

Navigating Environmental Justice in Risk Reduction to Address Socio-Spatial Inequalities in Chile's Coastal Wetlands

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City Population	22,738
City Area	246 km ²
City GDP	592,205 USD
Climate Zone	Csb (Warm-summer Mediterranean)
ARC3.3 Linkage	Equity, Development, and Informality Element

Introduction: Participatory Approaches for Disaster Risk Reduction and Climate Change Adaptation in Chile. The case study explores the challenge of integrating a participatory approach into the study of risk, emphasizing the crucial need to enhance community-based strategies for disaster risk reduction (DDR) and Climate Change Adaptation (CCA) in Chile. In recent decades, Chile has experienced numerous events that have disproportionately impacted vulnerable populations, highlighting the importance of analyzing risk through a perspective that encompasses both social and spatial dynamics, transcending a solely physical understanding of risk (Birkmann, 2006; Satterthwaite, 2011; Cardona, 2013).

Despite efforts made in the last decade to improve risk reduction, challenges like land use issues and high exposure of vulnerable settlements, remain a complex issue to be implemented within the regulatory planning framework. Community knowledge often gets marginalized, impeding the development of measures to enhance resilience at the grassroots level (Visconti et al., 2020).

Chile’s disaster risk culture and resilience framework reflect a technocratic approach that falls short in addressing the intensification of environmental risks. Real estate speculation in environmentally valuable sites creates a risk scenario where the privatization of natural resources results in environmental degradation and socio-spatial inequalities (Rojas et al., 2018). These dynamics impact the ability of ecosystems and communities to withstand cyclical hazards and climate-related events (Martinez et al., 2016; Hermann, 2015; Carraro et al., 2021).

Moreover, inadequate public policies for housing and services expose low-income groups to dwell in areas prone to natural hazards or environmental degradation, leading to conditions of high socio-environmental vulnerability (Romero, 2014). A structural gap persists in planning regulations that have yet to incorporate risk as a decisive component in decision-making and justice mechanisms, particularly for vulnerable communities disproportionately affected by extreme climate events in Chilean cities (Anguelovski et al., 2016).

The case analyzes territorial processes and emerging risks along the metropolitan coastal border of the V Region in Central Chile, narrowing its focus to Cartagena. Here, a collective mapping exercise was undertaken to inform the study of risk with bottom-up and qualitative information, providing insights into how tools for the co-production of knowledge can support procedural and recognitional justice in the upgrade of planning regulatory frameworks. The study outcomes nurtured the development of policy recommendations to foster the implementation of participatory processes for risk studies and spatial decision-making for risk reduction (Visconti et al., 2022).

The constraints within Chilean regulations and practices related to risk assessment for urban planning underscore the necessity for innovation in this domain. While certain issues identified in the analysis of the Chilean legislative framework require national-level legal changes, tools for the co-production of knowledge, such as collective mapping, could provide valuable support to existing methodologies for studying risk at the municipal scale, enabling the inclusion of vulnerable groups in planning procedures and contributing to justice objectives.

Analysis, Evaluation, and Implementation: Challenges and Opportunities in Chilean Coastal Risk Management.

This study is part of the transdisciplinary research project, “A local model for participatory risk disaster management,” led by CIGIDEN - the Research Center for Integrated Disaster Risk Management at the Pontificia Universidad Catolica de Chile. Commencing in 2019 with the pilot case of Cartagena, this research aims to formulate a replicable methodology involving community representatives, local and regional authorities, and other stakeholders in the integration of quantitative risk modeling, participatory governance tools, community-based risk management, and cultural perceptions of risks. The project’s outcomes have supported the dissemination of policy recommendations and scientific articles across various domains (Visconti et al., 2022; Carraro et al., 2021; Martinez et al., 2020a; Martinez et al., 2020b; Guerrero et al., 2023; Martinez et al.,

2019). Outreach initiatives, such as public round tables, community assemblies, and specific participatory exercises like collective mapping, interviews, community surveys, and neighborhood walks, have further fostered community engagement.



