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# Tijuana River Sewage Crisis: Economic Impacts

PREPARED FOR **San Diego County**

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ECO

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# Executive Summary

**The Tijuana River's longstanding pollution crisis is impacting the region's economy. This study examines the scale of losses experienced to date and what could remain at stake if the crisis continues.**

## A Longstanding Crisis with Regional Economic Consequences

For years, the Tijuana River has carried increasing flows of sewage, industrial waste, and urban runoff north from Tijuana, Mexico, through the Tijuana River Valley and Estuary to the Pacific Ocean. Inadequate and aging wastewater infrastructure, rapid population growth, and urbanization in the region have intensified these flows, particularly following heavy rainfall. The resulting pollution has contributed to frequent and prolonged beach closures and persistent environmental and public health concerns, with especially visible effects in Imperial Beach, Coronado, and southern San Diego County.

These conditions have consequences that extend beyond water and air quality and the associated environmental and public health concerns. Beach closures and concerns about pollution can change where people recreate, whether and how long visitors spend time in South Bay and Coronado, where households spend their time and money, and how businesses and investors view affected communities. Over time, those choices can translate into lost visitor spending, reduced business activity, changes in property and investment conditions, and additional costs for households and public agencies.

Despite the long history of the crisis, previous efforts to quantify these economic consequences have been limited in scope. The County of San Diego commissioned this economic impact study to provide a more comprehensive, regional assessment of the economic costs and impacts associated with the Tijuana River sewage crisis, including effects on businesses, property values, tourism, and the broader regional economy. This study is intended to illuminate the evidence available to local, state, and federal decision-makers and support future funding and mitigation efforts for the County.




**This report looks both backward and forward, asking—**

**What is the total economic loss attributable to the sewage crisis over the last 10 years?**

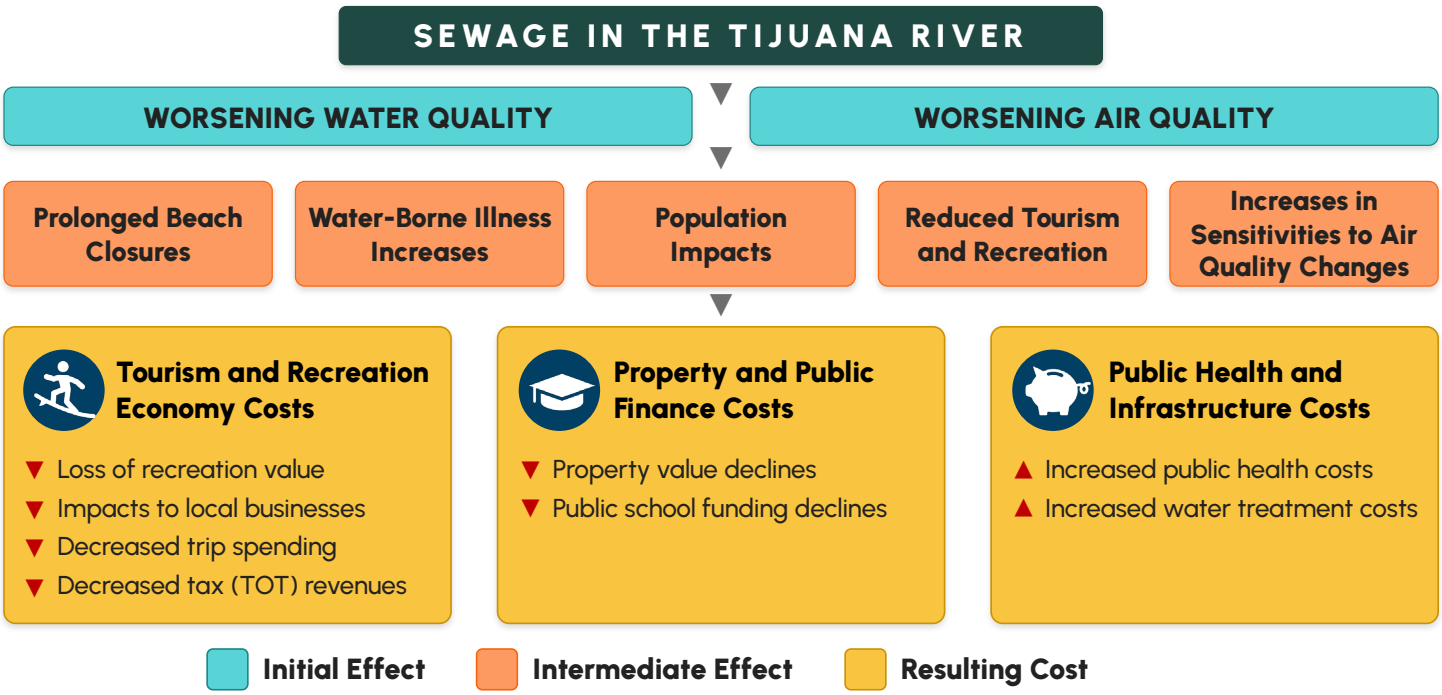
**What could the total economic loss be over the next 20 years without mitigation?**

