

Non-Migration and Contamination: Understanding Why People Are Not Migrating From the Quintero-Puchuncaví Sacrifice Zone

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Introduction

Between August and October of 2018, 1,553 Chilean children were poisoned, their bodies overcome by dizziness, shaking, and vomiting.¹ The reason: extreme pollution from the companies comprising the Ventanas Industrial Complex, an industrial zone between the Chilean communities of Quintero and Puchuncaví. In 1993, the Chilean Ministry of Agriculture declared this region a “saturated zone,” also known as a “sacrifice zone,” an area experiencing severe environmental degradation due to industrial contamination.² The term sacrifice zone was first coined during the Cold War to describe areas contaminated by radioactivity, particularly due to uranium mining. The term was later applied to other heavily contaminated spaces such as coal mines and industrial waste sites, becoming an integral term for the environmental justice movement.³ In Quintero and Puchuncaví the high levels of pollution, often in the form of toxic chemicals and heavy metals, are linked to cancer, heart disease, respiratory illness, strokes, reproductive issues, and mental health problems.⁴ Human and environmental well-being is thereby “sacrificed” as governments and businesses turn a blind eye, choosing to prioritize economic development over residents’ well-being. In 2022, a United Nations report concluded that millions of people globally live in sacrifice zones, disproportionately affecting poor, minority communities.⁵

Sacrifice zones exist globally. One of the most famous zones is in the United States, located in Louisiana and known as “Cancer Alley” because of the high cancer rates associated with toxic chemicals from over 100 oil refineries and petrochemical plants.⁶ Another major sacrifice zone is found in Kabwe, Zambia, where lead mining and smelting has poisoned generations of children.⁷ In Romania, arsenic, lead, and mercury poison the Roma people living near the Pata Rât landfill. In the French territories of Guadeloupe and Martinique, 90% of residents’ blood tested positive for the

¹Francisco Parra, “A Un Año de las Intoxicaciones Masivas: Así Viven los Estudiantes de Quintero-Puchuncaví la ‘Zona de Sacrificio.’” *La Tercera*, August 10, 2019, <https://www.latercera.com/que-pasa/noticia/a-un-ano-de-las-intoxicaciones-masivas-asi-viven-los-estudiantes-de-quintero-puchuncavi/777492/#>.

²Chilean Ministry of Agriculture, *Decree 346: Declares the area surrounding the Ventanas Industrial Complex, Region V, as a saturated zone by sulfur dioxide and particulate material*, 1993, <https://www.bcn.cl/leychile/navegar?idNorma=12531>.

³Ryan Holifield and Mick Day, “A Framework for a Critical Physical Geography of ‘Sacrifice Zones’: Physical Landscapes and Discursive Spaces of Frac and Sand Mining in Western Wisconsin,” *Geoforum* 85, (2017): 269-279.

⁴Damien Gayle, “Millions Suffering in Deadly Pollution ‘Sacrifice Zones’, Warns UN Expert,” *The Guardian*, March 10, 2022. <https://www.theguardian.com/environment/2022/mar/10/millions-suffering-in-deadly-pollution-sacrifice-zones-warns-un-expert>.

⁵Human Rights Council, *The Right to a Clean, Healthy and Sustainable Environment: Non-Toxic Environment* (United Nations, 2022), 2, <https://documents.un.org/doc/undoc/gen/g22/004/48/pdf/g2200448.pdf?OpenElement>.

⁶Gayle, “Millions Suffering.”

⁷Damian Carrington, “The World’s Most Toxic Town: The Terrible Legacy of Zambia’s Lead Mines,” *The Guardian*, May 28, 2017, <https://www.theguardian.com/environment/2017/may/28/the-worlds-most-toxic-town-the-terrible-legacy-of-zambias-lead-mines>.

carcinogenic pesticide chlordecone.⁸ In Chile alone, there are five designated sacrifice zones and six more regions that have the potential to be classified as sacrifice zones if environmental conditions worsen.⁹ The most notorious of these is the Quintero-Puchuncaví sacrifice zone.

The communities of Quintero and Puchuncaví are located in the Valparaíso region on the central coast of Chile, 156 km from Santiago. While these communities built their economies on artisanal fishing and tourism, between the 1950s and 1960s, the area underwent an industrial transformation as part of a “national project” to compete with the industrialized nations of the Global North.¹⁰ The first three industries established there were a petroleum refinery, a coal thermoelectric plant, and a copper smelter.¹¹ Over time, more and more companies moved into the region. Some industries operating in the Ventanas Industrial Complex are state-owned companies like Codelco, the Chilean national copper company, and ENAP, the Chilean national petroleum company.¹² Other industries are privately held but based in Chile such as Oxiquim, a chemical company, and Cementos Melón, a cement producer. Additionally, the region is home to international corporations like the US-based AES and the Italian-based ENEL, both energy distributors.¹³

Although industrial development promoted economic growth, it came at the expense of environmental health and human safety.¹⁴ Today, Valparaíso’s beaches are black from coal deposits and oil spills.¹⁵ The air often tastes metallic and animals lie dead on the shores.¹⁶ Chemical gases like methyl chloroform, nitrobenzene, and toluene frequently leak from plants, and heavy metals like lead, copper, and arsenic pollute the soil and water.¹⁷

Arsenic poses the biggest threat to the region due to its high toxicity and elevated concentrations in the air and water.¹⁸ A recent study found that arsenic levels in Quintero-Puchuncaví were 23 times higher than the European standard and the levels recommended by the World Health Organization.¹⁹ This pollution is so widespread that some have called the Quintero-Puchuncaví sacrifice zone the “Chilean Chernobyl.”²⁰ Accordingly, people living in the area face elevated health risks. The heavy metals and toxic gases found in the area have been associated with miscarriages, IQ deficiencies, respiratory and cardiovascular diseases, and cancer.²¹ For example, one teacher at a small school in Quintero reported that three of her students have leukemia, remarking that “it’s almost an unusual fact to have lived in Quintero and Puchuncaví and not have had cancer.”²²

⁸Gayle, “Millions Suffering.”

⁹Human Rights Council, *Visit to Chile* (United Nations, 2024), 5, <https://documents.un.org/doc/undoc/gen/g23/265/21/pdf/g2326521.pdf>.

¹⁰Flavia Liberona Céspedes and Hernán Ramírez Rueda, “Antecedentes y reflexiones sobre la zona de sacrificio de Quintero-Puchuncaví,” *Cuadernos Médicos-Sociales* 59, no.1 (2019): 23.

¹¹Liberona Céspedes and Ramírez Rueda, “Antecedentes y Reflexiones,” 23.

¹²Liberona Céspedes and Ramírez Rueda, “Antecedentes y Reflexiones,” 23.

¹³Liberona Céspedes and Ramírez Rueda, “Antecedentes y Reflexiones,” 23.

¹⁴Naomi Larsson, “The Brutal Reality of Life Inside One of the World’s Most Polluted Cities,” *Wired*, February 24, 2020, <https://www.wired.com/story/chile-quintero-pollution/>.

¹⁵Matías Concha, “Quintero y Puchuncaví: Niñez y vejez de sacrificio,” *El Mostrador*, August 29, 2022, <https://www.elmostrador.cl/destacado/2022/08/29/quintero-y-puchuncavi-ninez-y-vejez-de-sacrificio/>.

¹⁶Larsson, “The Brutal Reality.”

¹⁷Larsson, “The Brutal Reality.”

¹⁸María José Núñez and Alejandra Olguín, “Los dolores que aquejan a Quintero y Puchuncaví,” *La Tercera*, September 1, 2018. <https://www.latercera.com/reportajes/noticia/los-dolores-aquejan-quintero-puchuncavi/303300/#>.

¹⁹José Núñez and Olguín, “Los dolores que aquejan.”

²⁰Larsson, “The Brutal Reality.”

²¹Christina Lux and Florencia Ortúzar, “When the Energy Transition Isn’t Just: The Case of Quintero-Puchuncaví in Chile,” *AIDA*, July 21, 2023, <https://aida-americas.org/en/blog/when-the-energy-transition-isn-t-just-the-case-of-quintero-and-puchuncavi-in-chile>.

²²Adriana Espinoza Soto, et. al., “Trayectorias marcadas: narrativas familiares de salud producidos por la contaminación antropogénica en la zona de sacrificio de Quintero-Puchuncaví, Chile,” *Revista de Estudios Latinoamericanos sobre Reducción del Riesgo de Desastres* 8, no. 2 (2023): 59.

Another teacher asserted that “the percentage of people who are sick with asthma, cancer or have special needs is double the number in a commune of a similar size.”²³

A key question thus arises: if pollution levels are so high, what are residents’ motivations for non-migration? Although no scholars have examined this specific case, there is a growing academic interest in environmental-related migrations. The existing literature has had an overwhelming “mobility bias,” where scholars focus on the drivers of migration instead of the factors behind non-migration.²⁴ Only recently, across migration studies, and especially in climate migration studies, have academics begun to shift their research to the reasons why individuals choose not to migrate.²⁵ As more researchers have begun tackling environmental non-migrations, the literature has coalesced around three primary schools of thought: involuntary immobility, voluntary immobility, and acquiescence immobility.