Figure 1. *Bahía de Cartagena, Wetland and San Sebastian Estuary*

Challenges on the Chilean coast today, arising from anthropization, extreme events, socio-natural disasters, and the prevailing neoliberal economic model, necessitate progress in the legal framework, territorial planning system, and risk management of coastal areas (Martinez et al., 2020b). This comprehensive approach is rarely applied, despite attempts to update local plans after the 2010 earthquakes and tsunamis (Moris et al., 2017). Normative instruments face challenges due to institutional fragmentation, especially in the coastal zone (Vicuña and Schuster, 2021). Specific criteria for coastal zoning and the application of normative planning instruments are lacking, making it difficult to introduce limitations for a compatible and sustainable use of coastal areas (Martinez et al., 2019).

Existing policies such as the “National Policy for the Use of the Coastal Edge” (Política Nacional de Uso del Borde Costero-PNUBC), which is 25 years old, need to be updated. A proposal for a new law, the “Proyecto de Ley de Administración del Borde Costero y Concesiones Marítimas”, has been under discussion. Despite this legislative initiative, the bill insufficiently addresses the protection of marine-coastal ecosystems and vulnerable groups exposed to extreme events. The law proposal supports a privatization model, excluding indigenous groups from the decision-making process and the climate change context (Martinez et al., 2020b).

Municipal plans in Chile are developed by private planning consultants, generally not extending participatory instances to the study of risk (Visconti et al., 2021). This contrasts with

recommendations from Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) experts who emphasize local participation. Disenfranchised communities, with limited influence on top-down planning, are often the most affected by disasters (Anguelovski et al., 2016), experiencing disproportionate impacts from environmental burdens. Chilean coasts are particularly prone to environmental injustices, featuring a high prevalence of sacrifice zones (Valenzuela-Fuentes, 2021).

The lack of mechanisms for effective participation and the compelling consideration of community knowledge hinder meaningful change in the decision-making process, particularly regarding risk. Neoliberal urbanism in Chilean coastal cities increases disaster vulnerability, contributing to socio-economic segregation, environmental and socio-spatial justice issues (Carraro et al., 2021). The absence of meaningful engagement by diverse stakeholders is a significant factor contributing to numerous socio-environmental conflicts and the unequal distribution of environmental responsibilities and benefits in coastal areas (Martinez et al., 2020b).

Recognized as fundamental for advancing justice objectives, participation needs systematic pursuit in planning decisions and to support policy changes regarding coastal ecosystems. To achieve this, participatory processes for more just risk studies should include the voices of vulnerable individuals residing in hazardous conditions, informal settlements, and precarious housing. Collective mapping emerges as a powerful tool in risk studies, offering a pathway to meaningful participation and climate justice (Liu et al., 2018). By integrating the tacit knowledge of communities at risk, collective mapping facilitates a more inclusive and diverse exploration of risks (Corbett, 2009; Gaillard, 2009). Through this approach, the participatory nature of risk studies extends beyond consultation to active involvement in shaping decisions and policies. The collaborative map-making process becomes a tangible expression of community insights, fostering a shared understanding of risks and potential interventions.

Touristification and Landscape Privatization: Catalyst for Socio-Spatial Inequalities. The coastal border of the Metropolitan area, particularly Cartagena, grapples with challenges arising from rapid urbanization and touristification since the 1990s, intensified in recent decades (Hidalgo et al., 2016; Hidalgo et al., 2014). Cartagena, with 22,700 inhabitants, has witnessed substantial urban growth propelled by tourism, leading to a seasonal floating population of about 600,000 people annually. The city’s remarkable 66% urban growth rate from 1954 to 2000 nearly occupied dune fields and coastal wetlands, sparking concerns about resource management and resulting in an environmental footprint in waste and water deficit (Castro and Hidalgo, 2002).