# How the Crisis Creates Economic Effects

## The economic effects of the crisis occur through multiple interconnected pathways.

Sewage flows contribute to worsening water and air quality. Those environmental conditions can lead to prolonged beach closures, illness and health concerns, reduced tourism and recreation, and changes in where people choose to live, visit, and spend time. Those behavioral changes, in turn, can produce losses in recreation value and visitor spending, costs to businesses and households, changes in property and investment decisions, reduced public revenues, and additional costs to governments and institutions. The cost pathways diagram, Exhibit 1, highlights the effects and costs evaluated.

**Exhibit 1. Potential Cost Pathways**




Source: ECOnorthwest

The study uses this framework to distinguish between effects that can be credibly expressed in dollars and those effects for which the available evidence supports only quantitative (non-monetary) or qualitative characterization. This distinction is important. Some of the crisis's economic consequences, particularly changes in visitation and visitor spending, can be observed and modeled with relatively strong data. Other effects, such as changes in long-term investment, property values, public health, or household quality of life, are economically meaningful but more difficult to isolate from the many other factors affecting communities over time. Accordingly, the monetized results presented in this report represent part of the economic burden of the crisis, rather than an accounting of every effect.

# Methods of Analysis Used for this Study

## The study uses a mixed-methods approach that combines environmental, economic, demographic, and other administrative data with direct input from residents, visitors, businesses, community organizations, and other stakeholders.

- **Environmental indicators** include transboundary sewage flows, water-quality conditions, beach closures, and other available measures of exposure.
- **Economic datasets** include historic beach visitation, visitor origin and spending patterns, business licenses and business starts, employment and commuting data, school enrollment and attendance, property-market information, and documented public-sector expenditures.
- **Community and stakeholder engagement**—including focus groups and surveys of residents, visitors, businesses, and organizations—provides additional evidence about how people are responding to the crisis and helps interpret patterns observed in the quantitative data.

## Changes in beach visitation trends provide the strongest measurable pathway.

The strongest measurable pathway is changes in beach visitation trends. To understand the impact of these trends, our analysis examines historic visitation data to distinguish local and non-local visitation, estimates visitor spending using established tourism and recreation spending profiles, and applies IMPLAN industry-level modeling to estimate the direct, indirect, and induced economic activity supported by that visitor spending. Multiple comparison periods are evaluated as visitation patterns differ across Imperial Beach and Coronado and no single year provides a perfect representation of conditions absent the crisis.

Subsequent analysis examines trends in business formation and employment, school enrollment and attendance, recreation value, property and investment conditions, public health, and government expenditures. Taken together, these methods provide multiple lines of evidence rather than relying on any single dataset or model.

