

Examining Community-Drive Resilience and Participatory Adaptation in Latin American Informal Settlements:

Insights from Argentina and Chile

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Research Question	Summary of Findings
1. What housing and infrastructure adaptation strategies are developed and implemented by communities in informal settlements to mitigate the impacts of recurrent climate hazards?	<ul style="list-style-type: none">• Elevation of floors, reinforcement of roofs, and use of fire-resistant materials.• Gradual replacement of precarious housing structures with more durable materials.• Construction of sidewalks, diversion of rainwater with sandbags, and cleaning of drainage ditches.• Creation of informal water and electricity networks to compensate for lack of services.• Adoption of low-cost technologies such as “rocket stoves.”• Organisation of collective emergency responses, including coordinated evacuations and communal kitchens.
2. How do local knowledge systems, resource-sharing networks, and mutual aid practices - particularly those related to community organisation, gender responsiveness, knowledge sharing, and social networks - contribute to strengthening local resilience capacities?	<ul style="list-style-type: none">• Formation of local assemblies, <i>mesas de trabajo</i>, and neighbourhood committees.• Exchange of construction techniques and risk-reduction practices among residents.• Coordination of mutual aid initiatives such as food distribution, clean-ups, and childcare.• Use of WhatsApp groups and community radio for communication and early warnings.• Leadership roles of women in organising networks and driving resilience actions.• Alliances with social organizations and municipal actors.
3. How do existing urban policies shape adaptation processes in informal settlements, and to what extent are communities consulted and included in their design and implementation, with specific attention to inclusivity and gender dynamics?	<ul style="list-style-type: none">• Emergency compensation schemes and preventive measures implemented without addressing structural causes of vulnerability.• Limited engagement by State authorities.• Fragmented governance.• Insecure land tenure as a structural barrier to resilience.• Participatory practices to influence urban policy: community census, co-design workshops, territorial brigades, and women and youth engagement.• Participatory practices to improve policy implementation and efficiency: Patrulla de Control Popular de Obras.

4. What policy measures and institutional arrangements are necessary to build equitable urban resilience frameworks that incorporate the rights, knowledge, agency, and diverse needs of marginalised populations?
- Guaranteeing secure land tenure to enable long-term adaptation investments.
 - Provision of integrated services such as drainage, water, energy, and transportation.
 - Scaling up successful community-driven innovations
 - Ensuring continuity of projects and multi-year financing beyond political cycles.
 - Institutionalising participatory planning, knowledge sharing and co-decision in policy implementation processes
 - Developing gender-responsive policies that recognise care work and leadership roles.
 - Involve residents in monitoring and evaluation during and after policy implementation.
 - Embedding rights, redistribution, and recognition into adaptation policies to address systemic vulnerabilities.

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Abstract

Informal settlements across Latin America are disproportionately exposed to climate-related hazards while facing chronic infrastructural deficits and tenure insecurity. This qualitative study examines community-led adaptation and participatory practices in two cases-El Esfuerzo (Valparaíso, Chile) and Nuevo Alberdi (Rosario, Argentina)-to inform equitable urban resilience frameworks. Drawing on 28 key informant interviews, four focus groups, participatory mapping, and field observation, the analysis documents housing and infrastructure adaptations; local knowledge systems, mutual aid, and communication networks; and the enabling and constraining roles of urban policy, governance continuity, and tenure security. Findings show residents actively reduce exposure and cope with recurrent hazards (floods, wildfires, and landslides) through incremental housing upgrades, neighborhood works, and collective emergency practices, yet the scale, durability, and equity of these efforts hinge on secure tenure, integrated basic services, and institutionalized co-decision. The paper advances a rights- and justice-oriented approach to resilience, highlighting the need for multi-role state action-regulatory, redistributive, and enabling-alongside gender-responsive care infrastructures and participatory data systems. Policy recommendations connect grassroots practices to structural reforms that can transform reactive coping into durable adaptation pathways.

Keywords: equitable resilience; informal settlements; community-led adaptation; participatory planning; gender; urban policy; Latin America

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1. Introduction

Across Latin America, informal settlements represent one of the most acute expressions of urban inequality and climate vulnerability. Home to millions of people excluded from formal housing, infrastructure, and planning processes, these territories are often located on marginal lands and face disproportionate exposure to recurrent hazards such as floods, droughts, wildfires, and landslides. The interaction of precarious housing, insecure tenure, and limited access to essential services intensifies the impacts of these hazards, giving rise to community-led adaptation practices and local knowledge systems, even as these same conditions constrain residents' adaptive capacity.

Despite this, adaptation of research and policy responses have tended to privilege technical and infrastructural solutions over the social, political, and economic processes that shape vulnerability. Within this framing, the agency and knowledge of residents in informal settlements are often underacknowledged or idealized, with community initiatives portrayed as inherently adaptive yet detached from the broader structural conditions—such as development models, governance arrangements, and public–private relations—that determine access to resources and decision-making power. These limitations have given rise to a growing debate in urban resilience scholarship on the need to examine how community-led strategies and participatory approaches interact with socio-political dynamics and institutional frameworks to shape adaptation pathways in contexts of structural exclusion.

This research addresses that debate by reframing resilience as a socio-political process grounded in rights, redistribution, and recognition. It draws on theoretical perspectives from international relations, political economy, and critical urban studies to examine resilience beyond its functionalist and depoliticized framings. The study conceptualizes informal settlements as active sites of knowledge production, organization, and claims-making, where residents contest exclusion and articulate demands for services, tenure, and participation. This lens highlights the importance of understanding adaptation as both a material and political project: one that emerges from situated practices but is profoundly shaped by governance arrangements, institutional continuity, and broader development paradigms.

Empirically, the report investigates these dynamics through two qualitative case studies: El Esfuerzo in Valparaíso, Chile, and Nuevo Alberdi in Rosario, Argentina. Both settlements face significant climatic risks and chronic infrastructural deficits but differ in their histories, governance contexts, and levels of institutional engagement, offering complementary insights into community adaptation processes. Through semi-structured interviews, focus groups, participatory mapping, and field observation, the research captures the strategies

residents develop to confront hazards, the ways social networks and mutual aid strengthen resilience, the role of policy frameworks in enabling or constraining these efforts, and the pathways through which findings can inform the design of equitable and inclusive policy recommendations.

The research pursues four interconnected objectives. First, it analyzes the housing and infrastructure adaptation strategies developed by communities to mitigate climate hazards¹. Second, it examines the role of local knowledge systems, resource-sharing networks, and mutual aid - including their organizational, gendered, and social dimensions - in strengthening resilience capacities. Third, it investigates how urban policies shape adaptation processes and evaluates the extent and quality of community participation and consultation in their design and implementation. Finally, it formulates policy recommendations for equitable urban resilience frameworks that acknowledge and incorporate the rights, knowledge, agency, and diverse needs of marginalized populations.

The report proceeds as follows. It first situates the research within current debates on resilience, urban vulnerability, and informal urbanization. It then outlines the methodological approach and case study design. The findings are presented thematically, exploring adaptive practices, community organization, governance dynamics, and policy recommendations for equitable resilience. The discussion connects these findings to broader theoretical debates and policy implications, and the conclusion reflects their significance while identifying directions for future research.

2. Conceptual Background

2.1 Situating the Study: Resilience, Development, and the Political Economy of Urban Vulnerability

The concept of resilience has become a central organizing principle in climate change adaptation scholarship, yet its meanings, applications, and political implications remain deeply contested. Originally emerging from ecology to describe a system's capacity to absorb disturbance and reorganize while retaining core functions (Holling, 1973), resilience was later incorporated into the fields of urban studies, development, and international relations as cities became recognized as key arenas of climate vulnerability and response (Pelling, 2011). In this transition, resilience evolved from a descriptive ecological concept to a normative policy framework concerned with governance, risk management, and societal transformation (Graveline & Germain, 2022).

In global policy discourse, resilience has been institutionalized through the Sustainable Development Goals (SDG) -specifically SDG 11, which aims to make cities “*inclusive, safe, resilient and sustainable,*” and SDG 13, which calls for “*strengthening resilience and adaptive capacity to climate-related hazards*” (United Nations, n.d.-a, n.d.-b). International agencies-including UN-Habitat and the World Bank-frame resilience as a tool for risk reduction and recovery, emphasizing preparedness, stronger infrastructure, and the ability to “*build back better*” (UN-Habitat, 2018; World Bank & GFDRR, 2015). In this usage, resilience is presented as pragmatic and universally desirable.

Critics have argued, however, that mainstream resilience discourse-particularly in its policy and development applications-has been shaped by rationalities that valorize local adaptation and self-reliance while neglecting structural determinants of vulnerability (MacKinnon & Derickson, 2013). As governments and international agencies reframed resilience as a technical objective, the burden of adaptation was increasingly transferred from the state to communities and individuals (Joseph, 2013; Chu, Anguelovski, & Roberts, 2018; Jackson, 2024). This shift has been especially evident in the urban context, where resilience planning often focuses on enhancing the adaptive capacity of communities or individuals without addressing the political-economic systems that produce risk and inequality (Davoudi, 2012).

Latin America offers a critical vantage point from which to interrogate these dynamics. The region is simultaneously one of the most urbanized and one of the most unequal in the world, with over 20% of its urban population living in informal settlements characterized by inadequate housing, insecure tenure, and exclusion from state services (UN-Habitat, 2022).² Informal settlements are disproportionately exposed to climate-related hazards-including floods, droughts, heatwaves, and landslides-due to their peripheral locations, poor infrastructure, and socio-spatial marginalization (Hardoy & Pandiella, 2009; TECHO, 2023; Secretaría de Integración Socio Urbana & TECHO, 2022).

Pre-existing inequalities shape the unequal distribution of vulnerability to climate change, disproportionately affecting individuals who are socially and geographically marginalized, including those facing discrimination based on gender, age, race, class, indigeneity, and disability (Adger, 2006; Strange, Satorras, & March 2024). Evidence shows that inequality exacerbates climate vulnerability in three primary ways: by increasing exposure to hazards, heightening susceptibility to damage, and reducing recovery capacity (Nazrul & Winkel, 2017). The interaction of these factors produces a vicious cycle in which climate hazards and social inequalities reinforce one another, deepening disadvantage over time (Nazrul & Winkel, 2017).

According to UN-Habitat, a “*slum household*” is one where inhabitants suffer one or more of the following deprivations: lack of access to an improved water source, improved sanitation

facilities, sufficient living area, durable housing, and security of tenure (UN-Habitat, 2003). These inadequate housing conditions significantly increase residents' vulnerability to weather events like rain, heat, cold, and wind, as well as climatic events associated with climate change (UN-Habitat, 2018; SPARC, 2023). This heightened vulnerability leads to higher losses of human lives, material damages, and impacts on life expectancy, identities, and cultures when climatic events take place (Calderón, 2001). The exacerbation of risks and urgency of adaptation in this context cannot be disentangled from broader processes of development, urbanization, inequality, and state retreat from social provisioning (Fernández Wagner, 2004).

These risks are not isolated but instead interact in ways that can amplify one another, resulting in compounding, cascading effects and the accumulation of risk over time (Westman et al., 2022; Wolff & Ramírez-Lovering, 2022; Simpson et al., 2021). The concept of risk accumulation refers to the layering of multiple vulnerabilities and threats, shaped by underlying political and socioeconomic dynamics (IPCC, n.d.). This process highlights how overlapping exposures—such as densely populated, high-vulnerability communities—and the convergence of various climate and non-climate hazards can influence and exacerbate each other's impacts (Bull-Kamanga et al., 2003).

A political economic approach to resilience foregrounds the ways in which macro-level development models shape the unequal distribution of vulnerability and adaptive capacity.³ The emergence and persistence of informal settlements in the region reflect the interplay between rapid urbanization, weak state capacity, and shifting development paradigms. During the mid-20th century, rural-to-urban migration overwhelmed formal housing provision, leading many migrants to occupy peripheral or hazard-prone land and build incrementally outside formal legality (Dufour, 2004; Fernandes, 2011). These dynamics were deepened by the neoliberal structural adjustment programs and reforms of the 1980s and 1990s, which reduced state provision of affordable housing, deregulated land markets, and encouraged speculative urban growth (Fernandes, 2011, p. 9; Portes & Roberts, 2005). These shifts deepened urban inequality and pushed millions into informal settlements, where exposure to climate risks became structurally embedded (Hardoy & Pandiella, 2009). For example, the IDB's report "*Reforming Latin American Housing Markets: A Guide for Policy Analysis*" describes how regulatory impediments were dismantled to encourage private investment in housing, but without sufficient counterbalancing policies for affordability, resulting in expansions of informal urbanization. A more recent report from the MIT Center for Real Estate shows that despite high demand in Latin America, qualitative and quantitative housing deficits persist, and that macroeconomic instability plus liberalized land/development markets amplify spatial segregation, as poorer residents are forced into peripheries with poorer services and longer commutes (Saiz, Cuéllar Cerón, Rodríguez, & Ganitsky, 2022).

Within this framework, scholars in the region have been particularly incisive in showing how housing policies and land markets not only reflect existing social hierarchies but also actively reproduce patterns of vulnerability. Rolnik (2019) argues that the financialization of housing has subordinated urban policy to global capital flows, undermining the capacity of states to guarantee the right to adequate housing and exacerbating the precariousness of informal settlements. This insight highlights the importance of reframing adaptation not only as a technical challenge but as a socio-political project tied to questions of redistribution, regulation, and state responsibility. Regarding the role of the States, it oscillated between criminalizing and tolerating informal settlements, later incorporating them through selective upgrading or regularization (Huchzermeyer, 2004, p. 139). Informal settlements thus emerged not as anomalies but as constitutive elements of urban development in the region.

Against this backdrop, a justice-centered reframing of resilience has gained traction, most notably through the framework of Equitable Urban Resilience. Defined as “*ensuring that all city residents, especially the most vulnerable, benefit from and contribute to a city’s ability to withstand and recover from shocks and stress*” (Prism, n.d.). This approach reframes resilience from a narrow concern with restoring infrastructure and services to one that embraces transformative change, going “*beyond consideration of equity in the processes and distribution of development outcomes*” (Meerow & Newell, 2019, p. 3).

A core dimension of this framework is distributional justice, understood as equitable access to goods, infrastructure, and environmental amenities across urban populations (Anguelovski et al., 2016; Shi et al., 2016). In the Latin American context, this dimension is particularly salient given that the liberalization of land markets and selective upgrading policies have historically entrenched socio-spatial inequality (Hardoy & Pandiella, 2009; Fernandes, 2011; Rolnik, 2019). Equitable resilience therefore requires addressing how adaptation resources are allocated—ensuring that informal settlements, often located on hazard-prone peripheries, are not systematically excluded from protective infrastructure and services.

Equitable urban resilience also emphasizes the importance of context-rooted and socially just processes, recognizing that equity “*refers to positions of differential access to resources, capacities, and power among populations of interest*” (Matin, Forrester, & Ensor, 2018, p. 197). This resonates with Latin American experiences where community-led initiatives—such as grassroots upgrading, risk mapping, and water committees—have often filled the gaps left by weak or exclusionary state responses (Calderón, 2001; TECHO, 2023). By centering community knowledge and participatory governance, the framework aligns with long-standing demands in the region for recognition of marginalized groups as active agents in shaping adaptation strategies.

Scholars further argue that resilience planning must be participatory, democratic, and socially responsive. In practice, this entails involving informal settlement dwellers, low-income neighborhoods, and other at-risk groups in defining what resilience means for their lives; recognizing multiple scales and forms of knowledge, including indigenous and local understandings of climate risk; and confronting structural vulnerabilities such as poverty, segregation, insecure housing, and lack of basic services, which largely determine who suffers most in any disaster (Anguelovski et al., 2016; Ziervogel et al., 2017).