Involuntary immobility refers to individuals who aspire to migrate but lack the capacity to do so. In 2002, Jorgen Carling, a Norwegian researcher specializing in international migrations, sought to explain this phenomenon through the aspiration-ability model, highlighting that while some people desire to move, they may be unable to because of financial constraints, immigration barriers, a lack of employable skills, or familial obligations.²⁶ In the context of climate migrations, such individuals are often referred to as “trapped populations.”²⁷ Although the UK Government Office for Science’s Foresight report first introduced this term, it has become common in academic discourse amongst scholars studying involuntary immobility in environmentally precarious areas, such as Dewaard et al. and Black et al.²⁸

The second school of thought, voluntary immobility, refers to individuals who are capable of moving, yet willingly decide to stay. There are a variety of reasons for this phenomenon. The first is social ties and networks, as evidenced by the work of Ashan et al., Mallick et al., and Transiskus and Bazarbash, in which individuals lack a desire to move due to the absence of social networks to make the migration adjustment manageable.²⁹ Another driver of voluntary immobility is place-attachment, the bond that an individual or group has to a particular environment, be that the love and commitment to nature, culture, or land and the mere fact of being attached to one’s place of birth, indicated in the literature of Kelman et al. and Mallick et al.³⁰ Alternatively, scholars such as Wiegel et al., Mortreux and Barnett, Kelman et al., and Hamilton et al. have attributed voluntary non-migration to the perception that environmental threats do not pose an imminent risk

²³Concha, “Quintero y Puchuncaví.”

²⁴Kerilyn Schewel, “Understanding Immobility: Moving Beyond the Mobility Bias in Migration Studies,” *International Migration Review* 54, no. 2 (2019): 328-355.

²⁵Sebastian Fernand Transiskus and Monir Gholamzadeh Bazarbash, “Beyond the Binary of Trapped Populations and Voluntary Immobility: A People-Centered Perspective on Environmental Change and Human Immobility at Lake Urmia, Iran,” *Global Environmental Change* 84 (2024): 102803; Caroline Zickgraft, “Keeping People in Place: Political Factors of (Im)mobility and Climate Change,” *Social Sciences* 8, no.8 (2019): 228; Bishawjit Mallick, et al., “I Can Migrate, But Why Should I?—Voluntary Non-Migration Despite Creeping Environmental Risks,” *Humanities and Social Sciences Communications* 10, no. 34 (2023).

²⁶Jorgen Carling, “Migration in the Age of Involuntary Immobility: Theoretical Reflections and Cape Verdean Experiences,” *Journal of Ethnic and Migration Studies* 28, no. 1 (2002): 5-42.

²⁷Foresight, *Migration and Global Environmental Change: Future Challenges and Opportunities* (The Government Office for Science, 2011), 13, <https://assets.publishing.service.gov.uk/media/5a74b18840f0b61df4777b6c/11-1116-migration-and-global-environmental-change.pdf>.

²⁸Foresight, *Migration and Global Environmental Change*; Jack DeWaard et al., “Operationalizing and Empirically Identifying Populations Trapped in Place by Climate and Environmental Stressors in Mexico,” *Regional Environmental Change* 22, no. 29 (2022); Richard Black, et al., “Migration, Immobility and Displacement Outcomes Following Extreme Events,” *Environmental Science & Policy* 27, no.1 (2013): 32.

²⁹Nasif Ashan et al., “Promise, Premise, and Reality: The Case of Voluntary Environmental Non-Migration Despite Climate Risks in Coastal Bangladesh,” *Regional Environmental Change* 22, no. 1 (2021): 1; Mallick, et al., “I Can Migrate, But Why Should I?,” Transiskus and Bazarbash, “Beyond the Binary of Trapped,” 102803.

³⁰Ilan Kelman et al., “Does Climate Change Influence People’s Migration Decisions in Maldives?,” *Climatic Change* (2019): 285; Mallick, et al., “I Can Migrate, But Why Should I?”

necessitating migration.³¹ Finally, scholars like Wiegel et al. and Farbotko and McMichael have looked to the spiritual and cultural ties that individuals have to their land.³²

The third school of thought discusses acquiescence immobility. First introduced by Kerilyn Schewel in 2019, acquiescence immobility characterizes individuals who are both incapable of migrating and lack any aspirations to do so.³³ While acquiescence immobility is less frequently referred to in the literature, examples of this dynamic are still present. For example, Huntington et al.'s examinations on non-migration in Arctic Alaska found that despite not having the resources to migrate away from climate-induced environmental changes, Alaskan residents desired to stay in their communities.³⁴ Thiede and Brown's studies on non-migration after Hurricane Katrina found similar results; the residents of the communities under investigation lacked the capacity to move, but they were unlikely to leave.³⁵ Finally, Helen Adams came to a similar conclusion. She studied communities in highland Peru and found that while community members had low mobility potential because of social and financial restraints, they simultaneously lacked the desire to move because of a strong sense of place and high-levels of satisfaction.³⁶

The scholarly works on non-migration have concentrated on environmental degradation linked to climate change-related issues, such as rising temperatures, increasing sea levels, and intensifying storms. However, there remains a notable gap in the literature regarding non-migrations due to direct, human-caused environmental degradation, particularly pollution. While human activity is undeniably connected to these climate-related issues, the effects of climate-related issues are not the result of direct human actions in the same way that pollution is. While one study by Ma et al. explored how fluctuations in air pollution increase international migration patterns in China, and another by Germani et al. examined the role of air pollution in internal migration to less polluted areas, these works highlight reasons for out-migrations, not non-migrations.³⁷ Addressing this gap, I investigate non-migration in a region impacted by human-caused environmental degradation.

This paper does not intend to point to any singular rationale as more important than another, but rather shows the array of factors that impact individuals' decision to stay in Quintero-Puchuncaví. I argue that non-migration from the Quintero-Puchuncaví sacrifice zone can be attributed to six main factors: financial struggles, educational deficiencies, employment opportunities, place attachment, threat perception, and a commitment to staying and fighting for one's community. The government is legally responsible for protecting the environment and the people of Quintero-Puchuncaví, evidenced through constitutional obligations, domestic laws and international agreements. However, due to the interconnectedness between the state and the industries for the purpose of economic growth, the Chilean government has ultimately failed to protect its citizens. In response, community activism raising awareness of the dangers of industrial contamination, combined with recent policies and initiatives, have led to the closure of two industries in the

³¹Hanne Wiegel et al., "Safe From What? Understanding Environmental Non-Migration in Chilean Patagonia through Ontological Security and Risk Perceptions," *Regional Environmental Change* 21, no. 4 (2021): 43; Colette Mortreux and Jon Barnett, "Climate Change, Migration and Adaptation in Funafuti, Tuvalu" *Global Environmental Change* 19, no.1 (2009): 105; Kelman et al., "Does Climate Change Influence," 285; Lawrence Hamilton et al., "Climigration? Population and Climate Change in Arctic Alaska," *Population and Environment* 38 (2016): 115.

³²Carol Farbotko and Celia McMichael, "Voluntary Immobility and Existential Security in a Changing Climate in the Pacific," *Asia Pacific Viewpoint* 60, no. 2 (2019): 148; Wiegel et al., "Safe From What?," 43.

³³Schewel, "Understanding Immobility," 335.

³⁴Henry P. Huntington, "Staying in Place During Times of Change in Arctic Alaska: The Implications of Attachment, Alternatives, and Buffering," *Regional Environmental Change* 18 (2018): 489.

³⁵Brian C. Thiede and David L. Brown, "Hurricane Katrina: Who Stayed and Why?," *Population Research and Policy Review* 32 (2013): 803.

³⁶Helen Adams, "Why Populations Persist: Mobility, Place Attachment and Climate Change," *Population and Environment* 37 (2016): 429.

³⁷Shuang Ma et al., "Does Air Pollution Induce International Migration? New Evidence From Chinese Residents," *Economic Modeling* 120 (2023): 106176; Anna Rita Germani et al., "Does Air Pollution Influence Internal Migration? An Empirical Investigation on Italian Provinces," *Environmental Science & Policy* 120 (2021): 11.

sacrifice zone. Nevertheless, these closures alone will not remediate over 50 years of contamination.

I support this argument with a wide variety of primary sources. Due to the lack of statistical data on migration patterns in Quintero-Puchuncaví, I rely on an extensive collection of news articles and NGO reports that provide key quotes and anecdotes revealing critical narratives about residents' experiences in the Quintero-Puchuncaví sacrifice zone. Additionally, domestic and international newspapers like *La Tercera*, *France24*, and *El Mostrador* testify to the extent of the region's environmental degradation and the resultant human health and safety violations. I supplement these sources with a variety of government documents such as the Chilean Constitution, Chilean environmental laws, government press releases, and national strategy plans. Furthermore, I examine international agreements that Chile has supported such as the United Nations Resolution on the Right to a Clean, Healthy, and Sustainable Environment and the Escazu Agreement. Finally, I incorporate a Chilean Supreme Court case that ruled in favor of the people's constitutional right to an environment free from pollution.

Why Are Residents Not Migrating From Quintero-Puchuncaví?

