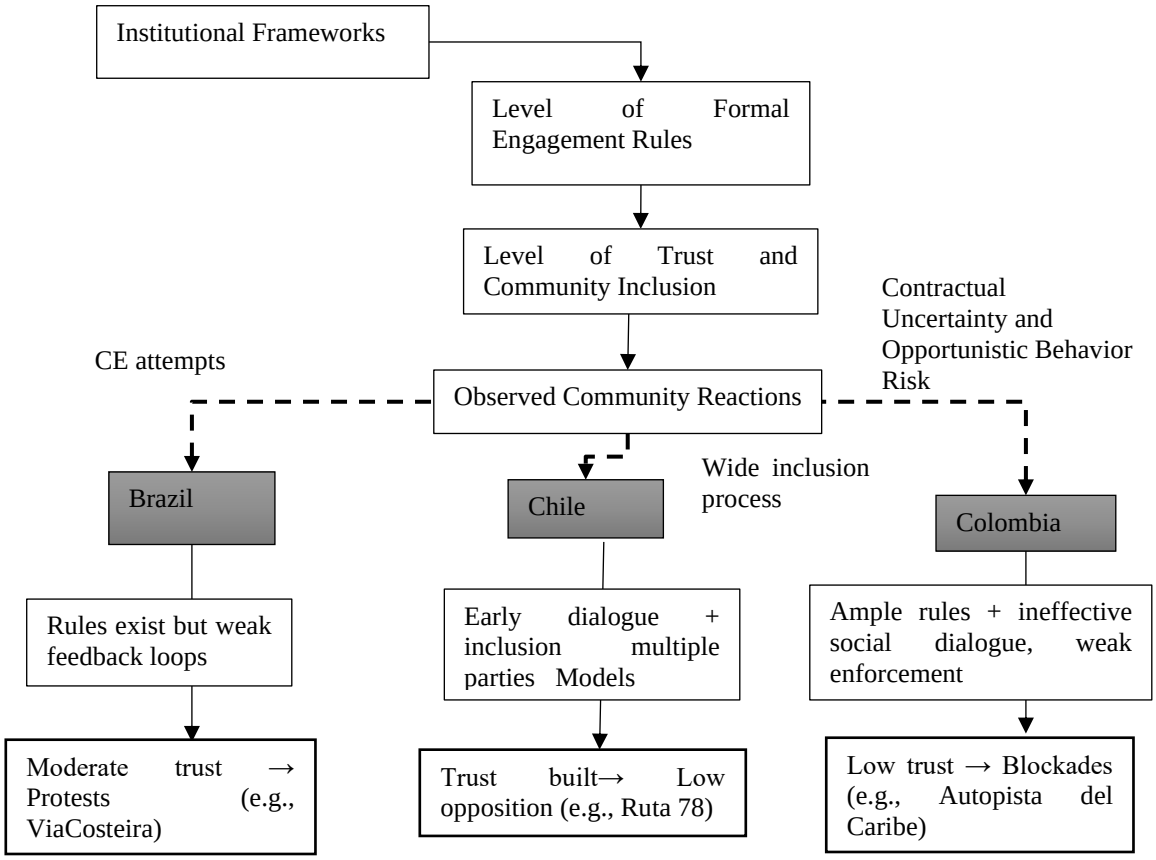

Figure 2. CE sequencing practices

The empirical cases show that the effectiveness of CE practices is contingent not only on the formal existence of regulatory mechanisms but also on the degree of trust-building, community inclusion, and procedural transparency embedded in those mechanisms. Chile's structured early engagement minimized conflict escalation, while Brazil and Colombia's experiences highlight those formal mechanisms without substantive feedback incorporation result in reactive and often disruptive stakeholder behaviors. This study is helpful to scholars in the governance of infrastructure projects through a structured procedure that synthetizes the current practice for CE in institutional frameworks of countries with relevant challenges on public participation in LST projects.