Finally, equitable urban resilience advances a justice-centered, transformative paradigm. Rather than merely seeking to “*bounce back*” after shocks, it reframes resilience as an opportunity to “*bounce forward*” by dismantling systemic inequities and addressing the structural conditions that perpetuate harm and vulnerability (Fainstein, 2014; Ziervogel et al., 2017). In Latin America, where informal settlements are not anomalies but constitutive elements of urban development (Huchzermeyer, 2004), this implies confronting the drivers of vulnerability-including speculative land markets, state retreat from housing provision, and uneven citizenship rights-so that resilience strategies do not reproduce the very inequalities they seek to redress.

2.2 Governance, State Capacity, and the Politics of Informality

Across Latin America, scholarship shows that the state’s role in informal settlements has been decisive yet shifting, with policy approaches closely mirroring broader development paradigms and political priorities. A large body of urban studies contests the state-informality relationship, oscillating between enabling/market-complementary and rights-based/structural roles for the state.⁴ One influential current-often associated with the 1990s “*enabling*” turn-holds that governments should facilitate rather than directly provide housing and upgrading, by reforming regulations, securing tenure, and leveraging non-state resources; while initially developed in shelter policy, this logic has informed strands of urban climate adaptation that emphasize creating “*enabling environments*” and devolving action to local actors and markets⁵ (Chu, Anguelovski, & Roberts, 2018). Empirically, the Chilean debate documents how market-centric subsidy regimes reduced quantitative deficits yet entrenched segregation and peripheralization, illustrating limits of “*enable-only*” paradigms in Latin American cities (Rodríguez & Sugranyes, 2005; Ducci, 2006).

A contrasting rights-based/structural literature, mainly from the political economy field, argues that the core drivers of informality-unequal land markets, insecure tenure, and infrastructural deficits-are politically produced and cannot be corrected without redistributive public investment, regulation, and statutory planning. Latin American scholarship, exemplified in the Economic Commission for Latin America and the Caribbean (ECLAC)’s *igualdad* agenda, places equality at the core of development and advocates for

expanding access to education, health, employment, housing, and basic services, alongside productive and fiscal policies-an explicit platform that links development strategies with inequality reduction and public investment in infrastructure and housing, especially in informal settlements (CEPAL, 2010).

Regarding governance, comparative and historical reviews document how legal frameworks, land policy, and urban programs have alternated among regularization, subsidies, deregulation and amnesties, shaping both the governance and the everyday conditions of informal settlements (Fernandes, 2011). Outcomes are further conditioned by institutional legacies, fiscal regimes, and land markets, which constrain municipal capacity unless accompanied by stronger public mandates and resources (Eakin et al., 2022; Juhola et al., 2022). Latin American studies show that governance gaps and service deficits are central determinants of risk (Hardoy & Pandiella, 2009). Where upgrading aligns with land valorization and large-scale development, state choices over tenure and finance decisively shape who benefits, showing the political rather than technical nature of State norms (Ons, 2021). Fiscal choices, land policies, and infrastructure investment priorities are not merely background conditions but active determinants of who are exposed to risk, who can adapt, and on what terms (Bulkeley et al., 2013).

Within the urban climate adaptation field, analyses of municipal climate governance in the global South show that the distribution of adaptive capacity depends on the interplay of national frameworks, municipal mandates, and the meso-level institutions that mediate resources and accountability (Bulkeley et al., 2013). Political economic perspectives highlight that climate governance experiments are embedded within pre-existing fiscal, regulatory, and institutional legacies-including liberalization histories and land market pressures-that often constrain ambition and reintroduce austerity logics (Ocampo & Ros, 2011). Evidence from Latin American cities suggests that durable gains arise when co-production is linked to legal recognition, budgetary commitments, and multi-scalar coordination rather than ad hoc projects, thereby embedding adaptation within socio-urban integration policies (Archer et al., 2014).

Recent peer-reviewed syntheses converge on a multi-role state-regulatory, redistributive, and enabling as a precondition for equitable outcomes of resilience in informal settlements. Comparative governance reviews similarly find that institutional legacies, fiscal regimes, and land markets-including those shaped by neoliberal reforms-condition what cities can do, often constraining equitable adaptation unless public mandates and finance are strengthened (Eakin et al., 2022; Juhola et al., 2022). Latin American studies reinforce this claim: Hardoy & Pandiella (2009) demonstrate that risk for low-income urban residents is tightly linked to municipal service deficits and governance gaps, making public upgrading and service expansion central to adaptation.

Across these debates, recent peer-reviewed literature suggests that adaptation in informal settlements is most equitable and scalable where the state combines roles: (i) regulatory, by securing tenure and aligning land-use with risk (Fernandes, 2011; Payne, Durand-Lasserre, & Rakodi, 2009), (ii) redistributive, through infrastructure and service investment supported by fiscal transfers (Hardoy & Pandiella, 2009; Satterthwaite et al., 2020); (iii) enabling, by providing planning frameworks, partnerships, and supportive governance conditions for local initiatives (Archer et al., 2014; Juhola et al., 2022).

The regulatory dimension is especially salient, as secure land tenure has emerged as a cornerstone of urban resilience, particularly in informal settlements where exposure to climate hazards intersects with legal and material precarities (Payne, Durand-Lasserre, & Rakodi, 2009; UN-Habitat, 2011). Without legal recognition of tenure, residents often face eviction threats, disincentives to invest in housing improvements, and systematic exclusion from state-led upgrading programs (Fernandes, 2011; Gilbert, 2002). This condition undermines adaptive capacity by perpetuating vulnerability to floods, landslides, and other climate-related risks (Hardoy & Pandiella, 2009; Satterthwaite et al., 2020). Conversely, secure tenure provides a foundation for residents to invest in safer housing, negotiate services, and participate in planning processes (Payne et al., 2009; Durand-Lasserre & Selod, 2009). From this perspective, resilience is linked not only to infrastructure but also to rights and citizenship (Rolnik, 2019; Satterthwaite et al., 2020). In the Latin American context, where tenure insecurity has historically been managed through selective regularization and clientelist practices, advancing equitable resilience requires treating tenure security as both a developmental right and a precondition for adaptive capacity (Fernandes, 2011; Calderón, 2001).

This centrality of tenure security is echoed in Howard et al. (2025) *Four Principles of Transformative Adaptation* for informal settlements, which position improved tenure security as the first step toward enabling long-term resilience. The second principle emphasizes the need for governance frameworks that are equitable and fit for purpose, requiring meaningful inclusion of marginalized voices, cross-scale coordination, and institutional mechanisms that bridge gaps between local and formal governance (Howard et al., 2025). The third principle highlights the necessity of generating and using data for evidence-based decision making, given that informal settlements are frequently excluded from official data systems; robust, participatory data collection is essential to guide tailored and responsive interventions (Howard et al., 2025). The fourth and final principle calls for addressing the drivers of complex risk, meaning that adaptation must confront the intersecting socioeconomic, spatial, and environmental conditions—such as segregation, lack of services, and compounding hazards—that amplify vulnerability over time (Howard et al., 2025). Taken together, these principles provide a structured pathway for adaptation efforts in informal

contexts to move beyond incremental change and open space for justice-centered, long-term resilience transformations.

2.3 Critical Urbanism: Right to the City, Gender, and Collective Agency

Lefebvre's *Right to the City* conceptualizes urban space as a collective work of inhabitants and emphasizes participatory claims to reshape space, contesting commodification and exclusion (Lefebvre, 1996; Purcell, 2002). Harvey (2008) extends this idea, arguing that the right to the city is a collective claim to transform urban processes—including decisions over land, infrastructure, and spatial investment—as part of broader struggles against capitalist urbanization. Building on this foundation, adaptation scholarship has increasingly integrated justice-oriented approaches, emphasizing participation, democratized governance, and the embedding of justice in infrastructure and urban design (Shi et al., 2016). Empirically, social movements articulate climate justice as a right to the city, linking claims over housing, water, and sanitation to broader struggles for adaptive capacity and urban citizenship (Wagle, 2022).

In Latin America, debates on informality connect directly to this agenda, showing how tenure precarity, service deprivation, and peripheralization are co-produced by state regulation and market logics, thereby relocating climate exposure onto marginalized populations (Roy, 2005). Legal and policy analyses of settlement regularization emphasize that secure tenure and serviced land are foundational for adaptation, while warning that formalization without affordability and infrastructure finance can entrench exclusion (Fernandes, 2011). Complementing this, critical housing studies trace how financialization undermines state capacity to uphold housing as a right, intensifying risk through speculative urban development and indebtedness (Rolnik, 2019). Taken together, this literature positions informality not as a deficit but as a contested governance regime and a field of urban citizenship claims through which adaptation is negotiated (Satterthwaite et al., 2020).

Community-led and participatory adaptation practices operationalize these principles. Defined as the self-organized capacity of local groups to anticipate, absorb, and reorganize in the face of shocks, they draw on situated knowledge, social organization, and practices of mutual support in articulation with external actors (Dodman & Mitlin, 2013). In Latin America, such practices are embedded in long histories of neighborhood organizing, land and housing struggles, and incremental upgrading, which together constitute the social infrastructure through which climate risk is recognized and acted upon (Satterthwaite et al., 2020). However, participation has analytical and practical value only when it redistributes agenda-setting power and resources, rather than legitimating pre-formulated projects (Mitlin, 2008; Archer et al., 2014). A co-production lens highlights how resident

organizations, external actors, and state agencies jointly produce services and knowledge, with outcomes contingent on associational life, enabling legal frameworks, and fiscal/administrative capacities (Joshi & Moore, 2004). While community organization is indispensable, local governments retain “*critical responsibilities*” for infrastructure, upgrading, and tenure security beyond the capacity of community initiatives alone (Satterthwaite et al., 2020).

Feminist urban scholarship deepens this justice agenda by demonstrating that vulnerability and adaptive capacity are structured by gendered divisions of labor, mobility, safety, and access to services, making gender an essential analytic for community-led adaptation (Falú, 2013). Rights-based housing research shows how financialization and insecure tenure disproportionately externalize climate and socio-economic risks onto women-headed households and informal workers, underscoring the need for state-backed social protection, serviced land, and accessible facilities as core enablers of adaptation (Rolnik, 2019). Evidence from informal settlements across the region documents women’s leadership in local adaptive responses—from the consolidation of *tomas de terreno* and disaster risk governance in Chile, to neighborhood upgrading and housing management in Argentina and Brazil—while also revealing the limits of relying on unpaid female labor (Zenteno et al., 2023; Acuña et al., 2021; Reta, 2024; Jovchelovitch et al., 2016).

A growing body of work therefore argues that gender-responsive approaches must institutionalize women’s leadership in decision-making, budgeting, and monitoring, to avoid reproducing care burdens during crises (Jabeen, 2019; Georgetown Institute for Women, Peace and Security, 2020). This perspective insists that investments in care infrastructures—water and sanitation, health and education, mobility, street lighting, and safe public spaces—are integral to equitable adaptation rather than ancillary (Satterthwaite et al., 2020; UN-Habitat, 2022; Global Center on Adaptation [GCA], 2023). Read through the Right to the City, feminist urbanism reframes adaptation as a struggle over the material conditions that sustain social reproduction, placing gender justice, care, and collective agency at the heart of transformative resilience strategies (Falú, 2013; Rolnik, 2019).

Bringing these strands together, the Right to the City, resilience justice, and feminist urbanism identify common structural drivers of vulnerability-segregation, insecure tenure, service deficits—and converge on democratic, redistributive, and care-centered approaches to urban adaptation (Swyngedouw, 2011; Anguelovski et al., 2016; Satterthwaite et al., 2020). This synthesis offers a normative compass for analyzing how resilience can be reframed as a struggle over rights, redistribution, and urban futures.

2.4. Synthesis and Conceptual Boundaries

The review of Latin American scholarship shows that adaptation in informal settlements is both a governance challenge and a justice project. Existing studies underscore that state roles must extend beyond facilitation to include redistribution, regulation, and co-production (Hardoy & Pandiella, 2009; Fernandes, 2011; Archer et al., 2014). Informality emerges not as a failure but as a constitutive feature of urbanization that shapes exposure and adaptive capacity (Roy, 2005; Rolnik, 2019). Community participation, while indispensable, must move beyond gap-filling to secure institutionalized influence over decision-making (Mitlin, 2008; Joshi & Moore, 2004). Finally, feminist and urban justice literatures highlight that gender and care are not auxiliary but central to resilience-building (Falú, 2013; Jabeen, 2019; Satterthwaite et al., 2020).

Nonetheless, conceptual and methodological gaps remain. Co-production and participation studies sometimes romanticize local agencies while underestimating the constraints imposed by legality, finance, and power asymmetries (Joshi & Moore, 2004). Structural analyses, conversely, risk overlooking everyday practices through which communities navigate vulnerability. Feminist perspectives deepen understanding of adaptation but remain under-translated into concrete planning and budgeting tools (Falú, 2013). Bridging these gaps requires a governance-and-rights analytic that situates neighborhood practices within broader political-economic contexts, while also translating justice-oriented diagnostics into actionable frameworks for equitable adaptation in informal urban areas.

3. Methodology

3.1 Research Design⁶

This study employed a qualitative, case-study design to examine community-led resilience and adaptation in informal settlements. The research was guided by the following question: *What community-led strategies and participatory approaches are developed by informal settlements in Limache (Chile) and Rosario (Argentina) to confront climate hazards, and in what ways do these strategies contribute to advancing equitable urban resilience amid systemic inequalities?*

A descriptive, non-comparative approach—guided by methodological principles from the Universidad Nacional de Rosario—privileged contextual depth over generalizability, generating empirically grounded insights into the socio-political processes that shape resilience in marginal urban contexts. Each settlement was treated as a bounded case,

enabling analysis of local adaptation strategies, forms of social organization, and institutional conditions influencing community responses to climate-related hazards.

3.2 Case Selection Criteria

The selection of Chile and Argentina, and of the informal settlements El Esfuerzo (Valparaíso, Chile) and Nuevo Alberdi Oeste (Rosario, Argentina), it was guided by four main criteria:

- Significant exposure to climate-related hazards and cumulative environmental risks
- Structural socio-economic inequalities and systemic barriers to accessing basic services
- The existence of active community organizations and collective responses to risk
- Contrasting temporalities and stages of settlement consolidation, which together offer complementary perspectives on resilience-building processes.

These criteria make the two cases particularly relevant for understanding how grassroots strategies intersect with public policy, rights frameworks, and institutional engagement in contexts of urban marginalization.

3.3 Community Profiles

3.3.1 El Esfuerzo (Valparaíso, Chile)

Responding to the criterion on significant exposure to climate-related hazards, Chile⁷ ranks 29th out of 181 countries on the ND-GAIN vulnerability index, and is home to 1,290 informal settlements, 91.3% of which are exposed to at least one climate-related hazard and 14% to four or more (TECHO-Chile, 2023). These risks include wildfires, landslides, floods, storms, and soil erosion. In Valparaíso Region, where El Esfuerzo is located, over 30,000 households face wildfire and drought risks, underscoring the region's high exposure (TECHO-Chile, 2023).