One in six deaths in the world involves diseases caused by pollution, three times more than from AIDS, malaria and tuberculosis combined and 15 times more than from all wars, murders and other forms of violence. - The Guardian, 2022³⁸

Living in a pollution hotspot like Quintero-Puchuncaví has disastrous impacts on human health and safety. But, if pollution and associated diseases are so deadly, what are non-migrators' motivations for staying in the Quintero-Puchuncaví sacrifice zone? This section explores the six rationales for the lack of migrations from this sacrifice zone. The first two rationales – financial struggles and educational deficiencies – highlight factors that prevent people from moving. The other four rationales – employment opportunities, place attachment, threat perception, and the desire to stay and fight for the community – provide reasons why people choose to stay.

The first rationale for non-migrations is a lack of financial resources. Although Chile is a high-income country, and highly ranked on the human development index, economic inequality remains a serious concern.³⁹ 49.6% of wealth is concentrated in the richest 1% of the population, while 80.4% of the wealth is held by the richest 10%.⁴⁰ This economic inequality, evidenced across Chile, is particularly prevalent in Quintero-Puchuncaví, which has some of the poorest communities in the Valparaíso region.⁴¹ In Quintero specifically, over 70% of the population is part of the most vulnerable social bracket, suffering from shortages of food, healthcare, work, social security, and housing.⁴² In 2018, the poverty rates in Quintero and Puchuncaví were 15.8% and 15% respectively, surpassing the regional and national averages of 12% and 11.7%.⁴³ The multidimensional poverty rates, poverty indicators that go beyond income to encompass socioeconomic factors such as health, education, and living conditions, are even more striking: Quintero and Puchuncaví reported rates of 26.7% and 23.4% compared to the regional and national levels of 18% and 20.9%.⁴⁴

Unemployment is another key indicator of the financial problems of the residents of Quintero-Puchuncaví. Historically, tourism has been a main source of employment in the region. However,

³⁸Gayle, "Millions Suffering."

³⁹Human Rights Council, *Visit to Chile*, 5.

⁴⁰Human Rights Council, *Visit to Chile*, 5.

⁴¹Human Rights Council, *Visit to Chile*, 11.

⁴²Concha, "Quintero y Puchuncaví."

⁴³Instituto Nacional de Derechos Humanos, *Informe misión de observación zona de Quintero y Puchuncaví* (Instituto Nacional de Derechos Humanos, 2018), 8. <https://bibliotecadigital.indh.cl/server/api/core/bitstreams/e9bf9331-8777-44ec-a332-882b66612299/content>.

⁴⁴Instituto Nacional de Derechos Humanos, *Informe misión de observación*, 8.

the increase in contamination, and its resultant media attention, has stigmatized the communities, driving tourists away. A 30-year resident of Ventanas recounted a conversation with friends who expressed fears of visiting the region and having their “skin...fall off.”⁴⁵ Another resident, an artisan, voiced her frustrations with the dwindling tourism industry, noting that she had not sold anything in three weeks.⁴⁶ The contamination also impacts the fishing industry, another major opportunity for employment. The elevated levels of heavy metals in the water have made much of the seafood inedible, with tests concluding that eight marine species contain high levels of arsenic.⁴⁷ One crab species was detected with arsenic levels 30 times higher than what is considered safe for human consumption.⁴⁸ Although residents rely on tourism and fishing, the industrial operations have forced many of these residents out of work. Without stable streams of income, and burdened by poverty, many residents are effectively “trapped” in Quintero-Puchuncaví.

The following testimonies attest to the financial hardships of the Quintero-Puchuncaví residents:

“We, especially for our daughters, have thought about moving, but due to economic reasons it has not been possible.”⁴⁹ “What do you do if you can’t afford to move to another city?”⁵⁰ “Those who have some money go to live in other places. But what choice do I have?”⁵¹ “Of course the poorest are the ones who suffer the most from the problem, because they can not afford to go elsewhere.”⁵² “[The poor] don’t have the capacity to fight or flee, they just have to stay.”⁵³

Even if some residents have the financial capacity to leave, another issue arises: Where will they go? In Chile, and particularly in major cities like Santiago, there is a housing and homelessness crisis, with only one new affordable home for every 10,000 people.⁵⁴ Costs are skyrocketing well above what families receive as a salary.⁵⁵ This housing crisis has led to a surge in homelessness, straining resources for those in need, and contributing to a 50% rise in crime rates since 2018.⁵⁶ The residents of Quintero-Puchuncaví, who are already pressed on resources, have no financial incentive to move and risk being unable to afford a place to live.

Beyond the financial constraints, environmentally influenced educational deficiencies and learning disabilities also hinder outmigration. With frequent school closures and high rates of learning disabilities because of the pollution, children struggle to enter into higher education or to find jobs that allow them to seek opportunities outside Quintero-Puchuncaví. The impact of pollution on

⁴⁵Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio: Contaminación, empleo y salud en Quintero y Puchuncaví* (Instituto Milenio Fundamentos de los Datos, 2022), 14. <https://imfd.cl/wp-content/uploads/2022/06/Monitor-IMFD-Actualizado.pdf>.

⁴⁶Instituto Nacional de Derechos Humanos, *Informe misión de observación*, 21.

⁴⁷Human Rights Council, *Visit to Chile*, 11.

⁴⁸Human Rights Council, *Visit to Chile*, 11.

⁴⁹José Núñez and Olgúin, “Los dolores que aquejan.”

⁵⁰José Núñez and Olgúin, “Los dolores que aquejan.”

⁵¹Human Rights Council, *Visit to Chile*, 10.

⁵²Fundación Terram, “Katta Alonso, activista ambiental: ‘La contaminación ha traído pobreza, delincuencia y narcotráfico,’” *Fundación Terram*, November 25, 2021. <https://www.terram.cl/katta-alonso-activista-ambiental-la-contaminacion-ha-traido-pobreza-delincuencia-y-narcotrafico/>.

⁵³Larsson, “The Brutal Reality”.

⁵⁴Agenda País, “Crisis de vivienda: En Santiago existe solo una vivienda nueva asequible por cada 10 mil personas,” *El Mostrador*, February 25, 2024. <https://www.elmostrador.cl/agenda-pais/agenda-social/2024/02/25/crisis-de-vivienda-en-santiago-existe-solo-una-vivienda-nueva-asequible-por-cada-10-mil-personas/>.

⁵⁵Martín Retamales Pacheco, “Expertos debaten sobre la actual crisis de vivienda que afecta a Chile,” *El Diario Inmobiliario*, April 10, 2024. <https://eldiarioinmobiliario.cl/noticias/expertos-debaten-sobre-la-actual-crisis-de-vivienda-que-afecta-a-chile/>.

⁵⁶Nayara Batschke, “Chile Confronts a Homelessness Crisis, a First for One of South America’s Richest Countries,” *LA Times*, July 14, 2024, <https://www.latimes.com/world-nation/story/2024-07-14/chileans-confront-a-homelessness-crisis-a-first-for-one-of-south-americas-richest-countries#:~:text=The%20central%20bank%20raised%20interest,Foundation%2C%20a%20Chilean%20think%20tank>.

schoolchildren is also evident through documented episodes of mass poisonings. In 2011, more than 40 children from the La Greda elementary school in Puchuncaví were taken to the hospital, falling ill from toxic gas and heavy metal exposure.⁵⁷ Following this incident, the school closed for 2-3 months, with classes relocating to shipping containers.⁵⁸ This shift away from a traditional schooling environment failed to provide stable or productive learning conditions for students. Similarly, between August and October of 2018, toxic gases poisoned 1,553 children in Quintero-Puchuncaví.⁵⁹ During this episode, local government officials declared a “yellow alert,” resulting in the indefinite suspension of classes and alterations in the school year programming. Although classes were held virtually and teachers remained in contact with students, some students lacked adequate home conditions and access to technology, impeding their ability to learn. These episodes of intoxication are a “double punishment” for school children, who are both “poisoned and deprived of their education.”⁶⁰ Frustrated, students have expressed feeling “lied to” and “disrespected,” as authorities have chosen to suspend classes and close educational facilities instead of regulating industrial activity.⁶¹

The contamination and poisoning has also generated fear amongst students which disrupts their ability to concentrate in class. One 14-year old student living near the Ventanas Industrial Complex noted, “My classmates and I are always afraid that something could happen to us while we are in class... We can’t go to school without worrying.”⁶² Another student shared that she is “afraid of dying from poisoning,” while another voiced concern that fellow classmates are “breathing poison and no one cares.”⁶³ Overall, one adult noted that children are “not learning” and struggling with “low IQs and learning difficulties.”⁶⁴ This observation is supported by exam data on Quintero-Puchuncaví students, who have some of the lowest test scores both regionally and nationally.⁶⁵

High rates of learning disabilities amongst schoolchildren, linked to pollution, further hinder their ability to leave Quintero-Puchuncaví. In an interview, one mother, a 25-year resident of Quintero shared her 5-year old son’s autism diagnosis, recounting how his doctors blamed exposure to heavy metals while she was pregnant.⁶⁶ This is not an isolated case; one resident acknowledged seeing many children with “neurological problems, congenital malformations, Down syndrome and a lot of autism.”⁶⁷ Records from the Annual Municipal Educational Plan of Puchuncaví show that the number of students entering special schools and programs is increasing. In 2012, 112 children attended these schools, and in 2017 there were 450 students.⁶⁸ The frequent school closures, the fear of illness, and the rise in learning disabilities highlight how many students are unable to complete their education or acquire the skills necessary to be able to get jobs outside of Quintero-Puchuncaví, since their “mind and body can’t take [the pollution].”⁶⁹

The following four rationales explain why people willingly stay in the region, the first being that

⁵⁷Anita Peña Saavedra, “Historic Victory of Citizens of Chile’s ‘Sacrifice Zone,’” *openDemocracy*, June 24, 2019. <https://www.opendemocracy.net/en/democraciaabierta/historic-victory-citizen-of-chile-sacrifice-zone/>.