Metrics and stakeholder behavior in community engagement

Community engagement in Complex infrastructure projects emphasizes the need for metrics grounded in context, design, power dynamics, and scale. In practice, this translates into a structured, evidence-based approach to project governance. However, structured metrics to manage opportunistic stakeholder behavior that surfaces post-concession, particularly in user-pay PPP, seems to challenge the power dynamic factors of the projects. The empirical evidence from Chile and Colombia shows how impacted stakeholders engage in reactive and coercive engagement tactics—such as roadblocks and protest-based blackmail—to demand additional infrastructure or compensation beyond contractually agreed terms (Castelblanco et al., 2022). This pattern underscores the necessity for metrics that evaluate stakeholder expectations, perceived entitlements, and behavioral thresholds. For example, Di Maddaloni & Davis (2018) highlight how lack of proactive engagement strategies during early phases of infrastructure projects allows for the emergence of high-cost conflict situations later on. If expectations are not captured through early-stage metrics (e.g., engagement sentiment scores, benefit agreement tracking), projects become vulnerable to unpredictable escalations in cost and scope. Moreover, this reactive stakeholder behavior feeds a negative feedback loop: community blackmail inflates costs that are then transferred back to those same communities via higher tolls or taxes—fueling erosion of social legitimacy. Metrics should thus include impact feedback loops and cost-transparency indicators to make stakeholder trade-offs clearer at the outset, reducing misinformation and resentment later.

From a theoretical standpoint, the phenomenon observed aligns with institutional theory, particularly the concept of legitimacy gaps between formal project structures and informal community expectations. Prebanić & Vukomanović (2023) show that without transparent, participatory mechanisms that involve stakeholders in shaping project expectations and scope, legitimacy becomes increasingly difficult to maintain. The blackmail tactics and scope inflation can also be framed through the lens of stakeholder salience theory: as certain groups (e.g., landowners or local governments) become more vocal and disruptive, their power increases irrespective of legitimacy or urgency. Thus, community engagement metrics should also measure salience shifts over time—tracking how and when stakeholders become "dominant" and how that affects project decisions and equity.

Xue et al. (2020) call for more empirical links between stakeholder theory and action, arguing that few models incorporate temporal dynamics and stakeholder opportunism. Metrics designed to capture phase-specific stakeholder behavior (e.g., post-tendering reactions) could provide early warning signs for institutional misalignment. By integrating measurable dimensions of CE such as expectation management, salience monitoring, and cost-benefit communication, both theory and practice can respond more effectively to the challenges posed by opportunistic stakeholder behavior in PPPs. Ignoring these dimensions risks perpetuating cycles of mistrust and cost inflation—ultimately undermining the social legitimacy of Complex infrastructure projects.

Castelblanco et al. (2024) argue that stakeholder engagement must be understood as an evolving set of relationships and power negotiations across four critical phases: shaping, tendering, construction, and operation. This phase-sensitive view provides a foundation for designing metrics that are temporally adaptive rather than static snapshots. Moving beyond traditional stakeholder mapping emphasizes the dynamic, multi-scalar, and political nature of stakeholder interactions over the lifecycle of Complex infrastructure projects and requires a focus on (1) accountability and legitimacy, where the erosion of social legitimacy can occur when impacted stakeholders feel excluded from early decision-making processes, including indicators of perceived fairness, transparency, and trust, especially in the early "shaping" stage when critical project decisions are made; and (2) the critical role of the public sector to institutionalize proactive engagement policies and develop early-stage metrics that flag exclusion risks (Castelblanco & Guevara, 2024). These could include tracking representation diversity, timing of first engagement, and alignment between community demands and compensation frameworks.

These findings can inform the design of stakeholder engagement metrics by calling for phase-specific indicators aligned with political and social risks. Additionally, metrics on community perception of influence and procedural justice. Thirdly, tools to track the evolution of claims and conflicts over time. Finally, the inclusion of feedback loops that enable recalibration of engagement strategy based on stakeholder responses.

This paper is helpful to scholars in the governance of infrastructure projects through a structured procedure that synthetizes the current practice for community engagement in

institutional frameworks of countries with relevant challenges on public participation in Complex infrastructure projects. Additionally, this analysis serves as the basis for the development of case studies that reflect the institutional process of public participation, finding outstanding traits of the CE process and measurement in Complex infrastructure projects. For this purpose, we developed an inductive approach based on governance structures, regulatory environments, and cultural norms.

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Appendix A

- Brazil ANTT projects' information: https://www.gov.br/antt/pt-br/assuntos/rodovias/concessionarias
- Brazil projects' legislation: https://anttlegis.antt.gov.br/action/ActionDatalegis.php?acao=categorias&cod_modulo=422&menuOpen=true
- Public Participation ANTT: https://www.gov.br/antt/pt-br/acesso-a-informacao/participacao-social
- Chile MOP projects' information: https://concesiones.mop.gob.cl/concesiones/concesiones-en-operacion-y-construccion/
- Colombia ANI projects' information: https://www.ani.gov.co/proyectos-ani-modo-carretero
- World Bank ESPF: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/383011492423734099/the-world-bank-environmental-and-social-framework#:~:text=The%20World%20Bank%20environmental%20and%20social%20framework%20sets%20out%20the,poverty%20and%20promoting%20shared%20prosperity.

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