Addressing the criterion on structural socio-economic inequalities and systemic barriers to accessing basic services, El Esfuerzo was established in May 2021 amid the socio-economic crisis linked to the COVID-19 pandemic, as families unable to afford rent sought alternative housing solutions. The occupation reflects broader structural barriers to formal housing, including rising living costs, insecure rental arrangements, and limited employment opportunities (TECHO-Chile, 2023; Pino Vásquez & Ojeda, 2013). Housing

conditions meet all of UN-Habitat's (2003) criteria for "household deprivation": there is no secure tenure, water is supplied irregularly by delivery trucks and stored in community tanks, sanitation services are absent, and electricity connections are informal. Built mainly with zinc sheets, OSB boards, and earth floors, homes are self-constructed and precarious. Access to public services remains highly restricted, with no formal drainage or waste collection, reflecting the broader exclusion of the settlement from state services and urban rights.

The community's location - on a ravine edge surrounded by eucalyptus forests - heightens exposure to multiple climate-related hazards, including wildfires, droughts, soil erosion, landslides, and seasonal storms (TECHO-Chile, 2023; Ministerio de Vivienda y Urbanismo, 2021). Heavy rainfall frequently causes flooding and road degradation, restricting emergency access and water delivery, while strong winds and rain damage fragile structures. Fire risk is exacerbated by surrounding vegetation, prompting residents to organize vegetation-clearing campaigns in line with the criteria on active community organization and collective responses to risk.

Finally, reflecting the criteria on contrasting temporalities and stages of consolidation, El Esfuerzo is a recently established settlement with insecure tenure, absent infrastructure, and limited public investment. Although the municipality designates the area as a "red zone" and applies limited preventive measures (Ministerio de Vivienda y Urbanismo, 2021), sustained state engagement remains weak, reinforcing reliance on self-organization and highlighting the need for rights-based approaches to adaptation and integration.

3.3.2 Nuevo Alberdi Oeste (Rosario, Argentina)

Argentina⁸ faces comparable structural dynamics. It has 6,467 registered informal settlements, the majority of which lack access to basic services: 66% are disconnected from the electricity grid, 92% from potable water, 97% from sewage systems, and 99% from gas networks (TECHO Argentina, 2024). Most of these settlements are also highly exposed to floods, which account for 60% of national disasters and 95% of economic losses (TECHO Argentina, 2024).

Addressing the criterion on structural socio-economic inequalities and systemic barriers to basic services, Nuevo Alberdi Oeste, located in the northwest of Rosario, Santa Fe, emerged in the early 1990s through successive waves of migration and today has a population of approximately 6,040 inhabitants, 73% of whom are under 34 years old (IGC, 2021). The settlement combines a consolidated urban area with a more dispersed rural zone and has historically faced deep socio-spatial marginalization, reflected in precarious living conditions, limited institutional presence, and chronic exclusion from urban services.

Aligned with the criterion on active community organization and collective responses to risk, Nuevo Alberdi has been a site of strong collective organization and sustained advocacy for land rights and socio-urban integration, with assemblies and collaboration with civil-society organizations functioning both as survival strategies and as platforms for demanding structural change (IGC, 2021).

Consistent with the criterion on contrasting temporalities and stages of consolidation, within the broader policy framework created by the Law for Socio-Urban Integration of Popular Neighborhoods (Law 27.453, 2018)⁹, Nuevo Alberdi was incorporated in August 2020 into the national urbanization programme, implemented locally by the *Instituto de Gestión de Ciudades*¹⁰ (IGC) and the territorial organization Ciudad Futura¹¹. A census conducted in 2021 established a baseline for participatory planning, leading to the development of several infrastructure projects, including sewage, potable water, and public space initiatives. However, due to the program's subsequent defunding, only the water supply project was implemented, leaving most planned works on hold despite formal approval.¹²

Synthesizing current conditions-and addressing the criterion on significant exposure to climate-related hazards and cumulative environmental risks- Nuevo Alberdi Oeste experiences recurrent flooding due to overflow of the Ibarlucea and Salvat canals, which heightens sanitary and health hazards. These climate-related risks are compounded by cumulative environmental pressures, including micro-dumps and chronic infrastructural neglect (IGC, 2021). Access to state services and infrastructure remains profoundly limited, with no formal drainage, waste collection, or gas network, and only partial provision of water and electricity (IGC, 2021; TECHO Argentina, 2024). Public institutions are scarce and insufficient to meet demand, while housing conditions remain precarious, with widespread structural deficiencies that further increase environmental exposure. These persistent gaps-despite legal recognition and policy frameworks-demonstrate how uneven state engagement and institutional discontinuity shape adaptive capacity, while community agency-expressed through assemblies, advocacy, and collaboration with civil-society actors-continues to operate both as a survival mechanism and a platform for demanding structural change (IGC, 2021; TECHO Argentina, 2024).

By selecting two cases that differ in geography, historical development, scale, and institutional engagement, the research captures a wide range of resilience dynamics, illustrating how state responsibility, rights-based frameworks, and community-led adaptation interact in distinct urban contexts.

3.4 Data Collection

3.4.1 Secondary Data

A comprehensive desk-based review examined the historical formation, adaptation dynamics, and vulnerability of informal settlements in Latin America through perspectives from international relations, development theory, political economy, and critical urbanism. A climatic profile of Argentina and Chile provided environmental context, while community profiles for *El Esfuerzo* (Valparaíso, Chile) and *Nuevo Alberdi Oeste* (Rosario, Argentina) were developed using national census data and information from *TECHO* and the *Instituto de Gestión de Ciudades (IGC)*.¹³ The review incorporated a multi-dimensional vulnerability assessment combining Adger's (2006) social-vulnerability framework, Cutter et al.'s (2009) "vulnerability of place," and *TECHO*'s model (Campos et al., 2022).

3.4.2 Primary Data Collection

Primary data were gathered through multiple qualitative methods to ensure triangulation and depth. Over four months of fieldwork, 28 key-informant interviews were conducted (12 in *El Esfuerzo*, 16 in *Nuevo Alberdi*) with residents, female community leaders, representatives of grassroots, social, and political organizations, and government officials. Four focus groups engaged women, youth, technical experts, and local-organization members to capture diverse perspectives. Participatory mapping was carried out in both sites—one as part of a global campaign in *El Esfuerzo* and another within a local-school project in *Nuevo Alberdi*—to spatially document risks, adaptations, and priorities. Transect walks and participant observation took place during nine field visits, complemented by geotagged photographs, field notes, and observations of daily practices (e.g., drainage maintenance, tree planting, emergency responses).

Secondary materials such as national census data, policy documents, municipal plans, NGO reports, and local-media coverage were used to triangulate participants' accounts. A gender-sensitive lens guided all stages of data collection: women were intentionally over-represented among interviewees, and attention was given to gendered divisions of labor and decision-making during adaptation processes.

3.5 Data Analysis

Data from transcripts, field notes, and documents were analyzed through manual thematic coding in Excel and Google Sheets, following Braun and Clarke's (2006) framework. Systematic coding, iterative refinement, and memo-writing ensured rigor and transparency, while the manual approach preserved participants' vernacular and contextual nuance.

Coding unfolded in two cycles. First, in-vivo coding captured expressions such as "*hacer lo que se puede*" ("doing what we can") to reflect local meanings of coping. Second, pattern coding grouped these into analytical categories aligned with research objectives, including housing and infrastructure adaptation, mutual aid, governance barriers, and claims-making.

As participants rarely used the term of *resilience*, it was operationalized analytically. Practices like reinforcing roofs, organizing flood alerts, and petitioning authorities were interpreted as *resilience-in-practice*: situated strategies expressing agency and contesting exclusion. A final analytical matrix synthesized cross-case patterns and linked findings to debates on resilience, governance, and the right to the city.

Ethical standards—including informed consent, anonymity, and sensitivity to trauma—were strictly applied. All materials were produced in Spanish and translated meaningfully into English, ensuring fidelity and clarity.

In sum, the methodology was designed to capture the lived experiences of resilience and adaptation in two informal settlements, through a combination of direct voices, community-level observation, and contextual data. While the qualitative and case-specific nature of the study means we do not claim statistical generalizability, we aim for analytical generalization – using the insights from these cases to speak to broader theoretical and practical questions about community resilience, climate adaptation, and urban inequality.

3.6 Research limitations

This study focuses on community-led adaptation and participatory practices in two informal settlements in Chile and Argentina, deliberately limiting its scope to neighborhood-level dynamics, state–community relations, and the operationalization of equitable resilience. Broader debates on political ecology, global climate governance, and national development models fall beyond its analytical boundaries. Methodologically, the qualitative design and two-case approach provide in-depth, context-specific insights but do not allow for statistical generalization or capture the full diversity of informal settlements across the region. These limitations frame the study as a contribution of situated evidence that complements larger-scale analyses.

4. Results and Findings

This section presents findings on how residents in El Esfuerzo (Valparaíso, Chile) and Nuevo Alberdi (Rosario, Argentina) adapt their housing and neighborhood infrastructure to recurrent climate hazards. It examines individual and collective practices that mitigate short- and long-term risks, drawing on interviews, focus groups, direct observation, and documentary evidence to provide a grounded understanding of adaptation in practice.¹⁴ The results are organized thematically around four key themes that emerged from the analysis as it can be seen in Table 1. The first examines housing and infrastructure adaptation strategies at the household and community levels, documenting how residents mobilize limited resources, technical creativity, and situated knowledge to reduce exposure and cope with hazards such as flooding, wildfires, and structural instability. The second explores participatory planning and local knowledge, analyzing how community organization, communication networks, and mutual aid underpin collective responses and shape adaptive capacity in contexts of structural exclusion. The third focuses on the role of public policies and institutional frameworks, assessing how land tenure, governance coordination, and policy design enable or constrain these locally driven practices and the extent to which they incorporate community agency. Finally, the fourth synthesizes policy recommendations for building equitable urban resilience, grounded in the growing pressures posed by climate change and environmental stressors such as flooding, droughts, and wildfires, and drawing lessons that connect grassroots practices with broader structural reforms.

Table 1 - Nuevo Alberdi and El Esfuerzo: results and Key Findings of Correlated with Research Objectives

Research Question	Summary of Findings
<p>1. What housing and infrastructure adaptation strategies are developed and implemented by communities in informal settlements to mitigate the impacts of recurrent climate hazards?</p>	<ul style="list-style-type: none"> • Elevation of floors, reinforcement of roofs, and use of fire-resistant materials. • Gradual replacement of precarious housing structures with more durable materials. • Construction of sidewalks, diversion of rainwater with sandbags, and cleaning of drainage ditches. • Creation of informal water and electricity networks to compensate for lack of services. • Adoption of low-cost technologies such as “rocket stoves.” • Organisation of collective emergency responses, including coordinated evacuations and communal kitchens.
<p>2. How do local knowledge systems, resource-sharing networks, and mutual aid practices - particularly those related to community organisation, gender responsiveness, knowledge sharing, and social networks - contribute to strengthening local resilience capacities?</p>	<ul style="list-style-type: none"> • Formation of local assemblies, <i>mesas de trabajo</i>, and neighbourhood committees. • Exchange of construction techniques and risk-reduction practices among residents. • Coordination of mutual aid initiatives such as food distribution, clean-ups, and childcare. • Use of WhatsApp groups and community radio for communication and early warnings. • Leadership roles of women in organising networks and driving resilience actions. • Alliances with social organizations and municipal actors.
<p>3. How do existing urban policies shape adaptation processes in informal settlements, and to what extent are communities consulted and included in their design and implementation, with specific attention to inclusivity and gender dynamics?</p>	<ul style="list-style-type: none"> • Emergency compensation schemes and preventive measures implemented without addressing structural causes of vulnerability. • Limited engagement by State authorities. • Fragmented governance. • Insecure land tenure as a structural barrier to resilience. • Participatory practices to influence urban policy: community census, co-design workshops, territorial brigades, and women and youth engagement. • Participatory practices to improve policy implementation and efficiency: Patrulla de Control Popular de Obras.

4. What policy measures and institutional arrangements are necessary to build equitable urban resilience frameworks that incorporate the rights, knowledge, agency, and diverse needs of marginalised populations?

- Guaranteeing secure land tenure to enable long-term adaptation investments.
- Provision of integrated services such as drainage, water, energy, and transportation.
- Scaling up successful community-driven innovations
- Ensuring continuity of projects and multi-year financing beyond political cycles.
- Institutionalising participatory planning, knowledge sharing and co-decision in policy implementation processes
- Developing gender-responsive policies that recognise care work and leadership roles.
- Involve residents in monitoring and evaluation during and after policy implementation.
- Embedding rights, redistribution, and recognition into adaptation policies to address systemic vulnerabilities.

Across both case studies, the findings reveal a common pattern: residents actively devise strategies to confront climate-related hazards and chronic infrastructural deficits, yet the scale and sustainability of these efforts are deeply conditioned by the structural environment in which they occur. Where tenure insecurity, fragmented governance, and discontinuous programs prevail, community action remains reactive, partial, and vulnerable to shifting political agendas. In contrast, participatory spaces, institutional continuity, and recognition of community agencies emerge as enabling conditions that can translate grassroots initiatives into more durable adaptation pathways. The following sections examine these themes in depth, beginning with the adaptive strategies developed within homes and neighborhood infrastructures.

4.1 Housing and Infrastructure Adaptation Strategies

This section presents findings on how residents in El Esfuerzo (Valparaíso, Chile) and Nuevo Alberdi (Rosario, Argentina) adapt their housing and neighborhood infrastructure to recurrent climate hazards. It examines both individual and collective practices that mitigate short- and long-term risks, drawing on interviews, focus groups, direct observation, and documentary evidence to provide a grounded understanding of adaptation in practice.

4.1.1 El Esfuerzo (Valparaíso, Chile)

Residents of El Esfuerzo have developed a range of adaptive strategies to address the recurring climate-related hazards that shape their everyday lives, particularly wildfires, flooding, and structural instability. These strategies emerge within the context of

vulnerable living conditions and limited institutional support, reflecting both immediate coping mechanisms and longer-term attempts to reduce vulnerability through self-managed interventions.

Elevation of floors, reinforcement of roofs, and incorporation of fire-resistant materials

A critical turning point in the settlement's collective experience occurred in 2023, when a rapidly spreading fire, fueled by flammable construction materials and the absence of water infrastructure for firefighting, devastated significant parts of the community. In its aftermath, many residents began incorporating fewer flammable materials into their homes as a preventative measure. Housing adaptations also targeted recurrent flooding. Several families elevated their homes above ground level to prevent water ingress: *"The rooms are two meters high, so the water doesn't enter. Some houses were elevated to two and a half or three meters,"* explained the community leader. Another resident described combining materials to protect against water infiltration: *"We put plywood, a sheet of wood, and also zinc sheets. The wood is to prevent water from entering, but the last time it still came in through the window."*

However, these strategies have not eliminated structural risks. Strong winds continue to dislodge roofs despite reinforcement, and soil erosion frequently undermines foundations. As one resident reported, *"Walls are sliding even though supports have been put in place, because sinkholes keep forming from the amount of water."* Such testimonies illustrate both the ingenuity and the limitations of local adaptation efforts, which combine short-term emergency measures with longer-term modifications in construction practices.

Image 1 and 2: Housing adaptation in El Esfuerzo: elevated homes and zinc-sheet roofing; interior ceiling repairs.



Source: image shared by a resident (2025)

External observers have characterized these practices as expressions of resilience but also highlighted their structural constraints. TECHO staff classify such self-managed

construction as *auto-construcción*, a form of building and reinforcement that emerges directly from local needs but often lacks safety standards and durability. While the shift toward less flammable materials following the 2023 fire is considered a significant adaptation, TECHO emphasized that these measures remain precarious without formal housing policies and state support.