⁵⁸Chloe Lauvergner, “‘We Know We’ll Die of Cancer’: Life in One of Chile’s Industrialised ‘Sacrifice’ Zones.” *France24*, June 17, 2022. <https://observers.france24.com/en/americas/20220620-we-know-we-ll-die-of-cancer-life-in-one-of-chile-s-industrialised-sacrifice-zones>.

⁵⁹Parra, “A Un Año de las Intoxicaciones Masivas.”

⁶⁰Lauvergner, “‘We Know We’ll Die of Cancer.’”

⁶¹Instituto Nacional de Derechos Humanos, *Informe misión de observación*, 19-20.

⁶²Camila Higuera, “Quintero-Puchuncaví: Una infancia asediada por un complejo industrial,” *Interferencia*, August, 15, 2021. <https://interferencia.cl/articulos/quintero-puchuncavi-una-infancia-asediada-por-un-complejo-industrial-0>.

⁶³Human Rights Council, *Visit to Chile*, 3.

⁶⁴Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 63.

⁶⁵Instituto Nacional de Derechos Humanos, *Informe Misión de Observación*, 8.

⁶⁶Higuera, “Quintero-Puchuncaví.”

⁶⁷Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 63.

⁶⁸Higuera, “Quintero-Puchuncaví.”

⁶⁹Larsson, “The Brutal Reality.”

its industries provide employment opportunities for residents. There is a general understanding in Quintero-Puchuncaví that while the “the companies pollute a lot,” they also “give... work,” creating a cycle of dependency on the industrial firms.⁷⁰ The industrial companies particularly exploit young people.⁷¹ These young workers, seeking more stable jobs than fishing or tourism, rely upon the industries’ wages, and are often willing to risk their health and wellbeing. One resident, when asked whether she would like to see the industries close, expressed unease at the idea, stating, “there is no work other than that.”⁷² Such testimonies underlines a key issue: despite the high levels of pollution introduced by industry, working for these companies remains a crucial source of income for many residents.

Understanding employment in Quintero-Puchuncaví requires recognition of how work within the industries is structured. Employment can be found either directly through the industries themselves or through contractors who provide services for the industries. Notably, in a 2017 census, only 5% of people in Quintero and 6% of people in Puchuncaví stated that they worked in the industrial sector, which seems to contradict the residents’ sentiments above.⁷³ However, this discrepancy can be explained by the fact that many residents are employed by contractors.⁷⁴ As a result, in the census data, individuals likely identified with the specific service sector they worked for, rather than the companies themselves.⁷⁵

The distinction between direct and indirect employment also has socioeconomic implications. Codelco, the Chilean national copper mining company that operates in Quintero-Puchuncaví, employs more than 2,000 workers, half of whom are directly employed by Codelco as plant workers and the other half of whom are employed through contractors. Of these workers, 80% are from Quintero-Puchuncaví.⁷⁶ The remaining 20% of workers, who come from outside the communities, tend to be employed directly by the companies and occupy higher skill administrative and leadership roles. These workers not only benefit from higher wages and economic stability, but are also free from chronic exposure to pollution, granting them both health and economic advantages. Their experience contrasts with the local residents employed in lower-skilled, contract-jobs, who are paid less and are constantly exposed to pollution, affecting their health and limiting their ability to accumulate the financial resources necessary to leave the region. While non-residents enjoy economic and health benefits, the local workers remain trapped in low paying jobs, faced with the dual burden of financial insecurity and health issues.

Alternatively, place attachment is another rationale for non-migration. Broadly speaking, place attachment is the bond that an individual or group has to a particular environment. Some in Quintero-Puchuncaví attribute this attachment to family ties; they “feel part of the whole Quintero Bay” since it is where they grew up, and where their family currently lives.⁷⁷ For others, place attachment manifests as an affinity for their community, with one resident expressing that she loves living in Quintero-Puchuncaví, frustrated that the industries sacrifice the region “in pursuit of what is called progress.”⁷⁸ Another resident stated, “I would not want to live anywhere else. Because I love my town, I love my land, I love where I live.”⁷⁹ Place attachment also manifests

⁷⁰Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 23.

⁷¹Concha, “Quintero y Puchuncaví.”

⁷²Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio* 36.

⁷³Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 21.

⁷⁴Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 45.

⁷⁵Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 23.

⁷⁶Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 22.

⁷⁷Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 41.

⁷⁸Paola Bolados García and Alejandra Sánchez Cuevas, “Una ecología política feminista en construcción: El caso de las ‘mujeres de zonas de sacrificio en resistencia,’ Región de Valparaíso, Chile,” *Psicoperspectivas* 16, no. 8 (2017): 76.

⁷⁹Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 41.

materialistically; another resident feels tied to the land because of homeownership, expressing that it took her “years to get a house” and thus she does not desire to leave.⁸⁰

However, the most common narratives associated with place attachment rely on memory. Residents reminisce about when “the quality of life was marvelous” and “the community lived off the ocean, the land, and tourism.”⁸¹ Katta Alonso, one of the foremost activists in Quintero-Puchuncaví, recalled coming to the region on vacation as a child, referring to the area as a “very nice community” where there were “unspoiled fishing coves” filled with “shellfish and fish of all kinds.”⁸² However, despite the love that many have for Quintero-Puchuncaví, pollution has taken a physical and emotional toll. Alonso, expresses her love for the communities and her “wonderful view of the sea,” but acknowledges that she is “drowning,” aware that she will soon need to move elsewhere.⁸³ The battle between wanting to both stay and leave is a common narrative in the region.

Threat perception also prevents residents from migrating. Environmental issues like pollution and climate change do not trigger an immediate response from the human brain in the same way that war or other forms of violence and persecution do.⁸⁴ Our brains are attuned to direct threats from agents like humans or animals. Although pollution and climate change are tied to human activity, we do not perceive these environmental issues as deliberate assaults on us by others.⁸⁵ Furthermore, environmental degradation tends to be slow and gradual, with individuals learning to live with the pollution over time, thus reducing its perceived threat level.⁸⁶

Since the contamination in Quintero-Puchuncaví has evolved, its residents have become habituated and adapted to this way of life. When the pollution first started, many residents did not even make the connection that they were living in a contaminated environment, simply becoming “used to the symptoms of poisoning.”⁸⁷ Especially for those born and raised in Quintero-Puchuncaví, “it seemed normal” that the industries “would make noise, throw smoke, ashes, a lot of things that are abnormal for anyone who lives outside of the area.”⁸⁸ As one resident bluntly stated, “one gets used to it.”⁸⁹ However, despite the emergence of new information on the dangers of the contamination, some residents continue to simply see the pollution as an inherent part of their daily lives. One resident expressed that she does not want to move, acknowledging that moving would not change the fact that “heavy metals are already in [her] body.”⁹⁰ This perspective reflects residents’ broader acceptance of pollution, which is so ingrained in their daily lives, that it has become less of a threat.

The sixth and final rationale for the lack of outward migration from the Quintero-Puchuncaví sacrifice zone is the residents’ desire to fight for their communities. As one resident aptly expressed, “those of us who live here fight against an industrial hub that gives billions of pesos to this country.”⁹¹ Frustrated by the economic power of the industries and their exploitation of residents, many feel that it is their duty to raise awareness for the environmental and human health dangers

⁸⁰Lauvergner, “We Know We’ll Die of Cancer.”

⁸¹Larsson, “The Brutal Reality”

⁸²Cristian González Farfán, “El testimonio de tres defensoras del medio ambiente: Katta Alonso, Valentina Escuti, y Camila Calderó-Quirgas,” *País Circular*, March 8, 2024. <https://www.paiscircular.cl/medio-ambiente/mujeres-8m/>.

⁸³Fundación Terram, “Katta Alonso, activista ambiental.”

⁸⁴Alisha Chang, “Why Climate Change Threats Don’t Trigger an Immediate Response from Human Brains,” Produced by NPR. *All Things Considered*, December 12, 2019. <https://www.npr.org/2019/12/12/787552712/why-climate-change-threats-dont-trigger-an-immediate-response-from-human-brains>.

⁸⁵Chang, “Why Climate Change Threats.”

⁸⁶Chang, “Why Climate Change Threats.”

⁸⁷Bolados García and Sánchez Cuevas, “Una ecología política feminista en construcción,” 38.

⁸⁸Instituto Milenio Fundamentos de los Datos, Zona de Sacrificio, 11.

⁸⁹Espinoza Soto, et. al., “Trayectorias marcadas,” 57; Concha, “Quintero y Puchuncaví.”

⁹⁰Lauvergner, “We Know We’ll Die of Cancer.”