This development pattern disrupts socio-ecological systems, causing the loss of essential ecosystem services and escalating environmental deterioration (Martinez et al., 2018). Metropolization and the privatization of the landscape exacerbate socio-spatial inequalities in urban planning, accessibility, and service distribution (Hidalgo et al., 2016; Alvarado, 2014, Martinez et al., 2023). Socio-envi-

ronmental vulnerability is evident in informal settlements, where illegal occupations in ecologically valuable sites coexist with poor housing conditions, poverty, and criminality, generating marginalization phenomena (Alvarado, 2014).

The absence of protective measures in local and metropolitan urban planning has transformed the landscape, with medium and long-term consequences for biodiversity and water scarcity (Pino, 2018). Despite advancements in responding to geophysical hazards with a strengthening of early warning systems for tsunamis, the lack of resilience measures in municipal planning perpetuates environmental degradation and economic vulnerabilities, especially due to the tourism-dependent economy, impacting social cohesion and contributing to informality (Carraro et al., 2021).

The study developed by CIGIDEN researchers focuses on Cartagena's residual wetland area, formed by a lagoon, the 'Humedal de Cartagena', and the estuary of San Sebastian. This area is particularly threatened by the environmental impact of the floating population and urbanization (see Figure 1). Settlements on the dunes, including El Ensueño and El Arellano, faced Tsunami effects in 2010 and coastal erosion (Martinez et al., 2018). These settlements born as informal have been partially regularized, and recently informality is resurfacing in unoccupied dune areas (Figure 2).

In 2019 the Municipality started a process to upgrade the Regulatory Municipal Plan that regulates the land use of the wetland area. The proposal extends the protection area to the urbanized sectors of the dunes (El Arellano and El Ensueño), but intensify tourist equipment on the beach of San Sebastian increasing the construction index on the area behind the beach (Figure 1). A strong mobilization led by civil society organizations and citizens comitees (NgO El Canelo, Playa Limpia, Cartagena Joven Grupo Ecologico, Junta de Vecinos El Arellano, Junta de vecinos San Sebastian) have risen expressing concerns for the draft of the Regulatory Municipal Plan that encourage the touristic flow to the detriment of environmental protection and risk reduction.

The contested nature of the wetland area prompted researchers to initiate a process of participant observation in public assemblies, interviews, and focus groups to gain a better understanding of the past and present socio-spatial dynamics. The data collected through discussions with various stakeholders (municipality, civil society organizations, citizen committees, practitioners) led to reflections on the social construction of risk, interpreting risk as a nexus of natural hazards and socio-spatial dynamics. Part of the study has been oriented to investigate the disaster vulnerability as related to the neoliberal urbanism of the Chilean coast (Carraro et al., 2021).

Participatory research activities using different methods (collective mapping, focus groups, and neighborhood walks) explored territory criticalities, values, and interventions related to geophysical and climate-related risks. Collective mapping, in particular, identified relevant actors, places, and processes for implementing a risk study in Cartagena's wetland area (Figure 4). This participatory tool transcends traditional

enabling communities to actively contribute their insights and experiences. Emphasizing the transformative potential of collective mapping, the study highlighted its role as a potential bridge between communities and decision-makers. This inclusive process, involving the co-creation of spatial representations, ensured that the unique challenges faced by different groups within the community were acknowledged.



Figure 2. *Informal settlement partially regulated, built on the dune ecosystem*

Policy Implications and Recommendations. The participatory exercises in Cartagena, particularly the methodology of collective mapping, played a pivotal role in shaping policy recommendations aimed at fortifying municipal urban planning for disaster risk reduction through collective risk mapping (Visconti et al., 2022). Documented in the policy paper “The Collective Mapping as a Tool for the Participatory Study of Risk in Municipal Urban Planning” (Visconti et al., 2022), part of the CIGIDEN Policy Papers Series, these insights and recommendations underscore the integration of risk studies into municipal planning. They advocate for the extension of participation mechanisms to probe the intricate interactions among natural hazards, social dynamics, and the built environment.