Construction of sidewalks, diversion of rainwater with sandbags, and cleaning of drainage ditches

Beyond household-level improvements, community-led initiatives have also addressed broader infrastructure vulnerabilities. Residents use sandbags provided by the municipality to divert rainwater, though new sinkholes continue to appear due to unstable terrain and intense rainfall. *“The municipality gives us sandbags and the neighbors place them. Now a sinkhole is forming where the water went through a crack. With mesh and stones, we could prevent it, but it is inevitable that it will happen again,”* explained a local leader. To maintain accessibility during heavy rains, residents, supported by TECHO volunteers, built walkways and sidewalks to ensure safe movement throughout the settlement.

Creation of informal electricity networks

Efforts to secure electricity have also been community driven. A planned regularization project was abandoned due to prohibitive costs and lack of institutional support from the utility company, given the absence of tenure security. Residents responded by self-organizing to install public lighting.

Firebreaks and vegetation cleaning campaigns

Given the persistent risk of summer fires, the municipality and community organized cleaning campaigns in high-vegetation areas, complemented by training sessions delivered by firefighters and organizations such as TECHO. Residents acknowledged that while these measures demonstrated strong collective organization and produced positive outcomes, their effectiveness remained uneven due to financial constraints and varying levels of participation.

Limitations due to absence of formal infrastructure

Despite these efforts, adaptation remains constrained by the absence of formal infrastructure and secure tenure. Recurrent flooding, erosion, and structural instability continue to affect daily life, underscoring the limits of self-managed strategies in the absence of sustained public investment.

External organizations corroborated the importance of these practices, emphasizing the strong coordination displayed in clean-up campaigns, fire prevention efforts, and

infrastructure construction. TECHO highlighted residents' ability to mobilize quickly in response to emergencies, framing these actions as examples of grassroots' resilience. However, all consulted stakeholders noted that while community-led efforts mitigate specific hazards, they remain reactive and fragmented without systematic state intervention or investment in durable infrastructure.

Image 3 and 4: Community activities: construction of a sidewalk and installation of public lighting.



Source: unpublished photo taken by TECHO (2025)

Municipal authorities emphasized similar constraints. A local risk management official identified wildfires and landslides as the settlement's most pressing hazards, both exacerbated by lightweight construction materials and unstable slopes. *"There is a culture of fire because one has already happened,"* she explained, *"but the forest is so large that it is impossible to take measures beyond firebreaks."* The municipality supports prevention by creating firebreaks annually, supplying tools for brush clearing, and providing water through tanker trucks during fire events, a necessity in the absence of a formal water network, which often comes late. The official described the municipality's role as primarily facilitative: linking with social organizations, helping form local committees, and supporting internal organizations. Yet she cited El Esfuerzo's status as fiscal land and its lack of legal recognition as factors that limited the scope of interventions.

Together, these findings show how residents of El Esfuerzo, despite limited resources, insecure tenure, and hazardous conditions, are actively reshaping their homes and immediate environment to mitigate climate-related risks. They raise houses, reinforce roofs, layer materials, divert water with sandbags, build walkways, clear vegetation, and participate in training initiatives. These practices, supported in part by NGOs and local authorities, mitigate specific hazards and sustain daily life. Yet they also highlight a broader structural reality: without secure land tenure, integrated infrastructure, or formal service provision, community-driven adaptations remain necessarily partial. El Esfuerzo thus exemplifies the dual nature of resilience observed across informal settlements in Latin America: it is simultaneously an expression of agency and a symptom of systemic neglect.

4.1.2 Nuevo Alberdi (Rosario, Argentina)

In Nuevo Alberdi, findings reveal a more extensive repertoire of adaptive practices shaped by the settlement's longer trajectory and partial engagement with state programs. The most pressing hazard is flooding, which residents describe as cyclical and inescapable. As one long-term resident put it, *"Here, life revolves around the next flood."* Moderate rains leave streets under water, while major storms inundate homes by 30–50 cm.

Heavy rainfall frequently overwhelms shallow and poorly connected drainage ditches, often blocked by waste due to irregular garbage collection. As a result, floodwater enters homes multiple times a year, damaging property and disrupting daily life. Residents also contend with water scarcity, especially in summer when pressure drops, irregular electricity supply, degraded roads, and uncollected waste, all of which intensify the impacts of climate events. Together, these conditions have compelled residents to develop a complex repertoire of coping strategies over time.

Elevation of floors and reinforcement of roofs

At the household level, residents have sought to reduce exposure to recurrent flooding and thermal stress by modifying their homes with limited resources. Many have raised the foundations and floors of their houses to prevent water ingress, while others reinforce walls and roofs with additional layers of wood, zinc, or recycled materials. However, widespread poverty constrains more durable adaptations. As one resident explained, *"Housing adaptation is difficult because of the budget,"* referring to the reliance on low-grade bricks and salvaged materials.

Adoption of low-cost technologies such as "rocket stoves"

Despite these limitations, some residents have developed innovative, low-cost technologies. One example is the *rocket stove*, designed by a local woman named Angela, built from local bricks and recycled parts. These double-combustion stoves require little fuel, produce minimal smoke, and retain heat for up to two days. Installed in community kitchens and schools, they even led to sales outside the neighborhood. Such initiatives reflect the ingenuity and technical knowledge present in the community, though their wider adoption remains limited by cost, lack of resources, and tenure insecurity, which discourages investment in permanent improvements.

Image 5: Housing of Nuevo Alberdi



Source: taken for this research July 2025

Regular cleaning of drainage ditches

At the community scale, collective organizations have been critical in addressing infrastructure challenges. To mitigate flooding, residents have long maintained and expanded drainage systems. Groups organize regular ditch-cleaning campaigns every six months and manually dig new channels to divert water.

Collective emergency responses: coordinated evacuations and communal kitchens

During severe flood events reported to have occurred more than 20 times- residents also employ emergency strategies. Portable pumps are borrowed from local construction workers to drain homes during severe floods. Evacuations are self-organized: tractors and even horses have been used to move families to higher ground. Women coordinate communal kitchens in schools and halls during crises, as one resident recounted: *“For weeks after the flood, we cooked for everyone who lost everything. It was the women who held*

it together". A representative from an external organization underscored the gendered dimension of these dynamics *"In flood response, women's leadership is fundamental. They organize food, clothes, and shelter-everything"*. Also, in the 2007 flood, ex-combatants helped cook for displaced families who remained in shelters for weeks.

Creation of informal water and electricity networks to compensate for lack of services

Water access also relies heavily on collective actions. While some areas have formal connections since 2023 as part of a national upgrading program, much of the settlement depends on tanker deliveries and informal networks. *"On rainy or muddy days, the truck can't enter, and many families are left without water"*, explained one resident. In response, households share water through hoses and buckets, demonstrating solidarity but also exposing themselves to contamination risks, as hoses are often buried or reattached without cleaning. Disputes over access occasionally emerge, especially when assemblies organize collective extensions of water pipes.

Removal of micro-dumps and planting native trees

Road conditions and waste accumulation further constrain resilience. Streets often become impassable after rains, leading residents to lay rubble to improve access, though municipal authorities frequently remove these informal fixes. Waste collection is similarly inadequate: the rural sector depends on a single dumpster, which overflows regularly, forcing families to store garbage indoors. In response, teachers from *La Ética* night secondary school launched a nursery project aimed at reclaiming public spaces by cleaning micro-dumps and planting native trees. Participatory mapping with community members identified dumps along the Ibarlucea Canal and other neglected areas as priorities for restoration.

Limitations due to lack of formal access to services and secure land tenure

External actors¹⁵ broadly recognize both the creativity and the limitations of Nuevo Alberdi's community-led responses. External activists and technical experts highlight residents' capacity to mobilize rapidly maintaining drainage systems, coordinating emergency responses, and building water-sharing networks-as examples of grassroots resilience. They also emphasize the persistence of state inaction: despite decades of advocacy, most government interventions have been short-term, such as distributing water tanks or providing temporary shelters. Two exceptions were noted: the 2008 compensation program¹⁶, which enabled many families to move into brick houses with reinforced roofs, and the *Mi Pieza* program¹⁷, which funded small home improvements to reduce flood and heat exposure.

Still, tenure insecurity remains the principal barrier to adaptation according to the organization Ciudad Futura, municipal officials and urban planners. Before recognition under the National Census of Informal Settlements (RENABAP) - which suspends evictions of informal settlements until 2027- the constant threat of eviction discouraged residents from investing in housing or infrastructure improvements. As one interviewee from Ciudad Futura observed, *“The impossibility of projecting a future without land ownership limits the ability to adapt”*. This insecurity continues to undermine resilience by deterring long-term planning and investment.

Across both cases, housing and infrastructure adaptation emerge as central to daily survival under recurrent climate hazards. Residents employ incremental and improvised strategies, often organized collectively, to withstand floods, fires, and storms. These efforts reflect agency, solidarity, and technical creativity. Yet external actors-NGOs, technical experts, and officials-concur that such strategies cannot substitute comprehensive state intervention. Adaptation, while necessary, remains insufficient in the absence of durable infrastructure, legal tenure, and risk-sensitive urban planning.

4.2 Participatory Planning and Local Knowledge in Strengthening Resilience

This section presents findings on how community organization, local knowledge systems, resource-sharing networks, and mutual aid contribute to resilience in El Esfuerzo (Valparaíso, Chile) and Nuevo Alberdi (Rosario, Argentina). It focuses on how residents organize themselves, mobilize collective capacities, share knowledge, and engage with external actors to strengthen their ability to respond to climate-related challenges.

4.2.1 El Esfuerzo (Valparaíso, Chile)

Formation of *mesas de trabajo* and neighborhood committees

Residents of El Esfuerzo described a relatively structured but unevenly sustained organization. The community is organized through a main committee, supported by delegates for each passage. While the committee formally includes over one hundred members, only about twenty participate regularly in meetings, reflecting the challenges of sustaining consistent engagement. Monthly assemblies, complemented by informal gatherings such as karaoke or bingo nights, serve both as social spaces and venues to strengthen cohesion. To finance small improvements, such as repairing the community hall,

residents also organize fundraising events. According to the president, *“we are doing bingos to repair the community hall; we even expanded the kitchen”*.

According to interviewed residents, leadership in El Esfuerzo is conceived as collective and inclusive, with women, youth, and older adults playing prominent roles in organizing food provision, cleaning, and decision-making. Men tend to take on physically demanding tasks, such as heavy labor during emergency responses. As a female community leader described, *“tasks are divided according to what each person can do-men usually do heavy labor, and women lead the cleaning. But decisions are shared”*. Decision-making is generally coordinated by the committee president, currently a woman, and by mixed-gendered delegates, who work to maintain participation even when engagement declines.

Use of WhatsApp groups for communication and early warnings

Digital communication plays a central role in coordinating community action during emergencies. Each passage maintains a WhatsApp group of approximately fifty families, enabling rapid information sharing about issues ranging from power outages to emergencies. During crises, such as fires or floods, these groups and networks of trust have enabled neighbors to mobilize quickly. One resident recalled: *“Two years ago there was a mudslide and once a fire burned down a house-two children, ages 7 and 9, died. We were deeply marked. During the mudslide in Vista Hermosa, three families couldn’t get out, so we built a small wooden bridge so they could leave. Neighbors organize themselves in moments of urgency”*. Similarly, another resident described, *“a neighbor’s patio flooded, and we all went to help her, digging ditches together”*.

Exchange of construction techniques and risk-reduction practices among residents

Knowledge sharing is both informal and dynamic. Techniques, such as simple roof-reinforcement methods, circulate horizontally among neighbors and are quickly adopted, demonstrating how everyday practices and peer-to-peer learning contribute to adaptive capacity. These exchanges show how community knowledge-rooted in experience rather than formal training-forms an essential part of the settlement’s resilience strategies.

Coordination of mutual aid initiatives such as food distribution, clean-ups, and childcare

Mutual aid is a cornerstone of community survival in El Esfuerzo. During crises, neighbors organize spontaneously to support those most affected. Food baskets are collected and distributed to families in need, and after disasters such as fires or mudslides, collective efforts help families recover. As one resident emphasized, *“When disasters happen, neighbors support each other after the mudslides. After the fire, everyone helped the affected families”*. Such practices, while informal and constrained by chronic resource scarcity, are essential to

coping with recurrent hazards and maintaining social cohesion, yet their very necessity reflects deeper structural neglect and policy gaps.

Alliances with social organizations and municipal actors

Alliances with NGOs and municipal actors play a significant role in strengthening local capacities. Collaboration with TECHO has enhanced organizational structures and provided material resources for small-scale infrastructure projects, such as sidewalks, as well as emergency training opportunities. Monthly *Mesas de Trabajo*¹⁸ institutionalize dialogue and foster collaborative decision-making, anchoring collective initiatives within a broader support network. The OMZ (Municipal Zone Management office) role has been limited to offering technical advice and construction materials.

Limitations due to lack of institutionalized participation and decision-making

From TECHO's perspective, El Esfuerzo exhibits moderate but meaningful levels of organization. They highlight the presence of structured leadership, rapid mobilization during emergencies, and effective communication networks as indicators of resilience. TECHO emphasized the value of local knowledge and knowledge-sharing to strengthen resilience. In one instance, a resident shared a simple roof-reinforcement technique—crossing metal bars—which was quickly adopted by others, illustrating the potential of peer-to-peer learning. Facilitated events are seen as essential to enable this kind of exchange more systematically. One key milestone was the construction of a multi-use community center, which strengthened collective organization and served as a meeting point for communal activities.

However, they also note that participation tends to increase when institutional and external support or resources are available: “*residents tend to participate more when they see there is support or resources coming*”, explained one volunteer. While community initiatives highlight the importance of grassroots' knowledge and organization, they also highlight the persistent absence of formal state involvement in institutionalizing participatory planning. TECHO, based on their work in other informal settlements with ongoing participatory urban planning practices, stressed its key role in enhancing resilience by strengthening social networks, mobilizing local knowledge, and fostering collective action.

The municipality similarly highlights the centrality of community leadership in shaping interventions. “*We don't do anything without consulting their leaders first*”, one official noted, describing a collaborative process in which interventions or support are offered in case of an emergency or to prevent them (such as firebreaks). Although no explicit barriers based on gender, age, or race were reported, bureaucratic requirements—such as documentation for subsidies—can exclude certain groups, particularly migrants.

4.2.2 Nuevo Alberdi (Rosario, Argentina)

This section examines how local knowledge systems, mutual aid networks, and participatory practices contribute to resilience in Nuevo Alberdi, focusing on how community organization, knowledge sharing, and collaboration with external actors strengthen collective capacities. The findings reveal a complex landscape of community action, characterized by informal yet deeply embedded practices that both enable rapid responses to climate hazards and expose structural limitations in rights-based policy interventions.

Local assemblies and neighborhood committees

Regarding community organization, most of the interviewed residents actively participate in the “*Asamblea Popular de Nuevo Alberdi*” (Community Assembly of Nuevo Alberdi), the main space where advocacy strategies and ongoing neighborhood issues are discussed. This long-standing assembly was created in the early years of the settlement as a platform to claim the right to the city and has since remained a central structure for collective action. Its activity fluctuates over time, with participation often intensifying in response to specific events such as severe floods, threats of eviction, or new policy initiatives like the Nuevo Alberdi Socio-Urban Integration Program announced in 2020. Through this space, residents articulate shared demands, coordinate collective responses, and negotiate with state actors, highlighting the assembly’s pivotal role in shaping community priorities and mobilizing action.

Leadership roles of women in organizing networks and driving post-disaster responses: food distribution, clean-ups, and childcare

According to both interviewed residents and external actors, leadership in Nuevo Alberdi is largely conceived as being led by women. Participation in the Assembly is predominantly female: “*In the last meeting, for instance, there were 40 attendees, and only five of them were men,*” shared a teacher from the night school. “*Women make most of the decisions, contact the supply companies, and are responsible for submitting claims to the State. The work during the planning of the urbanization project was driven by women,*” she added. Decision-making within the Assembly takes place through democratic voting, and women actively work to sustain participation even when community engagement declines.