⁹¹Higuera, “Quintero-Puchuncaví.”

that the industries cause. In 2004, photographer Alberto González left Santiago and moved back to Quintero-Puchuncaví to bring awareness to the pollution that has become an everyday reality for residents.⁹²

The campaign often focuses on the region's children. One resident asserted that her "fight is for them, for the children who every time there is a preventative alert have to stay inside a room without being able to play."⁹³ Echoing this sentiment, one teacher affirmed her determination "to make [her] students aware that they have the right to health and education, and to be able to live in an unpolluted environment."⁹⁴ Similarly, activist Katta Alonso remains in the community to ensure that the government and the companies do not "leave a world like this to the new generations."⁹⁵ Advocating for the community ensures that future residents can thrive and positively contribute to society, instead of being collateral damage in the pursuit of economic development.

However, despite the lack of migrations out of the Quintero-Puchuncavi sacrifice zone, it is also important to consider those who have chosen to leave, with one resident asserting that "it's not an option to live in that place." Another resident shared that although there is the "pain of having to leave your job of more than 10 years" and "the house you bought to live there," it is all useless if there is a risk of dying.⁹⁶ However, the decision is by no means easy; residents can "want to stay but they can also want to leave."⁹⁷ The nature of this decision-making process is deeply personal, with one resident reflecting: "do I continue living here or do I go?" and "if I stay, what do I do?"⁹⁸ The majority of residents ultimately stay in Quintero-Puchuncaví, forced to navigate the difficult balance between health risks, economic necessity, social ties, and a desire to see their community prosper once again.

Evaluating the Chilean Government's Responsibility Towards Environmentally At-Risk Communities

"The residents must look at this problem [of development] with a patriotic spirit and accept some sacrifices; otherwise, the foundry could not be installed anywhere in the country. The nations that have become industrialized have accepted these sacrifices. It is the price of progress." - El Mercurio de Valparaíso, 1957⁹⁹

The language of patriotism and sacrifice reinforces an important question: if people are unwilling or unable to move, is the government responsible for protecting the residents of Quintero-Puchuncaví, or are they simply collateral damage in the pursuit of economic development? Under its domestic environmental laws and international environmental agreements, the Chilean government is legally responsible for protecting the residents from environmental harm. This section evaluates the environmental commitments made by the Chilean government, the government's failure to fulfill these promises, and the underlying reasons for its inability to safeguard its citizens.

To evaluate the Chilean government's responsibility to protect its residents, I begin with an analysis of Chilean environmental laws. The formative document of the Chilean government, the Constitution, explicitly declares that the government is required to protect the people from pollution. Article 19, Number 8 of the Constitution asserts that citizens have "the right to live in an

⁹²José Núñez and Olgún, "Los dolores que aquejan."

⁹³Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 23.

⁹⁴Lauvergnier, "We Know We'll Die of Cancer."

⁹⁵González Farfán, "El Testimonio de Tres Defensoras del Medio Ambiente."

⁹⁶Espinoza Soto, et. al., "Trayectorias marcadas," 61.

⁹⁷Transiskus and Bazarbash, "Beyond the Binary of Trapped," 102803.

⁹⁸Bolados García and Sánchez Cuevas, "Una ecología política feminista en construcción," 39.

⁹⁹Liberona Céspedes and Ramírez Rueda, "Antecedentes y Reflexiones," 24.

environment free from contamination” and that it is the “duty of the State to ensure that this right is not jeopardized.”¹⁰⁰ This line is reinforced in Article 20, which stipulates that if deliberate or negligent pollution affects a person’s well-being, the individual has the right to take legal action to stop the pollution.¹⁰¹ The mere existence of the Quintero-Puchuncaví sacrifice zone violates Chileans’ constitutional right to live in an environment free from pollution, and thereby, the residents of these communities have the authority to take legal action against the industries. Chile’s supposed commitment to the environment is also evident in its environmental laws. In 1994, the Chilean government enacted Law 19300, the first and most comprehensive environmental law, known as the Law on General Bases of the Environment. This law outlined environmental regulations, the environmental impact assessment process, the different environmental ministries, and the rights to public access to environmental information.¹⁰² A key provision of this law is that anyone causing environmental harm must restore the affected ecological landscapes or compensate for the damages.¹⁰³ In the case of Quintero-Puchuncaví, this provision suggests that both the Chilean state and domestic and international corporations operating in the area must remediate the environment or provide restitutions. However, one resident expressed her dislike for the compensation approach, arguing that residents “do not deserve compensation” but “a place free from pollution.”¹⁰⁴ Repayment allows for “business as usual,” as the companies simply pay off residents without ever having to stop ecological destruction.

Laws 20417 and 20600 further reveal the Chilean government’s supposed commitment to the environment. Law 20417 establishes new environmental agencies. One such agency is the Ministry of the Environment, which advises the Chilean president on policies, plans, and programs for environmental protection, sustainable development, and natural resources management.¹⁰⁵ The law also institutes the Superintendent for the Environment, who enforces compliance with environmental laws and regulations.¹⁰⁶ Furthermore, Law 20600 establishes three environmental courts, which have jurisdiction over Northern, Central, and Southern Chile. The courts give the aforementioned Superintendent of the Environment the power to prosecute environmental violations.¹⁰⁷ Specifically, these courts hear cases related to areas designated as “latent” or “saturated” with “saturated zone” being another name for a sacrifice zone.¹⁰⁸ The law’s use of the term “saturated” underscores that the Chilean government acknowledges that these sacrifice zones are in fact harmful. The final Chilean law related to the environment is Law 21595.¹⁰⁹ Through Article 45 of this law, the government adds Articles 305, 306, 308, and 310 to the Penal Code, which explicitly define what constitutes an environmental crime.¹¹⁰ According to Article 305, courts can find individuals criminally liable if they fail to complete an Environmental Impact Assessment while being aware that an activity causes air, water, or soil pollution.¹¹¹ Article 306 calls for the courts to prosecute anyone who fails to comply with emission and environmental quality standards, decontamination or environmental management plans, or any other sanctioned environmental standard.¹¹² Articles

¹⁰⁰Constitución Política de la República de Chile [C.P.] art. 19, no. 8.

¹⁰¹Constitución Política de la República de Chile [C.P.] art. 20.

¹⁰²Chilean Law No. 19300, Law on General Bases of the Environment, March 9, 1994.

¹⁰³Chilean Law No. 19300, Law on General Bases of the Environment, Art. 51-55, March 9, 1994.

¹⁰⁴Bolados García and Sánchez Cuevas, “Una ecología política feminista en construcción,” 39.

¹⁰⁵Chilean Law No. 20417, Creates the Ministry of the Environment, the Environmental Evaluation Service, and the Environmental Superintendency, January 26, 2010.

¹⁰⁶Chilean Law No. 20417, Creates the Ministry of the Environment, the Environmental Evaluation Service, and the Environmental Superintendency, January 26, 2010.

¹⁰⁷Chilean Law No. 20600, Environmental Courts, June 28, 2012.

¹⁰⁸Chilean Law No. 20600, Environmental Courts, Art. 17, June 28, 2012.

¹⁰⁹Chilean Law No. 21595, Economic Crimes Law, August 17, 2023.

¹¹⁰Chilean Law No. 21595, Economic Crimes Law, Art. 48, August 17, 2023.

¹¹¹Chilean Law No. 21595, Economic Crimes Law, Penal Code Amendment, Art. 305, August 17, 2023.

¹¹²Chilean Law No. 21595, Economic Crimes Law, Penal Code Amendment, Art. 306, August 17, 2023.

308 and 310 allow the courts to charge companies committing environmental offenses that result in prolonged environmental impacts that are difficult to restore.¹¹³ Article 57 of Law 21595 amends the aforementioned Law 20417, establishing criminal liability for anyone who maliciously conceals, alters, or falsifies information in the environmental assessments, fails to comply with sanctioned closures, or obstructs environmental inspections.¹¹⁴ Based on the Constitution and the four aforementioned Chilean environmental laws, it is clear that Chile has ample environmental protections and regulations. However, I argue that in practice the government has failed to uphold these laws, evident through the lack of action addressing the contamination in Quintero-Puchuncaví. International agreements also support Chile's stated commitment to environmental protection. First, in 2022 Chile was among the 161 United Nations voting members that ratified the UN General Assembly Resolution on the Human Right to a Clean, Healthy, and Sustainable Environment.¹¹⁵ Although UN resolutions are not legally binding, Chile's signature highlights its willingness and ability to take steps towards safeguarding the environment for the protection and promotion of human health and safety.