**Tourism and Recreation Economy Costs**

### How do we measure changes in beach visitation trends?



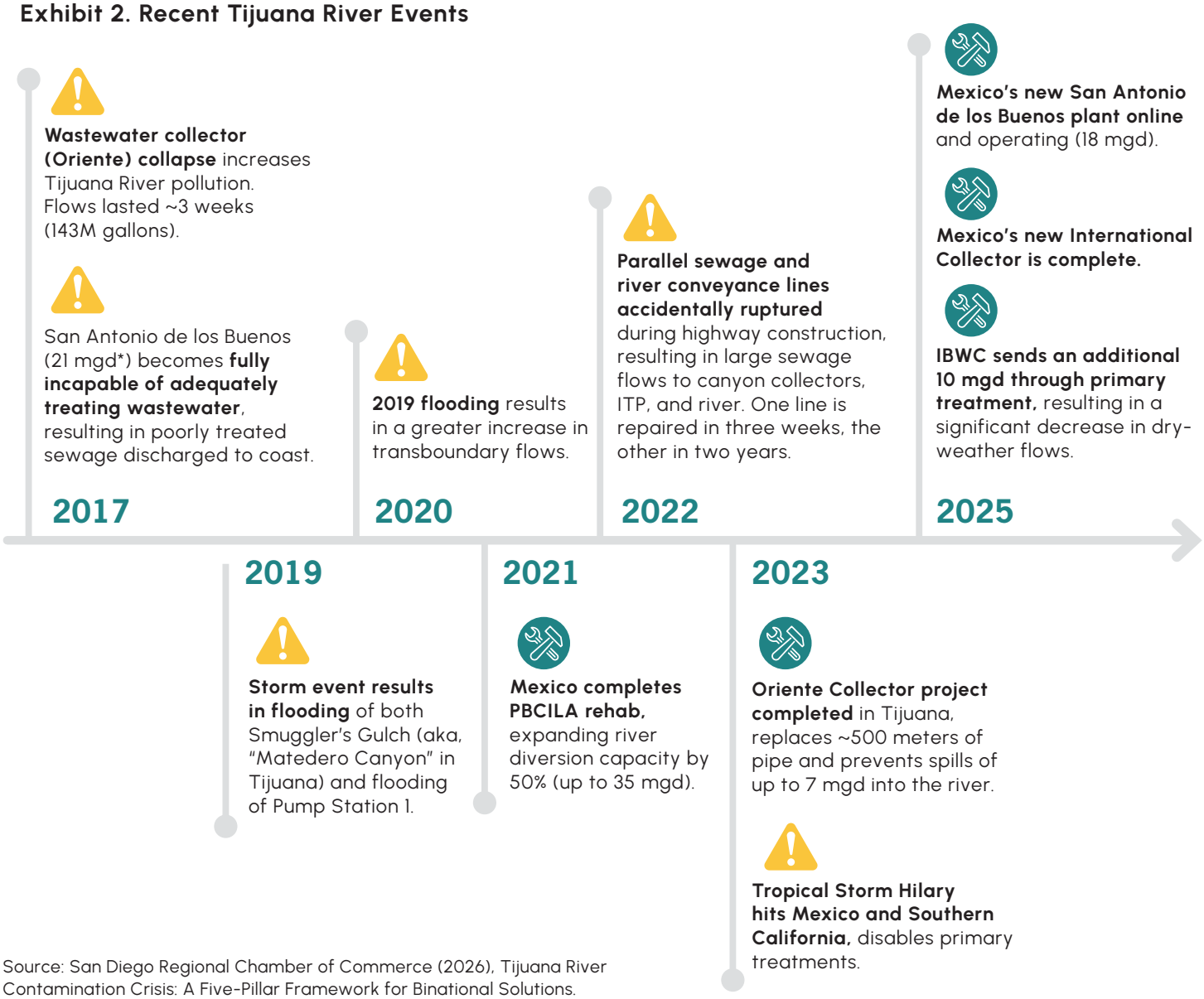

Read the full report to learn about the complete methodology and analysis.

# Key Findings

## Pollution conditions and related public awareness have intensified, particularly in recent years.

**Although pollution in the Tijuana River is not new, the scale and visibility of the crisis are increasing.** Infrastructure failures and major storm events in the last ten years, detailed in Exhibit 2, have resulted in more untreated water entering the ocean.

### Exhibit 2. Recent Tijuana River Events




Source: San Diego Regional Chamber of Commerce (2026), Tijuana River Contamination Crisis: A Five-Pillar Framework for Binational Solutions.