During disasters and previous major floods, interviewees reported that initial State responses involved evacuation sites separated by gender, which meant families were split, and children were placed with their mothers. In contrast, during the most recent major flood, residents decided to self-evacuate to a municipal *galpón*, establishing the first family-based evacuation site in the city. There, men spent as much time as possible working on

the reconstruction of the neighborhood, while women assumed a leading role in organizing care tasks, such as coordinating communal meals (*soup kitchens*), receiving and sorting donations, and taking care of children. *“It was women who made the ‘click’: the State must respond, because the disaster occurred due to the lack of promised infrastructure. They lost everything, once again, because of State inaction,”* recalled one teacher from the night School.

Use of WhatsApp groups and community radio for communication, early warnings and mobilization

When it comes to collective capacities of mobilization, residents consistently emphasize the central role of informal networks in coordinating responses to climate-related emergencies. Everyday communication channels -most notably WhatsApp groups - serve multiple purposes, from coordinating buying and selling to issuing urgent alerts. *“When a house catches fire or there is a flood alert, the message circulates immediately”*, explained a community referent. These networks are crucial for mobilizing rapid collective action: during emergencies, neighbors organize donations of food, clothing, and furniture, while spontaneous leaders -mostly women- step forward to coordinate tasks such as clearing ditches or supporting evacuations.

Collective mobilization and responses have included a range of structured actions before, during, and after flood events. Ahead of the last major flood, residents monitored canal water levels to issue early warnings, organized neighborhood patrols, requested municipal support, and distributed essential supplies such as mattresses and blankets. One community member recalled: *“Before the disaster, a neighbor monitored the canal’s water level and warned when flooding would come; during the flood, we organized patrols, asked the municipality for help, and coordinated resources like mattresses and blankets”*. This capacity for organization and advocacy continued in the aftermath, as residents convened assemblies to demand drainage works and basic services. However, participants also acknowledged that internal political divisions sometimes undermine these efforts: *“Today the neighborhood is highly divided; collective actions often break down because of party rivalries”*, noted one resident.

Younger residents consulted in the night school focus group confirmed the importance of communication tools and community kitchens. While some of them confirmed relying on WhatsApp groups like *“Vecinos en Alerta”* to share urgent information, others perceive little community organization, believing that problems must be solved individually. They cited examples of community engagement, such as soup kitchens that distributed food and clothing during the COVID-19 pandemic, neighborhood squares that hosted markets and cultural events, and small-scale environmental initiatives like weekly plastic collections organized with a recycling cooperative. These efforts, however, remain largely fragmented

and dependent on a handful of committed actors rather than sustained institutional frameworks.

Disaster response training, exchange of construction techniques and risk-reduction practices among residents

Ciudad Futura, a social and political organization working with residents in Nuevo Alberdi since the 2001 crisis¹⁹, emphasized the foundational role of social cohesion and local knowledge in strengthening resilience. Examples included community-led brick and adobe stove production, the incorporation of construction techniques shared by Bolivian migrants, and the establishment of a native plant nursery. One of the most significant initiatives coordinated with residents was the *Programa de Primeros Respondientes* (first respondents' program), which trained over 60 residents in disaster response, enabling rapid evacuations and firefighting during the 2024 wildfires and heatwave. Addressing gender dynamics, Ciudad Futura representative noted that “*strong local leadership, mostly women, allowed these responses to be coordinated effectively*”.

Teachers from La Ética, the neighborhood's night secondary school, echoed this view, stressing that even though much of the community's knowledge is informal and rarely documented, structures such as WhatsApp networks, community kitchens, and schools have been critical in enabling collective action. They also cited initiatives focused on emergency preparedness and recycling, though these remained isolated rather than systemic, emphasizing the need for deeper and sustained institutional engagement.

4.3 Public Policies and Institutional Frameworks in Relation to Community-Led Resilience

This section presents findings on how public policies and institutional frameworks shape resilience in El Esfuerzo (Valparaíso, Chile) and Nuevo Alberdi (Rosario, Argentina), focusing on land tenure, coordination with state actors, and the degree to which informal settlements are included or excluded from urban and climate planning agendas.

4.3.1 El Esfuerzo (Valparaíso, Chile)

Findings for El Esfuerzo highlight how institutional exclusion, fragmented governance, and tenure insecurity constrain adaptation efforts, reinforcing dependence on community action and non-governmental support.

Insecure land tenure as a structural barrier to resilience

Residents and institutions such as TECHO identified persistent structural barriers linked to irregular land tenure and lack of formal recognition. These barriers prevent residents from securing consistent public services and emergency support. As one resident explained, “we have no land titles, no papers that prove this is ours”. Residents of El Esfuerzo described that the community occupies land that is partly public and partly private; under current legislation, it is classified as an “*illegal occupation*”. As a result, the municipality excludes El Esfuerzo from formal improvement programs, and no land titles or ownership documents have been issued to households.

In this context, tenure insecurity has generated widespread fear of eviction, particularly in light of recent removals of other informal settlements in Chile. These barriers also hinder the regularization of basic utilities -such as electricity- despite the community’s willingness to formalize connections and pay for the service. The absence of a drainage system, reliable water infrastructure, and official emergency services compels the settlement to rely primarily on self-organized initiatives and partnerships with non-governmental organizations to implement essential resilience measures.

Absence of engagement by State authorities

From the municipal perspective, no formal urban planning process currently exists for El Esfuerzo, as it is still classified as an informal occupation. The official explained that regularization is a long and complex process: “*as it is a land occupation, there is no street planning; entering into regularization takes years and is difficult.*” Within the OMZ (Municipal Zone Management), follow quarterly plans focused on delivering short-term services rather than infrastructure development. There have been no consultations or formal interventions, participatory planning workshops, or mapping exercises involving residents in decisions about infrastructure, risk management, or climate adaptation. This exclusion extends to local knowledge, which residents feel is systematically disregarded in policy design.

From the residents’ perspective, this lack of systematic engagement reinforces their dependence on NGOs and informal initiatives. Municipal engagement with El Esfuerzo remains limited and largely reactive. Assistance is generally confined to emergency responses such as delivering sandbags or dumpsters during crises, with little to no investment in preventive infrastructure like drainage systems or water networks. Beyond these short-term interventions, the community has expressed a strong willingness to regularize the land and achieve better integration into urban frameworks. Leaders have actively requested support from municipal authorities, especially for vulnerable groups such as the elderly and resident’s dependent on electricity. In some cases, individual leaders have undertaken training, such as first aid courses, to address gaps left by state inaction. As a woman community leader noted, “*if the State won’t come, at least I must be prepared to help*

my neighbors during an emergency". While the OMZ occasionally lends equipment for activities, residents underlined that there is no systematic planning and no formal consultation process through which their priorities can be addressed.

From the perspective of TECHO, one of the primary NGOs working in El Esfuerzo, the state has failed to provide meaningful participatory spaces or mechanisms for community input. The land's eventual transfer to the Ministry of National Assets deepened fears of eviction, and residents have begun navigating bureaucratic pathways such as the Social Household Registry (*Registro Social de Hogares*)²⁰ with TECHO's support through workshops and information sessions to strengthen their legal claims for tenure security. Despite these initiatives, TECHO notes that the opportunities of residents to influence policy remain minimal. Apart from a small-scale veterinary campaign organized by the municipality, residents have had virtually no direct involvement in public programs. Knowledge of municipal climate adaptation plans in the city is scarce, highlighting a profound disconnect between official policies and conditions on the ground. As a staff member observed, *"urban policies exist on paper, but they rarely reach places like El Esfuerzo"*.

Fragmented governance

The governance landscape further illustrates this fragmentation. In terms of governance, TECHO highlighted the reactive and uneven pattern of public engagement. Collaboration exists between the community, TECHO, and municipal actors, as well as with SERVIU (the Housing and Urbanization Service). However, SERVIU has no dedicated representative for El Esfuerzo, and TECHO has often assumed the role of helping residents prepare and submit small-scale project proposals, such as those that secured private financing for lighting and sidewalks.

Overall, both TECHO and municipal representatives identify weak coordination among agencies as the main obstacle to sustainable resilience planning. TECHO concluded that there is little coordination between housing and environmental authorities and almost no integration of climate adaptation into local planning for informal settlements like El Esfuerzo. As one interviewee put it, *"better outcomes will only come if roles are clear, agencies coordinate, and residents sit at the table where decisions are made."*

Finally, the municipal official pointed to attempts to build public-private collaboration: *"the private sector has more resources and fewer limitations, so the aim is to work together—doing with them what the municipality cannot finance."* However, coordination among government agencies, NGOs, and communities remains weak, and the lack of institutional integration continues to undermine long-term resilience planning.

4.3.2 Nuevo Alberdi (Rosario, Argentina)

Findings for Nuevo Alberdi focus on how urban policies and institutional frameworks shape resilience, particularly through community inclusion, governance coordination, and integration of local knowledge in planning and implementation. The section also assesses the limits of participatory processes in a context where infrastructure improvements have been uneven and often disconnected from broader adaptation goals.

Insecure land tenure as a structural barrier to resilience

Community leaders consistently emphasized the gap between formal recognition and meaningful integration into urban policy. Although the neighborhood's inclusion in the RENABAP²¹ census granted residents housing ownership certificates, most households continue to rely on informal water and electricity connections.²² Attempts to secure legal meters or infrastructure upgrades have largely failed, leaving residents excluded from official planning processes. As one leader explained, *"most homes still have informal electricity and water connections, and advocacy efforts to get legal meters or improved infrastructure have not been successful, even though companies are legally required to install them once residents present their RENABAP housing certificates"*. Residents described a pattern of institutional engagement marked by superficial political visits and fragmented consultation: *"institutions show up mostly during elections, and assemblies lack continuity."* Such dynamics illustrate a structural disconnect between state interventions and the community's lived reality.

Participatory practices to influence urban policy: community census, co-design workshops, territorial brigades, and women and youth engagement

The team from the IGC²³ described a range of participatory practices developed as part of the Nuevo Alberdi Socio-Urban Integration Program initiated in 2020, a national initiative led by the National Secretariat for Social and Urban Integration (SISU) to urbanize informal settlements.²⁴ Workshops of 10–20 participants, supported by block-level representatives (*manzaneros/as*) and *duplas territoriales*²⁵ working alongside the organization Ciudad Futura, enabled residents to engage with project planning and implementation.

Participation was treated as integral rather than supplementary. Workshops generated tangible products such as maps and technical plans that directly informed the urbanization agenda. Community kitchens (*comedores*) and neighborhood food distribution spaces (*merenderos*) were used as critical entry points to engage residents, and discussions consistently prioritized flooding as the most pressing hazard. Although climate change was not explicitly discussed in policy terms, related issues such as heat, water scarcity, and the absence of urban vegetation emerged indirectly. Complementary initiatives, such as high-efficiency adobe stoves developed with INTI, aimed to improve household energy use. The IGC also facilitated programs with gender and youth focus, such as *Las mujeres urbanizan*

Nuevo Alberdi (women urbanize *Nuevo Alberdi*) placed women at the center of planning processes, while co-design workshops with children and young people shaped the design of public spaces.

Innovative communication tools also supported these processes: the weekly community radio program “*Aquí y ahora en Nuevo Alberdi*”²⁶ became a key platform for information sharing and local participation, while a large contact database from the census conducted for the urbanization program facilitated targeted messaging and follow-up. As one facilitator explained, “*After each activity, summaries were returned to participants, and decisions like furniture or paving types were made through micro-input rounds*”. These practices connected local knowledge with planning processes, while brigades originally formed for public works evolved into informal early-warning networks.

The social and political organization Ciudad Futura identified *Nuevo Alberdi* as a pioneering case of participatory and binding planning. Through the *Nuevo Alberdi Socio-Urban Integration Program* launched in 2020 (currently defunded and suspended), a census-based participatory mapping exercise identified 20 neighborhood priorities ranging from potable water access to public spaces. “*The community tells the State what needs to be done,*” explained one representative, underscoring how participatory planning shaped tangible outcomes.

Teachers from the local night school, La Ética, also recalled their involvement in the participatory planning process, where residents envisioned an urbanized neighborhood through participatory mapping. Top priorities included water access and recreational spaces. Outcomes, however, were uneven: “*in the urban zone, more water boxes were installed than planned, but in the rural zone connections never arrived because of the defunding and discontinuity of the national urbanization program*”. Perceptions among younger residents reveal a more limited awareness of these participatory processes. While they remembered the installation of water infrastructure, they did not recall earlier participatory mapping exercises, and their evaluation of project outcomes was mixed: “*the water connections created problems for some neighbors, and they had to solve them later*”. These perspectives highlight both communication gaps and uneven experiences of state-led infrastructure improvements.

Image 6 and 7: Territorial team during census and a workshop of Women Urbanize Nuevo Alberdi



Source: IGC page web

Municipal officials highlighted the role of institutional partnerships in supporting local resilience, pointing to workshops held in community institutions as key spaces for building networks and sharing knowledge. Initiatives like *Las mujeres urbanizan Nuevo Alberdi* (women urbanize Nuevo Alberdi) were cited as examples of efforts to ensure the participation of women and other marginalized groups in decision-making processes.

Participatory practices to improve policy implementation and efficiency: *Patrulla de Control Popular de Obras*

During the installation of portable water connections, a key example of participatory implementation emerged when neighbors from the *Asamblea Popular de Nuevo Alberdi*²⁷ organized the *Patrulla de Control Popular de Obras* (Community Oversight Patrol for Infrastructure Works) to assist construction workers and monitor progress. Their involvement improved efficiency and reduced costs, enabling more households to access the service. As one participant recalled, “*our active engagement made the difference-the work was done in less time and less budget was used, resulting in more houses being able to be connected*”. This shows how the effective involvement of residents in the implementation of an urbanization project can significantly increase the efficiency of a policy.

Fragmented governance

The Instituto de Gestión Comunitaria (IGC) emphasized that governance fragmentation - marked by poor coordination among municipal departments, state departments, social and political organizations, and neighborhood groups- has constrained the integration of energy poverty and climate adaptation into the broader urbanization process. Ciudad Futura also highlighted enduring governance obstacles: institutional resistance to community leadership and fragmented coordination continue to limit the scope of participatory planning. They argued that “*none of this is possible without popular leadership*”. They

recommended policy reforms grounded in socio-urban integration laws that guarantee land tenure and empower community agencies.

According to teachers from the local school, the regulatory framework is adequate in principle but lacks enforcement and sustained funding, which undermines the long-term effectiveness of planning efforts. Teachers concluded that while the community's involvement was genuine, the absence of coordinated action among local actors has repeatedly undermined long-term results. Despite successful mobilization of diverse community members, many initiatives faced discontinuity after national funding cuts following the 2022 elections, leading to frustration and weakened momentum.

The consulted municipal official also pointed to examples where community input shaped policy, such as improvements to two flood-prone alleys and efforts to eliminate illegal dumping sites. However, they acknowledged that coordination between municipal agencies, social and political organizations, and grassroots organizations remains inconsistent and "*politicized*", often characterized by overlapping responsibilities and competing agendas. Overall, these governance challenges - combined with limited enforcement capacity - have curtailed the transformative potential of participatory urban policy in Nuevo Alberdi.

4.4 Policy Recommendations for Equitable and Inclusive Climate Adaptation

This section integrates insights from residents, community leaders, NGOs, and municipal authorities to propose lessons and policy recommendations for advancing equitable and inclusive climate adaptation.