Chile's ratification of the Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean, also known as the Escazú Agreement in 2022, further exhibits its supposed international commitment to the environment.¹¹⁶ This agreement focuses on the right of the people to access environmental information and requires governments to involve the public in environmental decision-making.¹¹⁷ It also highlights justice, requiring the state to ensure accountability when companies or governments violate environmental rights.¹¹⁸ What sets this document apart, however, is its specific provisions to protect environmental defenders, demanding governments investigate and prosecute individuals who threaten or attack these defenders.¹¹⁹ Chile, along with Costa Rica, was at the forefront of the drafting process for the Escazú Agreement. However, due to pressure from mining and manufacturing industries, former Chilean president Sebastián Piñera initially neglected to sign the treaty –highlighting the influence that industry has on political decisions.¹²⁰ Only when current president Gabriel Boric assumed the presidency was the agreement signed as a “key commitment of the government's green agenda.”¹²¹ The Chilean Senate officially ratified the treaty in June 2022, making this agreement legally binding.¹²² Despite the ratification of this treaty, the continued pollution in Quintero-Puchuncaví contradicts this apparent progress. Another question thus arises: Why has the government failed to uphold these laws and agreements? One answer is the interconnectedness between the government and the industries for the purpose of economic growth. Governments view industrial progress as a development tactic and a key feature of integration into the global economic system. The narrative surrounding the development of the Ventanas Industrial Com-

¹¹³Chilean Law No. 21595, Economic Crimes Law, Penal Code Amendment, Art. 308 & 310, August 17, 2023.

¹¹⁴Chilean Law No. 21595, Economic Crimes Law, Art. 57, August 17, 2023.

¹¹⁵UN General Assembly, Resolution 73/300, The Human Right to a Clean, Healthy and Sustainable Environment, July 28, 2022, <https://documents.un.org/doc/undoc/gen/n22/442/77/pdf/n2244277.pdf>.

¹¹⁶“Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean,” open for signature Sept. 28, 2018, United Nations Treaty Series. <https://repositorio.cepal.org/server/api/core/bitstreams/7e888972-80c1-48ba-9d92-7712d6e6f1ab/content>.

¹¹⁷“Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean,” Art. 5-7.

¹¹⁸Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean,” Art. 8.

¹¹⁹“Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean,” Art. 9.

¹²⁰Deutsche Welle, “Acuerdo de Escazú es ratificado por el Senado de Chile,” *Deutsche Welle*, June 1, 2022. <https://www.dw.com/es/acuerdo-de-escazu%C3%BA-es-ratificado-por-el-senado-de-chile/a-61992287>.

¹²¹Government of Chile, “Why is it so important for Chile to be part of the Escazú Agreement?,” Government of Chile, April 20, 2022. <https://www.gob.cl/en/news/why-it-so-important-chile-be-part-escazu-agreement/>.

¹²²Deutsche Welle, “Acuerdo de Escazú es ratificado.”

plex in Quintero-Puchuncaví was no different. Since the beginning of Chile's era of transition to an export-oriented economy in the 1950s, the government framed this zone as an opportunity for work and progress, the so-called "engine of economic growth," moving Chile to the ranks of more developed countries capable of competing with the Global North.¹²³ Although many residents initially protested these projects, particularly farmers who recognized that industrial development would reduce available farm land and crop yields, the government dismissed their concerns.¹²⁴ One resident, recognizing the intrinsic connection between the state and industry, asserted that locals are accustomed to government rhetoric framing industrial development as part of a "national project," justifying the continued environmental degradation and human health harm in Quintero-Puchuncaví.¹²⁵

Since the Quintero-Puchuncaví industrial zone is part of the Chilean government's vision for development and economic growth, there is little political incentive to address the pollution. If the government upheld its environmental laws, the industrial complex would have to close, or severely reduce production, which impedes upon the state's vision of economic progress. Furthermore, the businesses themselves will not make changes on their own, as companies do not want to assume environmental costs beyond current regulations. One resident noted that, "there is no political will to end the sacrifice zone" since Chilean law "favors the business sector."¹²⁶ Government implementations of environmental and human health frameworks would not only impede the neoliberal philosophy of minimal regulations, but it would also bring forth an economic consequence: reduced profits.¹²⁷

The following statements attest to the residents' frustration with the state's prioritization of the industries and its failure to address the contamination:

*"[The state] wants to profit, profit, profit from all [the industries], but they do not want to put in the framework for the environment or for the health of the people."*¹²⁸

*"At the beginning [the industries] were disguised as an opportunity for work and progress. People bought into it. But eventually people started noticing this wasn't true."*¹²⁹

*"Unfortunately the Chilean regulations are very lax... insufficient to control what has happened here."*¹³⁰

*"The government told us that there would be no more peaks [in contamination] and they have failed... they lied to us, they let us down."*¹³¹

*"The pollution ultimately has to do with structural issues that are in the constitution, the constitution allows, through this neoliberal system, to live in sacrifice zones."*¹³²

Although the Chilean state has overwhelmingly failed to uphold its environmental laws and regulations, the Supreme Court found the state liable for these violations in a landmark case known as Francisco Chahuán v. Empresa Nacional de Petróleo.¹³³ The plaintiffs accused the state and private companies of negligence for failing to prevent environmental destruction largely without consequences, thereby violating their constitutional right to a clean environment.¹³⁴ The

¹²³Larsson, "The Brutal Reality."

¹²⁴Liberona Céspedes and Ramírez Rueda, "Antecedentes y Reflexiones," 24.

¹²⁵Instituto Milenio Fundamentos de los Datos, Zona de Sacrificio, 14.

¹²⁶González Farfán, "El testimonio de tres defensoras del medio ambiente."

¹²⁷Espinoza Soto, et. al., "Trayectorias marcadas," 61.

¹²⁸Espinoza Soto, et. al., "Trayectorias marcadas," 62.

¹²⁹Larsson, "The Brutal Reality."

¹³⁰Concha, "Quintero y Puchuncaví."

¹³¹Parra, "A Un Año de las Intoxicaciones Masivas."

¹³²Bolados García and Sánchez Cuevas, "Una ecología política feminista en construcción," 39.

¹³³Francisco Chahuán contra Empresa Nacional de Petróleo, ENAP S.A., Case No. 5888-2019, Judgement, 28 May 2019, https://juris.pjud.cl/busqueda/pagina_detalle_sentencia?k=M3RCeEQ2V0htL09lZnh5WXB5b0RTdz09.

¹³⁴Francisco Chahuán contra Empresa Nacional de Petróleo, ENAP S.A., Case No. 5888-2019, Judgement, 28 May 2019, https://juris.pjud.cl/busqueda/pagina_detalle_sentencia?k=M3RCeEQ2V0htL09lZnh5WXB5b0RTdz09.

court ruled that the economic benefits of the industries do not justify their negative environmental and human health and safety impacts. Resultantly, the state was ordered to conduct studies to determine the extent of the pollution and develop an action plan to reduce emissions.¹³⁵ The ruling also requires the state to diagnose diseases linked to pollution, implement better health programs, and establish a public information forum.¹³⁶ However, despite the ruling, there have been ongoing delays and barriers to the implementation of these measures. Although the Ministry of the Environment has taken steps to identify some of the pollutants like sulfur dioxide, nitrogen oxide, and volatile organic compounds like benzene, toluene, ethylbenzene, and xylene, there have been no meaningful reductions in emissions.¹³⁷ Accordingly, mass poisonings continue to affect students and teachers.¹³⁸ As of 2024, the state has yet to fulfill the parameters of this ruling, evidencing the state's negligence and leaving the residents in a "situation of permanent risk and vulnerability."¹³⁹

Despite the Supreme Court ruling, the government continues to approve new industrial projects. One of these is the Aguas Pacífico desalination plant, a facility that removes salt and other minerals from ocean water, producing fresh water for human consumption and industrial use.¹⁴⁰ The project started with the objective of supplying water to the industrial sector, particularly to the London-based mining company Anglo America.¹⁴¹ However, Aguas Pacífico has since reframed its project as an essential contributor to national security, signing a contract with rural sanitation services to provide potable water for rural areas.¹⁴² Despite this contract, the majority of the water will still support industrial activity. One resident, seeing through the national security narrative, bluntly stated that the water is for "industrial use, not for drinking."¹⁴³

Although Chile has domestic laws and international agreements concerning environmental and human health protection, its government has failed to uphold them. Due to the connection between the government and the companies, and the prioritization of economic progress, there is little political interest in addressing environmental harm. Although the Supreme Court ruled in favor of the people of Quintero-Puchuncaví, the measures outlined in the sentencing have not been upheld; more strikingly, the government continues to approve new projects.

The Role of Activism and Policy Change to Bring Forth Positive Progress

"Today we have a government that declares itself feminist, that promises to put an end to sacrifice zones. Otherwise, they would still be making decisions in the best interest of the macroe-

¹³⁵Francisco Chahuán contra Empresa Nacional de Petróleo, ENAP S.A., Case No. 5888-2019.

¹³⁶Francisco Chahuán contra Empresa Nacional de Petróleo, ENAP S.A., Case No. 5888-2019.

¹³⁷Francisca Mayorga, "Quintero y Puchuncaví: A tres años del fallo de la Corte Suprema, los episodios de contaminación no paran," *La Tercera*, May 26, 2022, <https://www.latercera.com/nacional/noticia/quintero-y-puchuncavi-a-tres-anos-del-fallo-de-la-corte-suprema-los-episodios-de-contaminacion-no-paran/LR5DNYXBIZASRB7ZN64PTM2SWY/#>.

¹³⁸Mayorga, "Quintero y Puchuncaví."

¹³⁹Defensoría Ambiental, "Infeliz 5° aniversario: Cinco años de incumplimiento de la sentencia de la Corte Suprema," *Defensoría Ambiental*, July 3, 2024, <https://www.defensoriaambiental.org/infeliz-5-aniversario-cinco-anos-de-incumplimiento-de-la-sentencia-de-la-corte-suprema/>.