The Cartagena experience revealed the potential of collective mapping when seamlessly incorporated into planning and regulatory frameworks, providing pathways for procedural and recognitional justice. Recommendations by CIGIDEN researchers call for the formulation of national guidelines that emphasize local participation, especially in delineating risk zones during the early stages of municipal plan development. Furthermore, proposals advocate for municipal planning offices to take a proactive role in expanding participation in risk studies, with suggested amendments to make participation a mandatory and binding component of urban planning. The community and researchers have identified numerous specific benefits arising from the implementation of community-based methods, which can incentivize governments to adopt such tools for risk-oriented planning. governments in adopting such tools for risk-oriented planning.

Co-production of knowledge, achieved through active engagement with diverse stakeholders—comprising local communities, researchers, and policymakers via collective mapping, participatory workshops, and focus groups—emerges as a transformative approach. This shift from traditional top-down models fosters dynamic synergy in decision-making processes. Collective mapping serves as a tangible expression of community contributions, adding a spatial dimension to their knowledge. This approach allows communities to directly engage in processes influencing them, translating abstract concepts into visual representations for easy understanding and communication. The quality of knowledge significantly improves with diverse perspectives integrated; local expertise complements scientific data, providing a more holistic understanding of local issues, risks, and opportunities. Communities and researchers collaborate to generate knowledge that is relevant and actionable within local contexts. This participatory procedure if implemented in the planning practice ensures that mitigation and adaptation measures are tailored to local needs and priorities, thereby increasing their effectiveness. By incorporating community perspectives and local knowledge into planning and policy-making processes, governments can make more informed and contextually relevant decisions.

The combination of co-production, participation, and collective mapping plays a pivotal role in promoting environmental and socio-spatial justice. Communities actively shape decisions, with their claims and vulnerabilities acknowledged, contributing to procedural and recognitional justice. This holistic approach ensures more just outcomes in decision-making processes and brings visibility to groups often excluded by spatial decision-making.



Figure 3. *Precarious houses built on the San Sebastian Estuary*



Figure 4. *Collective mapping exercise*

References

- Anbleyth-Evans, J., Prieto, M., Barton, J., Garcia Cegarra, A., Muslow, S., Ricci, E., ... & Francisca, V. P. (2022). Toxic violence in marine sacrificial zones: Developing blue justice through marine democracy in Chile. *Environment and Planning C: politics and space*, 40(7), 1492-1514.
- Cardona, O. D. (2013). The need for rethinking the concepts of vulnerability and risk from a holistic perspective: a necessary review and criticism for effective risk management. *In Mapping vulnerability* (pp. 37-51). Routledge.
- Carraro V., Visconti C., Inzunza S., (2021). Neoliberal urbanism and disaster vulnerability on the Chilean central coast. *Geoforum*, 121, pp. 83-92, ISSN 0016-7185, <https://doi.org/10.1016/j.geoforum.2021.02.023>.
- Castro, C. P., Ibarra, I., Lukas, M., Ortiz, J., & Sarmiento, J. P. (2015). Disaster risk construction in the progressive consolidation of informal settlements: Iquique and Puerto Montt (Chile) case studies. *International Journal of Disaster Risk Reduction*, 13 109–127. <https://doi.org/10.1016/j.ijdrr.2015.05.001>
- Herrmann, M.G., 2015. Urban planning and tsunami impact mitigation in Chile after February 27, 2010. *Nat. Hazards* 79 (3), 1591–1620. <https://doi.org/10.1007/s11069-015-1914-4>.