4.4.1 El Esfuerzo (Valparaíso, Chile)

Guaranteeing secure land tenure to support long-term adaptation and the right to access basic services

In El Esfuerzo findings highlight the centrality of rights-based approaches, structural reforms, and meaningful community participation as prerequisites for sustainable resilience. Residents consistently emphasized that their primary demand is not assistance framed as charity, but recognition of their rights as urban citizens - specifically, access to formal services and infrastructure, and to be assisted when climatic disasters occur. As one leader put it, "*we don't want things for free - we want the right to pay for electricity, water, and services, and not be abandoned or discriminated against because of our informal status*". This demand reflects deeper frustrations with structural neglect. Several residents cited the

example of a fire eight years ago, after which some families who lost their homes never received any housing support. For residents, these examples underscore the urgent need for policies that address communities through a framework of dignity and rights.

TECHO's policy recommendations focus on recognizing and upgrading existing settlements rather than relocating them, arguing that governments must "*work with communities for the socio urban integration of camps rather than enforcing evictions or offering inadequate temporary housing*". This shift requires investment in structural solutions and the removal of bureaucratic obstacles that hinder residents from accessing basic rights or influencing decision-making processes. Crucially, it also requires a transformation in institutional mindsets - from viewing informal settlements as problems to be eradicated, to understanding them as integral parts of the urban fabric that must be incorporated into planning and adaptation strategies.

TECHO also highlighted the need for systemic conditions to support long-term resilience. These include stable funding streams and secure land tenure, supported by clear institutional mandates and cross-sector coordination. As one interviewee summarized, "*external actors must stop seeing settlements as temporary. Integration, not eviction, is the path forward*". Achieving this vision requires transparent coordination among communities, governments, NGOs, and donors, ensuring that residents are not merely beneficiaries but active partners in designing resilient and equitable urban futures.

Institutionalizing participatory planning, scaling up community-driven adaptation initiatives and co-decision in policy implementation processes

At the same time, leaders acknowledged the internal barriers that hinder collective action. Participation in community meetings rarely exceeds 25 people, although they estimate that broader engagement - around 150 participants - would significantly strengthen their capacity to influence decision-making. As one community member observed, "*unity and solidarity are essential. Helping others without expecting anything in return is the core value of resilience.*" These shared values underpin many local initiatives (as seen in sections on Objectives 1 and 2) and illustrate how incremental problem-solving - from repairing a leaking window to replacing a damaged roof - generates collective learning processes.

To address these issues, they called for authorities to recognize and support community-led initiatives, facilitate legal access to electricity, improve institutional coordination with representatives of informal settlements, and make successful local practices more visible to inspire broader engagement. Solidarity, community leadership, and partnerships with NGOs such as TECHO were identified as key success factors. Residents stressed that "*everyone must row in the same direction*", emphasizing unity and responsibility as the basis for sustaining collective action.

The municipal perspective reinforced some of these conclusions. Officials described El Esfuerzo's strong community cohesion as a distinctive asset that should be leveraged in future planning. "*Normally neighborhoods are not so united or so committed to the common good, but in this case, they are*", the municipal representative observed. Looking ahead, municipal actors vision a more participatory model of decision-making in which communities articulate their priorities and professionals provide technical guidance to ensure feasibility and prevent conflicts. "*The community must have the final word about what they want*", one official concluded, "*but with professionals guiding the process so that there are no problems later on*".

From TECHO's perspective, many of the seeds for scalable adaptation are already present within informal settlements. These include training workshops on the Social Household Registry, the construction of shared infrastructure like the two-story community center and plans to repurpose shipping containers as a community health facility. "*Information sharing within camps is powerful and often underutilized*". "*When neighbors share solutions, adaptation capacity improves*". stakeholders emphasized the need to formalize inclusive participation and embed gender-responsive approaches that address differentiated vulnerabilities within communities. As a TECHO staff member noted: "*Better progress happens when communities have strong and sustained internal organizations*".

Embedding rights, redistribution, and recognition into adaptation policies to address systemic vulnerabilities

At the same time, Municipal officials stressed the need for broader governance and regulatory reforms, particularly in the environmental domain. "*In Chile, environmental regularization is left to the market rather than environmental care*", the official argued, pointing to the damage caused by unchecked private development. More proactive urban planning - rather than reactive responses to housing demand - is necessary to close the adaptation gap. Currently, municipal planning instruments apply only to regularized areas, leaving settlements like El Esfuerzo systematically excluded from policy frameworks.

4.4.2 Nuevo Alberdi (Rosario, Argentina)

Findings from Nuevo Alberdi highlight lessons and policy recommendations for advancing equitable, rights-based climate adaptation, drawing on the lived experiences of residents, community leaders, educators, municipal officials, and external organizations.

Guaranteeing secure land tenure to support long-term adaptation and the right to access basic services

Community priorities remain centered on tenure security - "*we can't live like this, being afraid of eviction of the homes we've been building for years*"-, basic services and infrastructure,

including drainage systems, street lighting, safe access to water and electricity, and fairer distribution of aid-alongside more consistent follow-up by state agencies. External actors like Ciudad Futura highlighted land tenure security as the single most important precondition for adaptation. They stated that *“The threat of eviction discourages investment in safer housing and long-term planning”*. They advocated for full and sustained implementation of RENABAP and the Law of Socio-Urban Integration to guarantee tenure and prevent forced evictions.

Youth voices also articulated resilience priorities in particular concrete terms: *“Water, light, and proper drainage”*. Their critiques focused on the superficial engagement of political actors- *“authorities should visit the neighborhood not just during election time”*-and called for deeper integration of community voices. Their demands include infrastructure and extend to essential social services such as secondary education, healthcare, recreational spaces, and reliable public transport; for them, resilience must be understood as inseparable from the fulfillment of basic rights. For young residents, resilience is inseparable from the fulfillment of basic rights.

Institutionalizing participatory planning, knowledge sharing and co-decision in policy implementation processes

Residents repeatedly emphasized that future adaptation policies must strengthen-not replace-grassroots organization. Central to this is recognizing and funding community-led diagnostics, planning, and coordination mechanisms. One community leader summarized this approach succinctly: *“You need to be patient and organize among neighbors. There’s always someone who can help. Don’t wait for politicians. Less talk and more action”*. Such perspectives reflect a consistent demand for autonomy and agency in shaping adaptation strategies.

Participation, Ciudad Futura argued, must be genuine and binding: *“The key to participation is at the moment of assigning priorities-the community has to lead, and the State has to follow”*. They recommended institutionalizing mechanisms such as assemblies, participatory mapping, and collaborative planning as core components of adaptation policy, formally recognizing grassroots organizations like the *Asamblea Popular de Nuevo Alberdi* as co-governance partners. Also, resident-led monitoring of urbanization projects, as occurred with the *Patrulla Popular de Obras*, has proven to deliver better outcomes in terms of scope and efficiency.

Educators from La Ética emphasized the need for genuine and empowering consultation processes, observing that *“communities are not used to being heard”*. They identified environmental priorities such as protecting the river, improving waste management, and expanding public spaces through plazas and nurseries. Education emerged as a

transformative policy tool and as a teacher expressed: *“A school in the territory is very important-schools act as a light and bring order”*. They advocated decentralizing EMPAs (adult secondary schools) to improve access and positioning schools as hubs for participatory planning and civic engagement. They also called for a more open approach by external actors: *“Anything related to the neighborhood must be done with the neighbors. External actors shouldn’t be afraid of complaints-they can be opportunities for connection”*. Building equitable resilience, in their view, requires respecting community agency, embedding participation in every stage of planning, and ensuring continuity of state support.

Municipal representatives shared a similar perspective, emphasizing that community participation is indispensable, and that top-down measures are insufficient. Permanent working groups were cited as effective mechanisms for fostering local engagement and continuity. Education again featured prominently: residents must understand their rights to demand them effectively. Finally, the consulted official stressed that environmental and social considerations must remain central to policy agendas, even during periods of crisis: *“Every policy should incorporate an environmental perspective, as vulnerable populations are disproportionately affected”*.

Scaling up successful community-driven adaptation practices

Innovations already emerging from within the settlement also provide scalable models for policy design around resilience. Locally developed rocket stoves were cited as effective, low-cost solutions to energy poverty, although their adoption remains limited. Cooperative efforts—such as the proposed brickmakers’ cooperative—illustrate the potential of community-driven economic strategies, though repeated attempts have failed due to misinformation and insufficient institutional support. Ciudad Futura also urged policymakers to scale up successful community-driven innovations, including low-emission stoves, elevated housing prototypes, native tree nurseries, and brigades of first responders. These examples highlight the importance of pairing community initiatives with state facilitation, capacity-building, and technical assistance.

Multi-level coordination, transparent governance, and integration of large-scale and agile initiatives with sustained funding beyond political cycles

Unity and collective action were consistently identified as fundamental to effective adaptation. *“Union is fundamental - ignore party, religion, or class divides; act together”*, a community referent stated, linking past infrastructure achievements — such as bridge construction and improved drainage — to moments of collective cohesion. Today, however, fragmentation and discontinuity are perceived as major barriers to progress, undermining the community’s capacity for coordinated action.

Several long-term infrastructure proposals - including upstream hydraulic works, the creation of a floodable park along the Ibarlucea Canal to retain stormwater, and housing adapted to higher elevations - remain largely unrealized, contingent on sustained political commitment and financial investment.

Institutional actors echoed these priorities, underscoring continuity as a critical enabling condition for resilience. “*Discontinuity erodes trust and pushes back progress*”, explained members of the IGC team, who emphasized the importance of maintaining long-term participatory spaces such as the *Casa de la Urbanización* and balancing governance responsibilities among municipalities, community organizations, and national agencies. From their perspective, macro-level enablers – including stable procurement systems and macroeconomic consistency – are essential to sustaining adaptation programs.

Finally, large-scale, multi-stakeholder initiatives should be complemented by smaller, more agile projects such as *Mi Pieza*, which demonstrated faster delivery of housing improvements. This combination of continuity, coordination, and flexibility was viewed by residents and institutions alike as key to advancing equitable and durable adaptation.

Recognition of care work and women’s leadership in community organization and disaster response

Consulted stakeholders consistently highlighted the central role of women in sustaining community organization and coordinating responses during disasters. Their leadership in organizing food provision, childcare, and recovery initiatives was described as the backbone of collective resilience. Participants from civil society organizations and local institutions agreed that care work functions as a form of social infrastructure that enables communities to recover and adapt yet remains largely invisible within institutional frameworks. They highlighted the need to move beyond viewing care as a private responsibility, recognizing it instead as a collective and public dimension of resilience that warrants institutional support. Integrating these contributions into adaptation and disaster management policies was considered essential to strengthen community capacities and ensure that resilience strategies reflect the realities of those most actively sustaining community life.

Across all perspectives, a shared conclusion emerges that equitable resilience cannot be delivered to communities; it must be built with them. This requires recognizing and institutionalizing community agencies, ensuring continuity in state programs, guaranteeing secure land tenure, and scaling up grassroots innovations. It also demands a fundamental shift in policy paradigms—from short-term, top-down interventions to collaborative, long-term frameworks that integrate community knowledge, priorities, and leadership into the core of climate adaptation and urban development strategies.

5. Discussion and Implications

The findings from Nuevo Alberdi in Rosario and El Esfuerzo in Valparaíso demonstrate that climate adaptation in informal settlements is not a question of discrete interventions or technical capacities, but a profoundly political and contested process that unfolds at the intersection of state practice, market logics, social organization, and urban citizenship. These cases confirm that resilience must be approached not as a neutral descriptor of communities' coping abilities, but as a socially produced condition embedded in broader political economies, governance structures, and struggles over rights and space (Pelling, 2011; MacKinnon & Derickson, 2013; Davoudi, 2012). By placing political economy, governance of informality, the right to the city, and feminist perspectives on care and agency into dialogue, the findings offer an alternative reading of adaptation and resilience one that foregrounds structural constraints, reveals the limits of community-led action, and illuminates the conditions under which resilience might become transformative.

5.1 Adaptation as Situated Practice: Housing and Infrastructure Strategies

The evidence from Nuevo Alberdi and El Esfuerzo demonstrates that adaptation in informal settlements is not reducible to technical interventions or isolated coping mechanisms. Rather, it is a deeply situated process shaped by entrenched inequalities, institutional decisions, and spatial marginalization - a process that unfolds within, and is constrained by, broader political economies and urban governance structures (Pelling, 2011; Davoudi, 2012; MacKinnon & Derickson, 2013). Resilience in this context emerges as a social condition, embedded in material, legal, and political realities, rather than as a neutral capacity to withstand hazards.

Both cases reveal how residents mobilize a wide repertoire of incremental and resource-constrained strategies to mitigate the effects of recurrent hazards, including floods, fires, landslides, and thermal extremes. These practices - ranging from household-level interventions to collective infrastructure solutions - represent what Adger (2006) terms "*everyday adaptation*": locally devised, context-specific responses that compensate for the absence of formal provision. In Nuevo Alberdi, repeated flooding compels residents to elevate floors and foundations, reinforce walls and roofs with layered materials, and

collectively dig drainage channels to divert water away from homes. In El Esfuerzo, residents adapt to wildfire and erosion risks by replacing flammable materials, reinforcing roofs against strong winds, and raising structures to reduce flood exposure. Such strategies reduce immediate vulnerability and improve habitability, yet they remain bound by structural constraints - especially tenure insecurity, infrastructural exclusion, and governance fragmentation.

These dynamics reflect the structural displacement of responsibility from state institutions onto vulnerable populations. In the absence of formal drainage systems, reliable water networks, or secure electricity provision, residents must assume responsibility for risk management, often at significant cost and personal risk. The self-organization of informal electricity connections in El Esfuerzo after utilities refused to extend services without proof of ownership illustrates Simone's (2004) concept of "*people as infrastructure*," in which urban populations themselves become the providers of essential services. These efforts, however, are both precarious and partial: they address symptoms without altering the structural conditions that generate vulnerability.

The persistence of this "*adaptation deficit*" (Adger, 2006) - the gap between short-term coping measures and the systemic interventions required for long-term risk reduction - is a recurring pattern. In Nuevo Alberdi, municipal compensation following the 2007 floods provided temporary relief but was not followed by the promised drainage works, leaving exposure unchanged. The subsequent suspension of urbanization programs following political turnover highlights how adaptation efforts remain vulnerable to shifts in fiscal and political priorities. As Swyngedouw (2009) argues, neoliberal restructuring - characterized by fiscal austerity and state retrenchment - undermines the continuity of adaptation policies, subordinating infrastructure provision to short-term political logics and thereby reproducing structural vulnerability.

Spatial dynamics compound these challenges. Both settlements occupy marginal, hazardous land - floodplains, unstable slopes, and fire-prone areas - where formal development is absent and regulatory oversight minimal. Such "*geographies of vulnerability*" (Roy, 2005; Huchzermeyer, 2004) are not accidental; they are the spatial outcomes of planning regimes and land markets that systematically exclude low-income populations from safe and serviced urban areas. Within these structural confines, even the most innovative community-led adaptations - such as the locally designed "*rocket stoves*" in Nuevo Alberdi, which improve energy efficiency and generate income - struggle to scale in the absence of secure tenure, financial resources, and institutional support.

Thus, while community strategies demonstrate remarkable agency and ingenuity, they also reveal the limits of adaptation under conditions of structural constraint. The result is a paradox: adaptation occurs, but it does so within and against the grain of systemic

exclusion. Without legal recognition, infrastructure investment, and coordinated state intervention, such efforts will remain fragmented and insufficient, unable to address the root causes of vulnerability that shape exposure and risk in the first place.