¹⁴⁰Erika Cabrera Cortés, "Seis visiones sobre la planta desalinizadora multipropósito que se construye en Puchuncaví," *País Circular*, May 7, 2024, <https://www.paiscircular.cl/agua/seis-visiones-sobre-la-planta-desalinizadora-multiproposito-que-se-construye-en-puchuncavi/>.

¹⁴¹Cabrera Cortés, "Seis visiones sobre la planta desalinizadora."

¹⁴²Cabrera Cortés, "Seis visiones sobre la planta desalinizadora."

¹⁴³Cabrera Cortés, "Seis visiones sobre la planta desalinizadora."

economy, but detrimental to people's lives."¹⁴⁴ — Alejandra Donoso, North American Congress on Latin America, 2022

In 2022, environmental activist Alejandra Donoso praised the Chilean government's decision to close down the Codelco copper smelter, reflecting the endurance of hope in Quintero-Puchuncaví. In addition to the closure of the Codelco copper smelter, half of the AES Gener thermoelectric plant ceased operations. In this section, I will discuss how these closures result from the work of activists combined with new governmental policies and plans.

Activism has played a formative role in generating greater awareness for the dangers associated with industrial contamination. One of the most powerful activist voices in Quintero-Puchuncaví is Katta Alonso, the founder of MUZOSARE, or the Women of Quintero-Puchuncaví Sacrifice Zone in Resistance.¹⁴⁵ This grassroots feminist group advocates for environmental justice, fighting specifically for the improvement of health outcomes for women and children.¹⁴⁶ These organizations contribute to an alternative narrative that is not based on the struggles and exploitation of the residents, but rather on a sense of belonging that encourages residents to defend themselves and their homes.¹⁴⁷

One tactic that Katta Alonso and MUZOSARE utilize is lobbying, both domestically and internationally. At the domestic level, Alonso and her team have met with mayors, governors, and regional environmental ministers, even going to Congress several times to participate in sessions of the Environmental Commission. While their lobbying efforts have been largely unsuccessful, in 2017, Alonso and MUZOSARE urged the Valparaíso Regional Comptroller to reject the proposed decontamination plans for the sacrifice zone, citing the plan's failure to generate meaningful and effective reductions in pollution levels.¹⁴⁸ With the Chilean government's inaction, Alonso has turned to the global stage. In 2018 she traveled to the UN headquarters in Vitacura, Chile to talk about the human rights violations in Quintero-Puchuncaví.¹⁴⁹ She also spoke at the 2019 Inter-American Commission on Human Rights' 171st period of sessions in Bolivia, where she urged Chile to align its laws and regulations in accordance with WHO standards, implement new and strong regulations that protect soil, air, and water, and reduce maximum breathable concentrations of arsenic and organic compounds.¹⁵⁰

While these meetings have garnered mostly international attention, Chilean politicians are also beginning to recognize Alonso and her organization. She particularly attracted the attention of Cristian Cáceres, the Presidential Delegate for the Management of the Socio-Environmental Crisis of Concón and Quintero and Puchuncaví. The two met in May of 2024, initiating a source of permanent communication between the residents and the central government, allowing the government to better understand community needs through the perspectives of actual residents. These meetings and lobbying efforts forced the government to pay more attention to the reality of living in Quintero-Puchuncaví.¹⁵¹

Alonso and MUZOSARE are also utilizing research as a tool for activism. Since the government

¹⁴⁴Angelina de los Santos, "Women Win Decades-Long Clean Air Battle in Chile's Own 'Chernobyl'," *North American Congress on Latin America*, July 21, 2022, <https://nacla.org/women-win-decades-long-clean-air-battle-chile-own-chernobyl>.

¹⁴⁵Peña Saavedra, "Historic Victory."

¹⁴⁶Peña Saavedra, "Historic Victory."

¹⁴⁷Katia Valenzuela-Fuentes, Esteban Alarcón-Barrueto, and Robinson Torres-Salinas, "From resistance to creation: Socio-environmental activism in Chile's 'sacrifice zones'," *Sustainability* 13, no. 6 (2021): 3481.

¹⁴⁸Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 63.

¹⁴⁹Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 64.

¹⁵⁰Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 64-65. *Note: Also referenced as Peña Saavedra, "Historic Victory."*

¹⁵¹Radio Festival, "Delgado Cáceres se reunió con dirigentes de Mujeres de Zona de Sacrificio en Resistencia de Quintero-Puchuncaví," *Radio Festival*, May 15, 2024. <https://www.radiofestival.cl/delegado-caceres-se-reunio-con-dirigentes-de-mujeres-de-zona-de-sacrificio-en-resistencia-de-quintero-v-puchuncavi/>.

has failed to carry out adequate investigations on the negative health and environmental impacts of the industries, the group has partnered with research organizations to conduct their own studies. First, the group collaborated with the Colegio de Médico de Chile, the national medical association, to document miscarriages, cancers, and cardiovascular and respiratory diseases, particularly in women and children.¹⁵² The group also worked with local fishermen to monitor environmental damage through photographic evidence of on- and off-shore pollution.¹⁵³ Finally, the women of MUZOSARE worked with Waterkeeper Alliance, a New York-based organization fighting for the right to clean water. They collected water samples from different wells in Quintero-Puchuncaví, finding that the water was a “toxic soup of heavy metals,” with particularly high levels of aluminum, arsenic, barium, chromium, nickel, cobalt, copper, lead, and zinc.¹⁵⁴ In one of the wells, the levels of arsenic were 15 times higher than the WHO’s standards.¹⁵⁵ Through these research efforts, MUZOSARE has quantified the pollution and its human health impacts, aiding in residents’ understanding of the causes behind elevated rates of disease.

While lobbying and research efforts are important, these forms of activism require a certain level of expertise. However, other forms of activism like marches, protests, community forums, and educational workshops allow for more widespread community participation. After the mass poisoning episode in 2018, residents of Quintero-Puchuncaví took to the streets, waving black flags and beating drums, demanding new environmental legislation and better living conditions.¹⁵⁶ While the march began peacefully, police eventually arrested thirteen people for disturbing public order, highlighting the state’s determination to prevent public discourse surrounding the contamination.¹⁵⁷ Also following the 2018 mass poisoning, residents renamed one of their main plazas “La Plaza de Dignidad,” or Dignity Plaza. This site transformed into an informal town hall where families could discuss their concerns, and committees created plans of action for addressing government negligence.¹⁵⁸ Finally, workshops have also become a tool for activism with children and adolescents creating educational workshops to teach the community about the dangers of pollution.¹⁵⁹

As activism has helped raise more governmental attention towards the contamination, new governmental policies and plans have resulted in the closure of the Codelco copper smelter and half of the AES’ thermoelectric plant. The government targeted its first set of new plans and initiatives towards addressing the coal-fired thermoelectric plants. In 2019, under the leadership of President Sebastián Piñera, Chile published its first report detailing the phase-out of coal-fired thermoelectric power plants. The plan called for the plants to shut-down by 2040, with the first stage of closures beginning in 2024.¹⁶⁰ To reinforce the country’s determination to move beyond coal power, Chile joined the Powering Past Coal Alliance in 2021 an alliance comprising countries, cities, regions, and companies taking concrete steps to phase out coal.¹⁶¹ Through their membership in this alliance,

¹⁵²Peña Saavedra, “Historic Victory.”

¹⁵³Peña Saavedra, “Historic Victory.”

¹⁵⁴Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 62.

¹⁵⁵Instituto Milenio Fundamentos de los Datos, *Zona de Sacrificio*, 62.

¹⁵⁶Jonathan Galarce, “Marcha en Quintero termina con 13 detenidos y crece la tensión,” *La Tercera*, September 8, 2018, <https://www.latercera.com/nacional/noticia/marcha-quintero-termina-13-detenidos-crece-la-tension/313411/#>.

¹⁵⁷Galarce, “Marcha en Quintero.”

¹⁵⁸Jose Olavarria, “Mujeres en la ‘zona de sacrificio’: La lucha de las integrantes del Cabildo Abierto Quintero-Puchuncaví,” *El Mostrador*, September 23, 2018, <https://www.elmostrador.cl/noticias/pais/2018/09/23/mujeres-en-la-zona-de-sacrificio-la-lucha-de-las-integrantes-del-cabildo-abierto-quintero-puchuncavi/>

¹⁵⁹Espinoza Soto, et. al., “Trayectorias marcadas,” 59.

¹⁶⁰Ministry of Energy, *Plan of Phase-out and/or Reconversion of Coal Units* (Government of Chile, 2020), 6. https://energia.gob.cl/sites/default/files/folleto_estrategia_desc_eng_30102020.pdf

¹⁶¹Government of Chile, “Chile announces that it will work to put an end to coal by 2030 after joining the Powering Past Coal Alliance,” *Government of Chile*, November 5, 2021. <https://www.gob.cl/en/news/chile-announces-it-will-work-put-end-coal-use-2030-after-joining-powering-past-coal-alliance/#:~:text=Chile%20has%20been%20invited%20to,generation%20to%20clean%2C%20renewable%20energy> Note: Original URL contained special characters.