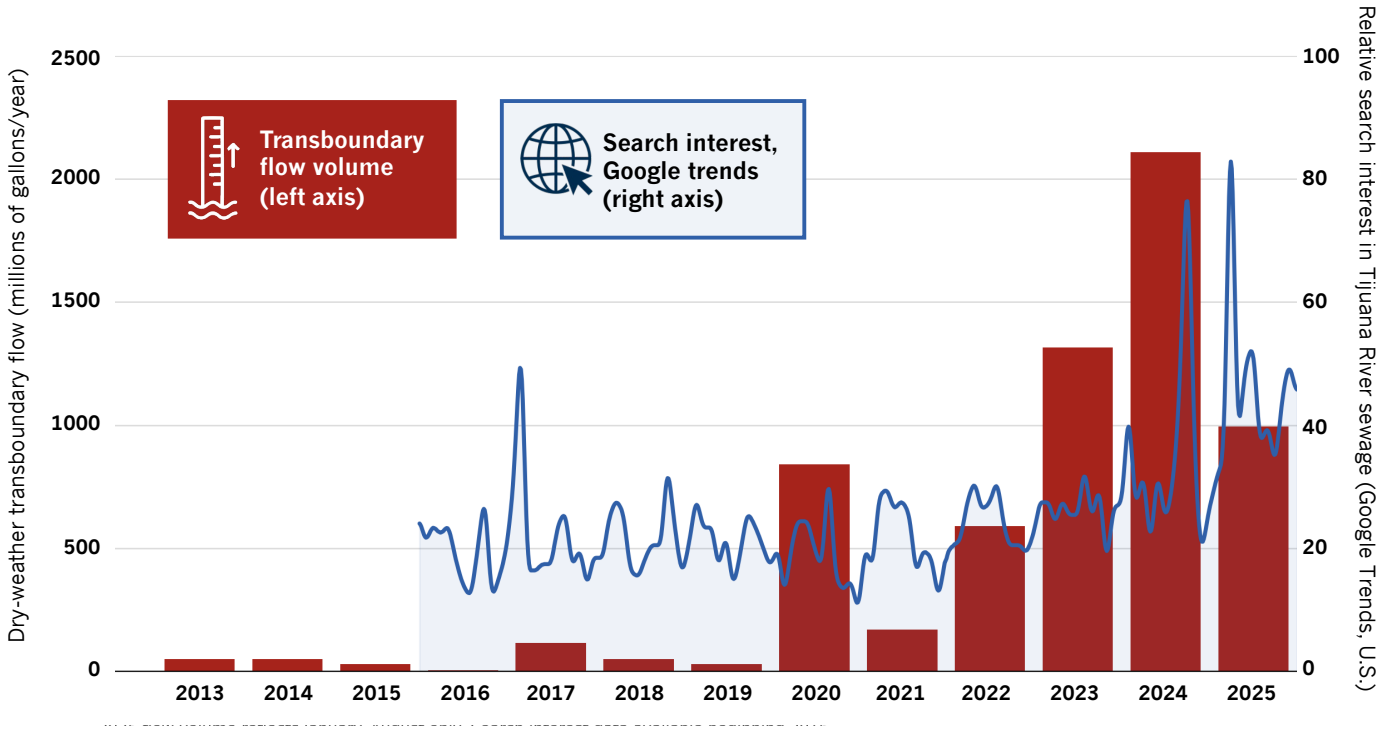
*Note: Million gallons per day (mgd) is a standard unit of measurement used to describe the flow rate or treatment capacity of a water and wastewater facility.

Transboundary flows from Mexico have varied over time, but **increased substantially beginning in 2020, reaching record levels in recent years.** Water-quality monitoring similarly shows elevated bacterial conditions at affected beaches. **At the same time, public attention to the crisis has grown substantially,** with internet searches related to the Tijuana River and sewage pollution increasing alongside the escalation in environmental conditions, as illustrated in Exhibit 3.

These trends matter economically because environmental conditions alone do not create every downstream economic effect. **Economic costs emerge when pollution changes the behavior over time of residents, visitors, businesses, and institutions.** Increased awareness can amplify the geographic reach of the crisis—even people who do not directly encounter polluted water or air may change their travel or spending decisions due to public perception and deterioration of a community's brand.

**As transboundary flows increased, internet searches related to the Tijuana River increased, pointing to behavior changes and emerging economic costs.**

**Exhibit 3. Dry-Weather Transboundary Flow Volume vs. U.S. Search Interest in "Tijuana River"**




Source: Attributed from Google Search Results and the San Diego Regional Chamber of Commerce (2026), Tijuana River Contamination Crisis: A Five-Pillar Framework for Binational Solutions.



**Community and visitor surveys consistently indicate that pollution is affecting daily behavior.**

## The crisis is changing how residents and visitors recreate and spend money in the South Bay.

**Community and visitor surveys consistently indicate that pollution is affecting daily behavior.** Residents reported avoiding beaches and outdoor activities, spending less time in their neighborhoods, shifting activities or spending elsewhere, and in some cases considering relocation. Visitors similarly reported changing beach activities and making shorter or less frequent trips. Businesses and community organizations described reduced customers, reputational harm, operational challenges, lost income, and staff or organizational resources being redirected toward responding to the crisis.

**Survey responses provide an important link between worsening environmental conditions and the economic patterns observed in other datasets.** They also show that the effects of the crisis extend beyond people entering the water—perceived environmental conditions can affect recreation, shopping, travel, business activity, and the broader image of these communities.