5.2 Knowledge, Organization, and Collective Capacities

If material interventions represent one dimension of adaptation, social organization and knowledge of production constitute another. The findings underscore that resilience in informal settlements is as much a product of social and political practices as it is of physical infrastructure. Adaptation emerges through networks of care, mutual support, and collective governance - practices that both reflect and reinforce theoretical understandings of resilience as a socially produced condition (Davoudi, 2012; MacKinnon & Derickson, 2013).

Across both sites, local knowledge forms the backbone of adaptive capacity. Residents lived experience of environmental dynamics - from flood behavior to wildfire spread - informs decision-making and guides everyday practices. This knowledge is shared, refined, and institutionalized through informal infrastructures, such as neighborhood assemblies, WhatsApp groups that operate as early-warning systems, and peer-to-peer learning exchanges. These networks represent what Satterthwaite et al. (2020) describe as “*knowledge infrastructures*”: dynamic systems of observation, communication, and co-learning that enable communities to anticipate, respond to, and recover from climatic events. They also illustrate how adaptation knowledge is not a static, external input, but an evolving process rooted in lived realities.

Collective organization amplifies the capacity to act on this knowledge. In Nuevo Alberdi, the *Asamblea Popular* functions as a political and organizational hub, enabling residents to deliberate on priorities, negotiate with state institutions, and articulate demands for rights and services. This aligns with Lefebvre’s (1968) and Harvey’s (2008) conception of the “*right to the city*” as not merely a right of access but a right to participate in the production of urban space. Through such spaces, adaptation becomes a vehicle for politicizing vulnerability and transforming it into collective claims on the state.

These dynamics are deeply gendered. Women play central roles in coordinating emergency responses, managing care networks during floods, leading negotiations with authorities, and sustaining community cohesion. These practices reflect feminist analyses of urban resilience, which emphasize reproductive labor as a critical but often invisible dimension of adaptive capacity (Falú, 2013; Castañeda, 2024). However, reliance on

unpaid female labor exposes a structural contradiction: while women's leadership expands collective agency and redefines citizenship from below, it also risks entrenching gendered inequities if care responsibilities are not redistributed and supported through public services (Roitman, 2023).

Community organizations also produce what Holston (2009) calls "*insurgent citizenship*": alternative forms of governance that challenge exclusionary urban orders. In El Esfuerzo, passage committees, monthly assemblies, and social fundraising initiatives - predominantly led by women - form a grassroots governance infrastructure that sustains adaptive capacity. Yet, as Purcell (2003) cautions, such practices cannot realize the right to the city without structural change. They can mitigate vulnerability and mobilize claims, but without secure tenure, infrastructure, and legal recognition, they remain confined within the boundaries of informality.

The transformative potential of these capacities ultimately depends on institutional recognition and integration. Without mechanisms to translate local knowledge into policy or embed collective practices into statutory planning, community agency risks being instrumentalized - valued for its efficiency but stripped of its political content (Bulkeley et al., 2013). Resilience, then, is contingent not only on what communities do but also on how state institutions respond.

5.3 Urban Governance, Planning and Inclusion

The governance landscape fundamentally shapes the trajectories of adaptation in informal settlements. Whether adaptation remains reactive and fragmented or evolves into a transformative process depends on how states recognize, engage with, and institutionalize the claims of informal residents within planning and policy frameworks. Across both cases, the tension between enabling approaches and rights-based governance emerges as a decisive factor.

In Rosario, the introduction of the Socio-Urban Integration Program in 2020 marked a significant shift towards a rights-based framework. Grounded in Law 27.453 and the RENABAP initiative, this program framed tenure regularization, service provision, and infrastructure investment as legal obligations rather than discretionary policies. Participatory mapping exercises, community oversight brigades, and co-design workshops materially improved implementation outcomes - shortening project timelines and expanding service coverage - and demonstrated how institutionalized participation can enhance the efficiency and legitimacy of public action. Yet these gains proved vulnerable to political volatility: the suspension of national funding following a change of government

disrupted project continuity and eroded the policy relevance of community-generated knowledge, illustrating the fragility of adaptation gains when institutional commitments are not insulated from political cycles.

In Valparaíso, governance practices were more selective and fragmented. Municipal authorities recognized community representatives and provided limited forms of support - such as brush clearing or emergency water delivery - but consistently invoked legal ambiguities and budgetary constraints to justify the exclusion of El Esfuerzo from essential services, tenure regularization, and urban planning. This reflects what MacKinnon and Derickson (2013) term the “*enabling trap*”: a governance mode that celebrates community participation while leaving structural inequalities intact. The result is a paradoxical policy environment in which strong community organizations coexist with persistent vulnerability.

Land tenure remains a pivotal axis of this governance landscape. The absence of legal recognition excludes residents from formal service provision, deters household investment, and perpetuates cycles of exclusion (Payne et al., 2009; Fernandes, 2011). Temporary protections under RENABAP mitigated eviction threats in Nuevo Alberdi and enabled more ambitious adaptation initiatives, but as an interviewee explained, “*the impossibility of projecting a future without land ownership limits the ability to adapt*”. This captures the structural paralysis produced by legal precarity and underscores the need to treat tenure security as both a developmental right and a precondition for adaptive capacity (Satterthwaite et al., 2020).

Alliances between communities, social movements, and external organizations have proven instrumental in scaling grassroots initiatives into policy-relevant proposals. In Rosario, collaborations with Ciudad Futura and the Instituto de Gestión de Ciudades enabled the co-design of drainage systems, public space upgrades, and housing improvements submitted to municipal and national authorities. In El Esfuerzo, TECHO supported residents in drafting infrastructure proposals and navigating bureaucratic procedures. Yet these efforts reveal another limitation: without formal mechanisms to translate community proposals into binding commitments, adaptation remains a collection of discrete projects rather than a coherent urban strategy.

Ultimately, governance shapes adaptation not just by enabling or constraining specific initiatives but by defining the terms of urban citizenship itself. Resilience depends on whether informal settlements are recognized as legitimate components of the city and whether their claims to services, infrastructure, and participation are institutionalized within planning regimes. Enabling participation without redistribution or rights simply reproduces existing hierarchies; integrating informal settlements into statutory planning,

with secure tenure, guaranteed services, and sustained resource allocation, is what allows adaptation to become transformative.

5.4 Policy Analysis and Institutional Arrangements for Equitable Resilience

If governance defines the structural boundaries of adaptation, then public policy must work to reconfigure those boundaries. The findings show that equitable resilience cannot emerge from community ingenuity alone; it requires a state capable of redistributing resources, enforcing rights, and institutionalizing participatory processes within long-term, legally grounded frameworks (Pelling, 2011; Rolnik, 2019; Satterthwaite et al., 2020).

Tenure security is the foundation upon which all other adaptation measures rest. Legal recognition incentivizes household investment, facilitates infrastructure provision, and anchors community claims within planning processes (Payne et al., 2009; Fernandes, 2011). Measures such as RENABAP provide important protection but must evolve into permanent legal frameworks that guarantee ownership, prevent eviction, and integrate settlements into official city boundaries. Regulatory reforms are essential to dismantle exclusionary planning regimes that leave informal settlements beyond the reach of urban services.

Institutional design must also address the temporal dimension of adaptation. The suspension of Rosario's urbanization program illustrates how participatory initiatives are vulnerable to political cycles. Embedding adaptation mandates in law, statutory planning, and budgetary allocations can safeguard continuity and allow co-production to evolve from service delivery into a mechanism for reshaping governance relationships. Co-implementation and resident oversight - such as those observed in Rosario's water infrastructure projects - demonstrate how institutionalized participation enhances policy effectiveness, provided it is supported by stable financing and legal guarantees.

Housing quality is another critical axis of adaptive policy in informal settlements. Sustainable housing directly influences environmental performance, social equity, and economic opportunity (Ingrao et al., 2018). Programs such as *Mi Pieza* - which provides state funding for home improvements in informal settlements - illustrate how targeted interventions can reduce exposure and improve well-being, but their transformative potential depends on addressing structural constraints such as eviction risks and discriminatory planning (UN-Habitat, 2018; Satterthwaite et al., 2020). Housing upgrades

must therefore be embedded within broader state-led strategies that include secure tenure, guaranteed services, and integration into long-term urban planning.

Finally, consistent with the conceptualization of equitable resilience adopted in this research, the cases indicate that resilience in informal settlements is inseparable from the rights-based integration of those settlements into the city. Community-driven practices—mapping, oversight brigades, radio, assemblies—are powerful engines of knowledge and coordination. But their transformative potential depends on a state that not only “enables” but also redistributes and reconfigures securing tenure; investing in risk-sensitive, durable infrastructure; and incorporating community decision-making into the legal-bureaucratic machinery of urban policy. When these pieces align, the evidence suggests that adaptation can move beyond coping toward trajectories that reduce structural vulnerability and expand urban citizenship in practice (pp. 20, 22, 30, 35).

As Howard et al. (2025, p. 4) argue, transformative adaptation requires secure tenure, equitable governance structures, context-specific data, and integrated responses to the structural drivers of risk. This study builds on insight by defining equitable resilience not as a descriptive label but as a relational configuration in which (i) participatory co-production is institutionally embedded, (ii) rights are realized through secure tenure and networked services, and (iii) multi-year financing is insulated from electoral cycles. Under these conditions - as illustrated by the completed water infrastructure in Rosario - community practices can evolve from reactive coping to path-shaping adaptation. In their absence - evident in halted urbanization plans and prevention efforts that lack essential services - adaptation remains structurally constrained.

6. Conclusion

This research report examined how communities in two Latin American informal settlements - El Esfuerzo in Valparaíso and Nuevo Alberdi in Rosario - respond to climate-related hazards and systemic vulnerabilities through locally driven strategies of adaptation, organization, and advocacy. By analyzing these processes through the combined lenses of critical urban studies, political economy, and the “*right to the city*”, the research contributes to a growing body of scholarship that views resilience not merely as a set of adaptive capacities but as a socio-political process embedded within structures of inequality.

The study opened by situating the research within debates on resilience, inequality, and informality, framing the study’s contribution as an exploration of adaptation as a socio-political process shaped by power, rights, and governance. The literature review built the

conceptual foundations for this approach, examining how dominant resilience frameworks obscure structural drivers of vulnerability and highlighting critical perspectives that reorient the discussion toward equity and participation. The methodology section detailed the qualitative, comparative design and justified the case selection, demonstrating how interviews, focus groups, participatory mapping, and observation captured the complexity of adaptation dynamics in two contrasting contexts. The results presented evidence on material adaptations, collective strategies, and social networks, as well as the institutional and policy conditions that enable or constrain them, leading to a set of grounded policy recommendations. Finally, the discussion connected these findings to wider theoretical debates, underscoring the need for approaches that link community agencies with institutional change in order to move beyond coping responses and toward more durable, inclusive forms of resilience.

Through both case studies, adaptation emerged as agency exercised under structural constraint. Findings show that residents develop a range of material and social strategies - from incremental housing improvements and risk-reduction infrastructures to mutual aid networks and participatory governance mechanisms - that both mitigate immediate risks and challenge the exclusions that shape their vulnerability. However, these initiatives remain profoundly shaped by external conditions: precarious tenure, fragmented governance, and inconsistent policy frameworks often undermine their potential, while institutional continuity, participatory decision-making, and recognition of community agencies enhance their transformative capacity.

The report makes three key contributions. First, it demonstrates the analytical value of situating community-led adaptation within broader political and economic structures, revealing how neoliberal governance and uneven urban development constrain resilience. Second, it shows how social networks, gendered forms of leadership, and collective organization function as critical infrastructures of resilience, extending the concept beyond its technical and ecological dimensions. Third, it highlights the role of policy design and state accountability as enabling or disabling conditions, pointing to the necessity of multi-scalar approaches that integrate grassroots action with structural reform

Future research could deepen these findings by examining a broader range of political and institutional contexts in informal settlements and by analyzing how tenure reforms, financing mechanisms, and participatory governance arrangements influence adaptation over time. For policymakers and practitioners, the results point to the need to move beyond short-term, reactive responses toward approaches that acknowledge informal settlements as integral parts of the urban fabric and as critical arenas where adaptation efforts must engage with existing practices, address and transform structural constraints, and support long-term resilience processes. Equitable resilience is thus not a descriptive

label but a relational configuration that links local knowledge and collective agency with rights-based inclusion in urban policy - an approach that demands stable, redistributive, and accountable institutions, embedded in development models capable of transforming the socio-spatial conditions that produce vulnerability in the first place.

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Appendix 1 - Country and Community Profiles

El Esfuerzo (Valparaíso, Chile)

a) Chile's Climatic Profile

Latin America is one of the regions most exposed to the impacts of climate change, frequently experiencing climate- and water-related disasters (UNDRR, 2023). This vulnerability is compounded by deep-rooted social and economic inequalities, making informal urban settlements particularly susceptible to climate-related risks (UNDRR, 2023; IADB, 2022).

Chile ranks 29th out of 181 countries in terms of vulnerability to climate change, according to the ND-GAIN Index (2020). Located along the Pacific Ring of Fire, the country is subject to frequent geological events such as earthquakes, volcanic eruptions, and tsunamis (World Bank Group, 2021). These natural threats are increasingly intensified by climate change, which is expected to raise the frequency and severity of wildfires, floods, and landslides (idem).

Chile's geography encompasses a vast latitudinal range, which results in significant climatic diversity²⁸. The case study of this report belongs to the Csb category, is in the central zone, and it experiences a Mediterranean-type climate characterized by warm, dry summers and cool, wet winters where annual precipitation averages around 700 mm (Pizarro, 2012). This climatic regime is shaped by the influence of the Pacific Ocean, the Andes, and seasonal shifts in atmospheric circulation patterns (World Bank Group, 2021).

Informal settlements in Chile are particularly exposed to multiple and overlapping hazards. TECHO-Chile's 2022–2023 National Informal Settlements Survey identified 1,290 informal settlements across the country, reflecting a 39.5% increase in the number of families since 2020–2021 (TECHO-Chile, 2023). According to the Ministry of Housing and Urbanism (MINVU), 30.9% of these settlements are in areas officially designated as high-risk (MINVU, 2022).

One of the most pressing threats is wildfire exposure: 65.8% of informal settlements (849 camps) are situated in zones with frequent fire recurrence, placing over 72,000 households-nearly 64% of the national informal settlement population-at risk (TECHO-Chile, 2023). The Valparaíso Region has the highest concentration, with more than 30,000 households facing risks associated with wildfires and droughts, followed by the

Metropolitan Region, where over 15,000 households are exposed to similar threats (TECHO-Chile, 2023).

TECHO-Chile's census data also highlights that informal settlements are frequently affected by diverse hazards, including landslides, heavy storms, floods, river overflows, frosts, and snow. Only 8.7% of settlements are located outside hazard zones, while 91.3% (1,178 camps) are exposed to at least one threat and 14% face four or more simultaneous hazards (TECHO-Chile, 2023).

Within the Valparaíso Region, TECHO-Chile's 2023 census documents the significant impact of climate-related events. 72.9% of settlements report being affected by storms, tempests, or heavy rainfall, while 27.1% experience flooding, mudslides, waterlogging, or river overflows. Dynamic surface processes, such as landslides, threaten 24.6% of camps, and forest fires affect 28.9%, a risk intensified by ongoing drought conditions. Overall, 88.2% of settlements surveyed reported disruptions to daily life caused by climate change.