Chile acknowledges that they are hoping to accelerate the phase-out of coal to 2030 instead of the original timeline of 2040.¹⁶² The government's coal-phase plan has seen some positive progress, particularly in Quintero-Puchuncaví, evidenced through the closure of two out of the four AES coal-powered thermoelectric units.¹⁶³ The company retired Unit 1 and Unit 2 in 2020 and 2023 respectively, and Units 3 and 4 are set to close by 2025.¹⁶⁴ Although AES has not fully closed the plant, its partial closure signals efforts to shut down more heavily polluting industries.

Another policy change was introduced under the leadership of the current president, Gabriel Boric. Boric campaigned on a platform of environmental reform, taking office in March of 2022 and pledging to take a strong stance on climate change and environmental degradation.¹⁶⁵ In 2022, his administration passed the Climate Change Framework Law.¹⁶⁶ This law not only includes a goal of net-zero emissions by 2050, but it also decentralizes the country's climate change agenda, requiring all government agencies to implement climate change management plans, and taking on a holistic approach to the climate crisis.¹⁶⁷ However, Boric's more consequential environmental reform was his call for the 2023 closure of the Codelco copper smelter in Quintero-Puchuncaví.¹⁶⁸ Since Codelco is a state-owned company, Boric asserted that the country "[could not] allow economic development to be contradictory to the care and protection of the environment."¹⁶⁹ He also proclaimed that the closure would be orchestrated to safeguard the "well-being of all citizens," but particularly those more directly impacted by the "exclusive and unequal socioeconomic model that exists in the sacrifice zone."¹⁷⁰ Hernán Ramírez, an official in the Ministry of the Environment, reiterated these sentiments, focusing on how the state was "strongly committed to effectively transforming Quintero and Puchuncaví into an environmental recovery zone."¹⁷¹ Despite the closure, the sacrifice zone remains largely unchanged. The shutdown of Codelco, significant as a state-owned company, was thus more a symbolic gesture aimed at showcasing the country's progress than a substantive change.

Despite the government finally taking action to address the contamination in Quintero-Puchuncaví, there have been mixed reactions to the closure of the Codelco plant. Many residents have reacted positively, equating the fight in Quintero-Puchuncaví to "David against Goliath."¹⁷² Others have expressed how this decision is an "achievement for all," looking fondly on the Boric administration as one that "promises to put an end to sacrifice zones."¹⁷³ However, not everyone has expressed excitement over the plant's closure. In 2022, the mayor of Quintero voiced concern for the closure, pointing to the 320 plant workers and 400 contract workers who would be left out of work.¹⁷⁴ Others expressed similar worries, recognizing that while Codelco is a major source of pollution, it also "provides the most employment within the community of Quintero and Puchuncaví."¹⁷⁵

¹⁶²Government of Chile, "Chile announces."

¹⁶³Superintendencia del Medio Ambiente del Gobierno de Chile, "Quintero: SMA inicia proceso sancionatorio contra AES Gener por incumplimientos ambientales," *Superintendencia del Medio Ambiente del Gobierno de Chile*, October 2, 2019, <https://portal.sma.gob.cl/index.php/quintero-sma-inicia-proceso-sancionatorio-contra-aes-generpor-incumplimientos-ambientales/>

¹⁶⁴Global Energy Monitor, "Ventanas Power Station," *Global Energy Monitor*, July 17, 2024, https://www.gem.wiki/Ventanas_power_station

¹⁶⁵Al Jazeera, "Chile's New President Boric Signs Escazu Environmental Treaty," *Al Jazeera*, March 18, 2022, <https://www.aljazeera.com/news/2022/3/18/chile-new-president-boric-signs-escazu-environmental-treaty>.

¹⁶⁶Chilean Law No. 43277, Climate Change Framework Law, June 13, 2022.

¹⁶⁷Chilean Law No. 43277, Climate Change Framework Law, June 13, 2022.

¹⁶⁸De los Santos, "Women Win Decades-Long Clean Air Battle."

¹⁶⁹Matías Vasquez, "Cierre de Ventanas: ¿Qué opinan las dirigentas sociales de Quintero-Puchuncaví?," *CNN Chile*, June 26, 2022, https://www.cnnchile.com/pais/cierre-ventanas-opinion-dirigentas-quintero-puchuncavi_20220626/.

¹⁷⁰Vasquez, "Cierre de Ventanas."

¹⁷¹De los Santos, "Women Win Decades-Long Clean Air Battle."

¹⁷²De los Santos, "Women Win Decades-Long Clean Air Battle."

¹⁷³De los Santos, "Women Win Decades-Long Clean Air Battle."

¹⁷⁴Vasquez, "Cierre de Ventanas."

¹⁷⁵Vasquez, "Cierre de Ventanas."

As much as the closure of the plant signals positive progress towards environmental protection, it simultaneously worsens issues such as unemployment that already heavily impact the residents of Quintero-Puchuncaví.

The work of activist groups to raise more awareness for the dangers of the industrial contamination, combined with progressive new political policies and initiatives, have notably led to the closure of two of the industries in the sacrifice zone. While acknowledging the positive progress that has been made is important, the termination of two industries will not erase over fifty years of environmental degradation and human health issues.

Conclusion

Financial struggles, educational deficiencies, employment opportunities, place attachment, threat perception, and the determination to fight for the community all play a role in non-migration from Quintero-Puchuncaví. Ultimately, the residents should not be forced to leave these communities given that the government is responsible for protecting the environment and the people, as established by the Constitution, environmental laws, and international agreements. However, due to the ties between the state and the industries for economic growth, the Chilean government has failed to protect the people. While community activism and new political policies and initiatives have led to the closure of two of the industries in the sacrifice zone, these closures alone will not bring justice to the residents nor will they remediate decades worth of pollution.

The simplest way to reduce contamination would be to halt all industrial activity in the region. However, widespread closure is unlikely as these industries drive economic development, and they are also a major source of employment for the region's residents. Thus, future development efforts must instead put sustainability and justice at the forefront. One sustainable industry that Chile may seek to develop is renewable energy. Chile's geography is perfectly suited for nearly all types of renewable energy development. Solar power capabilities are particularly powerful in the northern and central parts of the country, the southern regions could benefit from wind power, and the coasts could produce energy from tides and waves.¹⁷⁶ There are also areas throughout the country that could benefit from geothermal and hydroelectric energy, particularly in Chile's more mountainous regions.¹⁷⁷ The development of renewable energy in Chile not only has the potential to replace fossil fuel use, but it could also help the economy grow more sustainably. Renewable energy development also creates new jobs, improves human capital development through skills training and education opportunities, and stimulates economic activity through increased spending and domestic and foreign investment.

Another more sustainable industry that Chile could develop is green hydrogen. Through a process known as electrolysis, hydrogen and oxygen atoms are split from water molecules, which is fully powered by renewable energy. The hydrogen can be used as a fuel source that, when burned, does not produce emissions. Chile can not only utilize green hydrogen domestically, but can also ship it internationally, introducing a new export commodity. Recognizing the potential for this industry in light of Chile's huge renewable energy capacity, Chile's Ministry of Energy released the National Strategy for Green Hydrogen in 2020 with the goal of becoming the world's largest producer by 2030 and the largest exporter by 2040.¹⁷⁸

In the meantime, as Chile works to develop these new industries, civil society and the government

¹⁷⁶División Energías Sostenibles, *Potenciales de energías renovables PELP 2023-2027* (Government of Chile, Ministry of Energy, 2021), https://energia.gob.cl/sites/default/files/documentos/potencial_renovable_-_pelp2023-2027_ago2021.pdf

¹⁷⁷División Energías Sostenibles, *Potenciales de energías renovables*.

¹⁷⁸Government of Chile, *National Green Hydrogen Strategy* (Government of Chile, Ministry of Energy, 2020), 2, https://energia.gob.cl/sites/default/files/national_green_hydrogen_strategy_-_chile.pdf.

must continue to work together to remediate Quintero-Puchuncaví for its current residents. One effective solution is maintaining a stable communication stream with government officials, especially at the local and regional levels, which have more direct control over the functioning of Quintero-Puchuncaví. Another solution is participation in electoral processes. Local environmental regulators could also play a stronger role in upholding existing policies and regulations. The more stringent officials are on pollution, the more companies will abide by environmental regulations to avoid fines and other penalties. Finally, the government can take measures to bolster social programs that combat the housing crisis and high unemployment rates.

If Chile can fulfill its constitutional obligation to address the pollution in Quintero-Puchuncaví, and tread a path of more sustainable economic development, it can be a model for other countries facing similar contamination-induced environmental degradation and human health concerns. Future research may seek to examine non-migration from other sacrifice zones to discover whether comparable rationales influence non-migration. However, no matter the path of future research, it is clear that if the Chilean government does not begin to address the contamination in Quintero-Puchuncaví more vigorously, its communities are at risk of irreversible damage, destroying the ability of future generations to thrive and prosper. Nonetheless, for years the residents have remained strong in their unwavering determination to hold the government and the industrial companies responsible for the damage they have created. The story of Quintero-Puchuncaví cannot continue to be one of sacrifice and destruction, but must become one of progress and hope, where the government begins to see the intrinsic value of human lives over the pursuit of economic progress.

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