- Hidalgo, R., Santana, D., Alvarado, V. (2016). *En Las Costas Del Neoliberalismo*. Naturaleza, Urbanización y Producción Inmobiliaria: Experiencias En Chile y Argentina. Impresión gráfica LOM.
- Luco, C.R.A., Gana, A. (2013). Impactos del desarrollo inmobiliario en localidades costeras del Área Metropolitana de Valparaíso. *Revista de Urbanismo* (28): 27–60. <https://doi.org/10.5354/ru.v15i28.26934>.
- Guerrero, N., Contreras, M., Chamorro, A., Martínez, C., & Echaveguren, T. (2023). Social vulnerability in Chile: challenges for multi-scale analysis and disaster risk reduction. *Natural Hazards*, 1-36.
- Martínez, C., Moris, R., Quense, J. (2016). *Valoración de las áreas de riesgo por tsunami y potencial de evacuación: propuestas para la reducción del riesgo de desastres a escala local.*: 36.
- Martínez, C., Contreras-López, M., Winckler, P., Hidalgo, H., Godoy, E., & Agredano, R. (2018). Coastal erosion in central Chile: A new hazard?. *Ocean & Coastal Management*, 156, 141-155.
- Martínez, C., Arenas, F., Bergamini, K., & Urrea, J. (2019). Hacia una ley de costas en Chile: criterios y desafíos en un contexto de cambio climático. *Serie Policy Papers CIGIDEN*. https://www.cigiden.cl/wp-content/uploads/2019/10/PP_LeyBordeCostero_digital.pdf.
- Martínez, C., Cienfuegos Carrasco, R. A., Inzunza, S., Urrutia, A., & Guerrero, N. (2020a). *Worst-case tsunami scenario in Cartagena Bay, central Chile: Challenges for coastal risk management*.
- Martínez, C., Martínez, I., Paredes, C., & Cienfuegos, R. (2020b). ¿Por qué Chile necesita una ley de costas. Hacia Nueva Gobernanza de la Costa Para el Siglo XXI. *Serie Policy Papers CIGIDEN*.
- Martínez, C. & Rangel-Buitrago, N. (2023). The Kandinsky building in Chile: A case study demonstrating extreme urbanization pressure on coastal ecosystems. *Ocean & Coastal Management*, 246, 106905.
- Moris, R.; Contrucci, P.; Ortega, A. (2017) El riesgo en la actualización post-desastre de instrumentos de planificación territorial comunales en Chile 2010–2014. *Revista de Estudios Latinoamericanos sobre Reducción del Riesgo de Desastres*, 85-100.
- Rojas, C., Munizaga, J., Rojas, O., Martínez, C., & Pino, J. (2019). Urban development versus wetland loss in a coastal Latin American city: Lessons for sustainable land use planning. *Land use policy*, 80, 47-56.
- Vecchio, G., Hernández Farías, P. A., Bastías Acuña, G., Vega Zurita, P. E., Vicuña del Río, M. M., Moris Iturrieta, R., & Martínez Reyes, C. D. P. (2020). *Vulnerabilidad territorial y capacidad institucional en el litoral central de Chile*. Hacia una ley de costas en Chile: bases para una gestión integrada de áreas costeras.
- Vicuña del Río, M. M., & Schuster Olbrich, J. P. (2021). *Planificación urbana y gestión del riesgo de desastres: desafíos para instrumentos y mecanismos de planificación urbana y territorial*.
- Visconti C., Carraro V., Inzunza S. (2020), Collective mapping as a methodology for participatory, disaster-responsive urban planning: lessons from Chile, In Bindè P., Moraes de Almondes K., Matos de Carvalho R.J., Queiroz de Almeida L., Murillo Santos de Araujo S. (Eds). *Multidisciplinary Perspectives about Disasters: Covid-19 and other Challenges for Disaster Risk Reduction from a Latin American Experience*, p.268-288. ISBN: 978334634134. GRIN Verlag.
- Visconti C. Carraro V., Inzunza S., (2022). *El mapeo colectivo como herramienta del estudio participativo del riesgo en la planificación urbana municipal*. CIGIDEN Policy Paper Series, Pontificia Universidad Católica de Chile, Santiago de Chile, ISBN : 978-956-14-2905-5, <https://www.cigiden.cl/mapeo-colectivo-como-metodologia-participativa-para-el-estudio-de-riesgos-de-la-planificacion-urbana-comunal-una-propuesta-para-chile/>
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- ### Additional Data
- **Population Density:** 1,806 people/km²
 - **Gross National Income (GNI):** 15,820 USD (High Income)
 - **Gini Coefficient:** 43
 - **Human Development Index (HDI):** 0.860 (Very High)
 - **Type of Climate Intervention:** Adaptation
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