Further evidence from MINVU identifies 9,139 households with 49,699 individuals located in *high-risk areas*, representing 81% of the total population living in informal settlements in the Valparaíso Region (MINVU, 2021). These figures underline the acute, multidimensional vulnerability of these communities.

b) Community Profile El Esfuerzo

El Esfuerzo is an informal settlement located in the Valparaíso Region of Chile, home to approximately 250 residents distributed among 84 families (TECHO-Chile, 2023). The community is organized into four sectors: Pasaje Medialuna, Pasaje El Esfuerzo, Pasaje Vista Hermosa, and Pasaje La Comunidad, covering an area of roughly 5,4 hectares (ROOH, interview residents). Specific demographic data for El Esfuerzo is scarce; however, there is an unpublished document of TECHO that describes the local occupational profile which shows that most men work as construction workers, while women are primarily homemakers.

Map 1: Satellite View El Esfuerzo



The settlement was created in May 2021, in the context of the COVID-19 pandemic and an acute economic crisis²⁹. Many of its first residents had been unable to continue paying rent in their previous homes, forcing them to seek alternative living arrangements. Families began constructing their houses using whatever materials they could acquire, initiating a process of self-built housing typical of urban occupations in Chile's peripheries.

In September 2021, according to local leaders, the residents formalized their organization through the creation of a community committee. From that point, they began carrying out collective fundraising activities, with the dual aim of meeting immediate needs and fostering a sense of solidarity among neighbors.

The occupation of El Esfuerzo reflects a response to structural barriers in access to formal housing, where rising living costs, insecure rental arrangements, and limited employment opportunities converge (TECHO-Chile, 2023). Like other recent *tomas*, its location is partly explained by the availability of low-value land, the absence of strict municipal oversight, and a socio-spatial context where the territory is perceived as marginal or underutilized (Pino Vásquez & Ojeda, 2013).

According to the information gathered in the focus group with local referents, the dwellings in El Esfuerzo are predominantly *semi-precarious*, constructed from low-cost and locally available materials acquired through nearby markets, construction or demolition sites, or by reuse. Roofing materials primarily consist of metal sheets (zinc), roofing felt paper for insulation, and, in some cases, polyethylene. These are secured with roofing nails to withstand strong winds. Wall construction relies on OSB boards, painted OSB, and zinc sheets, while floors are typically made of earth, wooden planks, or pine/wooden stilts (pilings). Such materials reflect the community's resourcefulness and adaptability to meet evolving housing needs, such as family expansion, despite constrained budgets.

Access to public services is limited and mostly informal. As residents express during the interviews, water is supplied by a public utility company via delivery trucks (aljibe) and stored in community tanks, a system that reflects ongoing water insecurity. All households have individual toilets, but there is no formal sanitation service or sewage system, forcing residents to rely on rudimentary solutions that pose public health risks. Electricity is obtained through informal connections. Although no eviction threats have been reported in the past five years, the lack of tenure security, informal service provision, and substandard housing conditions leave the community in a highly vulnerable state.

Concerning infrastructure and utilities, the residents themselves have installed street lighting. The streets, primarily composed of dirt, have been improved by the residents with rocks to enhance their condition. There is no proper water draining system. There is no formal garbage collection service; instead, residents take their waste bags with them when they go into town.

Image 7: El Esfuerzo dirt Street



Source: unpublished photo taken by TECHO (2025)

According to the interviews both community accounts and external organization like TECHO highlight high exposure to hazards associated with hydro-meteorological factors—particularly drought, soil erosion, and wildfires—alongside surface dynamic processes such as landslides (TECHO-Chile, 2023; internal documents). The settlement's location in ravines surrounded by eucalyptus forests heightens wildfire risk, especially during summer drought periods. Seasonal storms frequently lead to flooding and road degradation, with unpaved routes becoming slippery and unsafe, restricting access for emergency services and water delivery. Landslides are a recurring concern during periods of heavy rainfall, posing risks to housing stability.

Additional extreme hazards reported in interviews and focus groups include strong winds and cold temperatures. Winds in the area can be intense enough to damage or even carry away fragile housing structures. Heavy rain has caused leaks in dwellings, further compromising residents' living conditions. Fire risk is exacerbated by the surrounding vegetation and topography, prompting periodic cleaning campaigns to remove dense vegetation and accumulated waste. The municipality classifies the settlement as a high-risk zone ("*zona roja*") and promotes preventive measures such as banning bonfires and conducting safety talks (Ministerio de Vivienda y Urbanismo, 2021).

Since its establishment, according to interviewed community residents, these recurrent events have disrupted daily life, compromised infrastructure, and heightened the community's vulnerability. Impacts include restricted mobility during winter rains, loss of housing materials due to winds, the need for wildfire evacuation preparedness, and ongoing risks to water security and housing stability. This combination of climatic and environmental factors underscores the settlement's high biophysical vulnerability within the broader Valparaíso regional context.

Nuevo Alberdi (Rosario, Argentina)

a) Climatic Context Analysis

Argentina, located in the southern cone of South America, ranks 88th among 181 countries in its vulnerability to climate change impacts (ND-GAIN Index, 2020). It is the second largest country in the continent after Brazil, with a highly diverse geography encompassing subtropical climates in the north, temperate mid-latitudes, and extreme thermal conditions ranging from very hot lowlands to the cold tundra of the far south and high Andean peaks (World Bank Group, 2021). Its diverse ecosystems and climates contribute to the country's exposure to a variety of climate-related hazards.

Argentina is highly susceptible to natural hazards, with floods representing approximately 60% of all disasters and accounting for 95% of the associated economic losses (World Bank Group, 2021). Most large-scale flooding events are linked to warm phases of the El Niño–Southern Oscillation (ENSO), which trigger heavy rainfall and cause overflow in major rivers of the La Plata Basin like Paraná River (World Bank Group, 2021).

The Argentinean case study in this report focuses on Rosario, a city in central-eastern Argentina situated along the Paraná River, one of South America's major waterways. According to the Köppen climate classification, Rosario 's climate is Cfa-humid subtropical with hot summers (Encyclopædia Britannica, n.d.). Average monthly temperatures remain above 10 °C year-round, with at least one month exceeding a mean of 22 °C (Servicio Meteorológico Nacional, n.d.). Rainfall is evenly distributed throughout the year, with no

marked dry season, and annual precipitation surpasses 1,000 mm (Servicio Meteorológico Nacional, n.d.). These climatic conditions, while supporting agricultural productivity and biodiversity, also heighten the city's vulnerability to flood events and other hydrometeorological hazards, particularly under projected climate change scenarios.

Regarding exposure to climate hazards, informal settlements are among the most affected areas in Argentina. Data from the Observatorio de Barrios Populares and the Registro Nacional de Barrios Populares indicate that there are currently 6,467³⁰ registered *barrios populares*³¹ across the country. Survey results from the former Secretariat for Socio-Urban Integration reveal that 66% of these neighborhoods do not have formal access to the electricity grid; 92% lack formal access to the potable water network; 97% lack formal connection to the sewage network; and 99% have no formal access to the gas network. Notably, most of these neighborhoods are self-constructed by the residents themselves, often located on land with inadequate environmental conditions, exposing them to multiple climate-related hazards.

According to the report *Desigualdad Climática en Barrios Populares* (TECHO Argentina, 2024), 7 out of 10 informal settlements are exposed to at least one environmental risk factor. Almost half of these settlements (48%) are in flood-prone areas, while 34% are affected by the presence of informal dumpsites. Vulnerability is particularly high in informal settlements, as many are established on vacant land in flood-prone zones and generally lack adequate drainage systems. In these contexts, rainfall itself is not the risk factor; rather, the absence of mitigation measures and infrastructure creates critical conditions. The consequences range from material damage to potential loss of life, while precarious electrical connections increase the risk of electrocution, and deficiencies in sanitation and waste collection heighten exposure to health hazards during heavy rains (Zapperi, 2018). These environmental conditions intersect with broader socio-economic vulnerabilities, including precarious housing structures, low-income levels, and limited access to basic services, reducing their adaptive capacity to climate risks.

As a result, *barrios populares* face a combination of high social vulnerability and direct exposure to climate change threats, such as floods, droughts, heatwaves, cold spells, and intense rainfall (TECHO Argentina, 2024). The overlap between environmental hazards and structural inequalities deepens their susceptibility to climate impacts, making them priority areas for targeted adaptation and resilience policies.

b) Community Profile Nuevo Alberdi³²

Nuevo Alberdi Oeste, located in the northwest quadrant of Rosario, Santa Fe, emerged in the early 1990s through successive waves of migration. From its origins, the neighborhood has been characterized by a combination of a more consolidated “urban” area and a more

dispersed “*rural*” zone that extends into Rosario’s western expansion frontier. It has historically been relegated in terms of urban development and integration, a condition reflected in its limited institutional presence and the persistence of precarious living conditions. Despite these constraints, the neighborhood has cultivated strong community networks and a history of collective struggle for improved living standards, shaped by cycles of economic crisis, unemployment, informal work, and the pressures of criminal economies that have marked the territory in recent decades.

Map 1: Satellite View Nuevo Alberdi



Nuevo Alberdi is one of the neighborhoods in Rosario that became part of the national policy push for integrating informal settlements in Argentina. Since 2016, the federal government has advanced these initiatives through the Ministry of Social Development and, more specifically, the Secretariat for Socio-Urban Integration (SISU). In recognition of the structural deficit, the *Law for Socio-Urban Integration of Popular Neighborhoods* (Law 27.453), approved in 2018, created a national framework to regularize land and finance essential infrastructure. Since then, more than 1,200³³ integration projects have been initiated across the country, ranging from water and sewage networks to public spaces. Within this policy context, Nuevo Alberdi was incorporated in August 2020 into the program through an agreement with SISU, representing the national government, and the territorial organization Ciudad Futura³⁴. Following this, a census was conducted in 2021 to generate a baseline diagnosis, and the *Instituto de Gestión de Ciudades*³⁵ (IGC) developed participatory project plans. Six early-works projects were presented, including a sewage network, a potable water system, an “*Edible Plaza*,” a new building for the La Ética school, and improvements to the Servillera soccer field. Of these, three reached the bidding and approval stage, but only the water supply project was implemented. With the change of government and SISU’s subsequent defunding, the remaining projects were left on hold, despite having been formally approved and, in some cases, tendered.

The census data revealed that the demographic structure of Nuevo Alberdi Oeste underscores its youthful character. With a population of 6,040 inhabitants, 84% reside in the urban zone and 16% in the rural zone. Age distribution illustrates that 73% of the population is under 34, reflecting a community composed predominantly of children, adolescents, and young adults. This demographic composition shapes the challenges of the settlement, with significant implications for education, employment, and social development.

Access to public services and infrastructure is profoundly limited. The neighborhood has minimal public institutions, consisting only of a kindergarten, a secondary school of social management with insufficient capacity to absorb local demand, an overburdened health center, and a municipal community center with reduced activity. There are no clubs, neighborhood associations, or recreational spaces, and most essential services are located outside the neighborhood, obliging residents to travel—often across the RN 34—to access schools, administrative services, and cultural activities.

The quality of houses in Nuevo Alberdi Oeste reflects generalized precariousness and exposure to environmental risks. Most dwellings are built with brick—mainly hollow bricks—though a smaller proportion still relies on sheet metal, wood, or other fragile materials. More than half of the houses lack exterior plaster or coating and are affected by humidity, cracks, or fissures, with a notable share facing subsidence or collapse risks. Roofs are predominantly uncovered metal sheets, with little thermal insulation, and water infiltration is widespread. Moreover, almost half of them have floor humidity and one-third of homes are built below the surrounding terrain. These conditions illustrate a pattern of deterioration and structural weakness that leaves households highly vulnerable to flooding, humidity, and extreme temperatures.

Climate hazards and exposure further compound these structural deficiencies. The neighborhood is recurrently affected by flooding, primarily due to the overflow of the Ibarlucea Canal, which also collects water from the Salvat Canal. The most significant episode in recent decades was the March 2007 flood, although heavy rains continue to generate frequent localized inundations. The impacts of flooding extend beyond water damage, producing sanitation and health risks as wastewater is discharged into open ditches that run along streets and alleys. Stagnant water fosters the proliferation of vermin and mosquitoes, while micro-dumps near the canal and in rural plots exacerbate environmental degradation.

Image 8: Canal Salvat polluted



Source: picture taken for research (2025)

The recurrent events highlight the chronic exposure of Nuevo Alberdi to climatic variability. The geography of the neighborhood intensifies these risks: low-lying rural areas are highly susceptible to overflow, and nearly one-fifth of houses face soil instability. At the same time, technological hazards intersect climate risks, as high-voltage power lines run close to residential areas, while rail and highway infrastructure reinforce the physical isolation of the settlement. Together, these factors situate Nuevo Alberdi Oeste at the intersection of natural, technological, and sanitary hazards, with profound implications for the daily life and long-term resilience of its inhabitants.

Image 9 and 10: Flooding in Nuevo Alberdi 2012 and 2024



Source: Newspaper La Capital (2012) and a neighbor (2024)

Appendix 2 - Images and Photos

Photos El Esfuerzo



Black roofing felt (insulating layer)



Dwelling constructed with various materials on landfill



Elevated piles



Dwellings constructed on raised pilings.



Housing made of OSB and tin



Dwelling on short piles installed on filled ground.



Expanding foam sealant for openings.



Oriented Strand Board (OSB) and sheet metal



OSB and fiber-cement board (Internit)
coated with sand.



Fiber-cement board (Internit) and wooden
roof insulated with roofing felt.



InternIt and metal sheet



OSB



Grooved plywood panels.



Internit



Opening sealed with adhesive.



OSB and thin wood panel.



Dwelling built with mixed materials



Outside Zinc

Photos Nuevo Alberdi Oeste



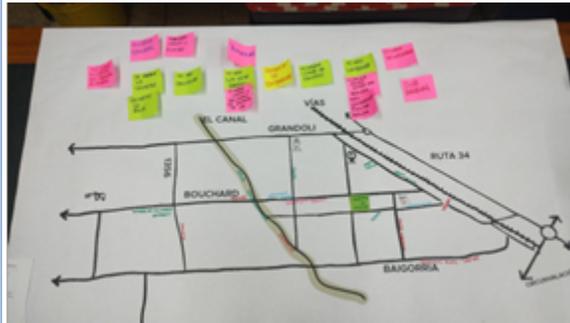
Interview referents July 2025.



Interview referents July 2025.



Focus Group IGC July 2025



Focus Group 1 Students Nuevo Alberdi
July 2025



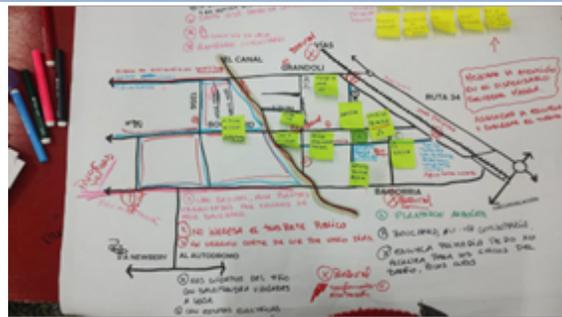
Focus Group 2 Students Nuevo Alberdi
July 2025



Focus Group 1 Students Nuevo Alberdi
July 2025



Focus Group 3 Students Nuevo Alberdi
July 2025



Focus Group 3 Students Nuevo Alberdi
July 2025



Focus Group 2 Students Nuevo Alberdi
July 2025



House of multiple materials



Home-made stove



Contamination in Canal Salvat



Metal sheet and brick houses.



Contamination in Canal Salvat



Brick production



Brick production



La Ética nursery of natives. July 2025.



Workshop of natives in La Ética, social school in Nuevo Alberdi. July 2025.



Radio program: Here and now Nuevo Alberdi 2022



Water boxes installed in Nuevo Alberdi 2022.



Community works monitoring patrol in 2022.



Census in Nuevo Alberdi