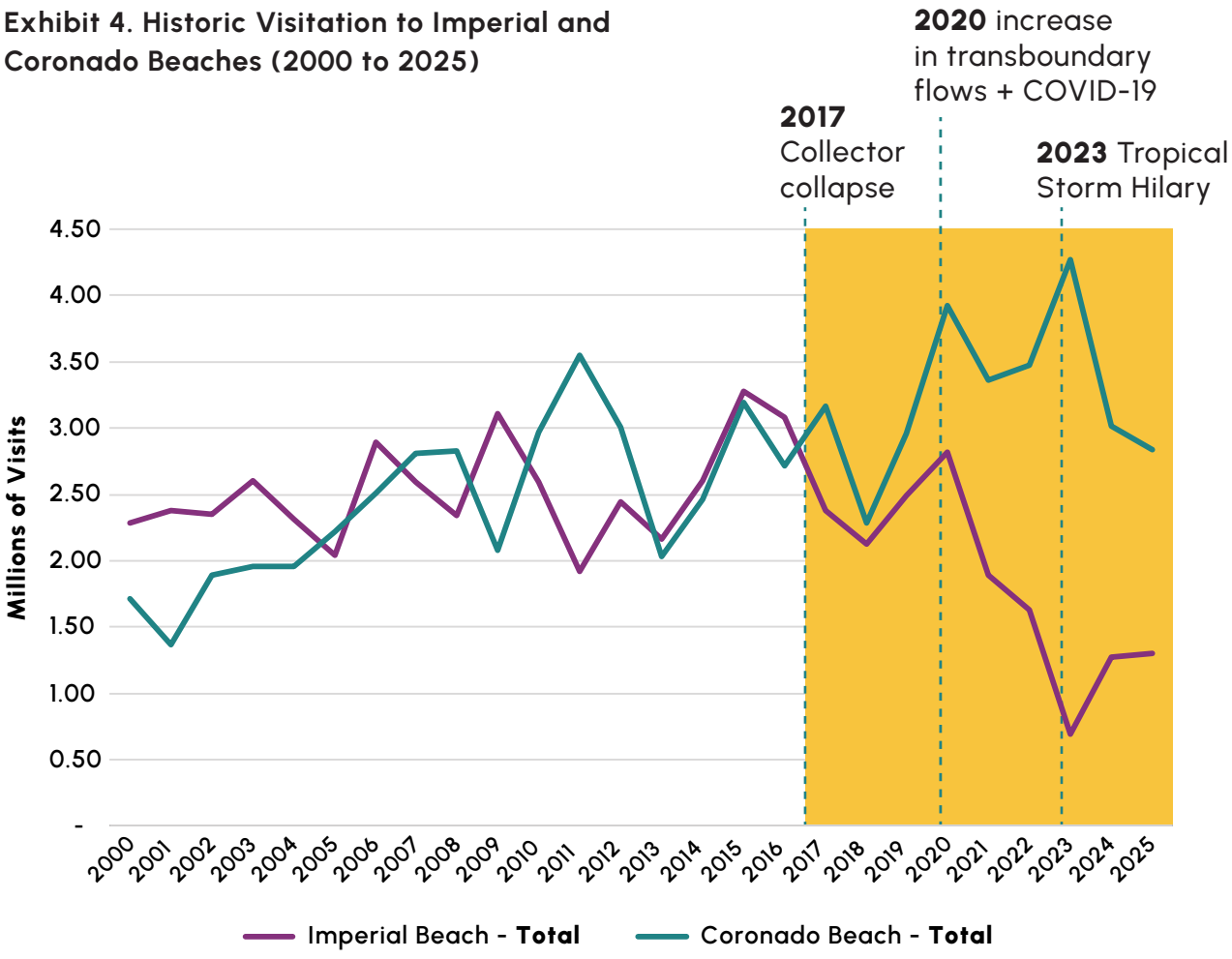
**Perceived environmental conditions can affect recreation, shopping, travel, business activity, and the broader image of these communities.**

## Beach visitation declines correlate with worsening sewage pollution.

**Historic visitation provides the clearest quantitative evidence of behavioral change resulting from the pollution.** Exhibit 4 illustrates how Imperial Beach and Coronado followed broadly similar patterns for much of the historical period, but their trajectories increasingly diverged as sewage conditions worsened. Imperial Beach visitation has fallen substantially since the late 2010s, with particularly pronounced declines in recent years. On the other hand, Coronado Beach visitation remained comparatively stronger before declining from recent peaks.

Since other events (including the COVID-19 pandemic and major storms) also affected visitation during this period, we cannot attribute every observed change to sewage pollution. Instead, we use multiple historical comparison periods to establish a reasonable range of impacts. The longer comparison period—beginning in 2008—provides a lower estimate based on longer-term and less volatile visitation patterns, while the more recent comparison period places greater weight on the behavioral changes since 2020 that coincide with observed shifts in public awareness and perception.

**Exhibit 4. Historic Visitation to Imperial and Coronado Beaches (2000 to 2025)**



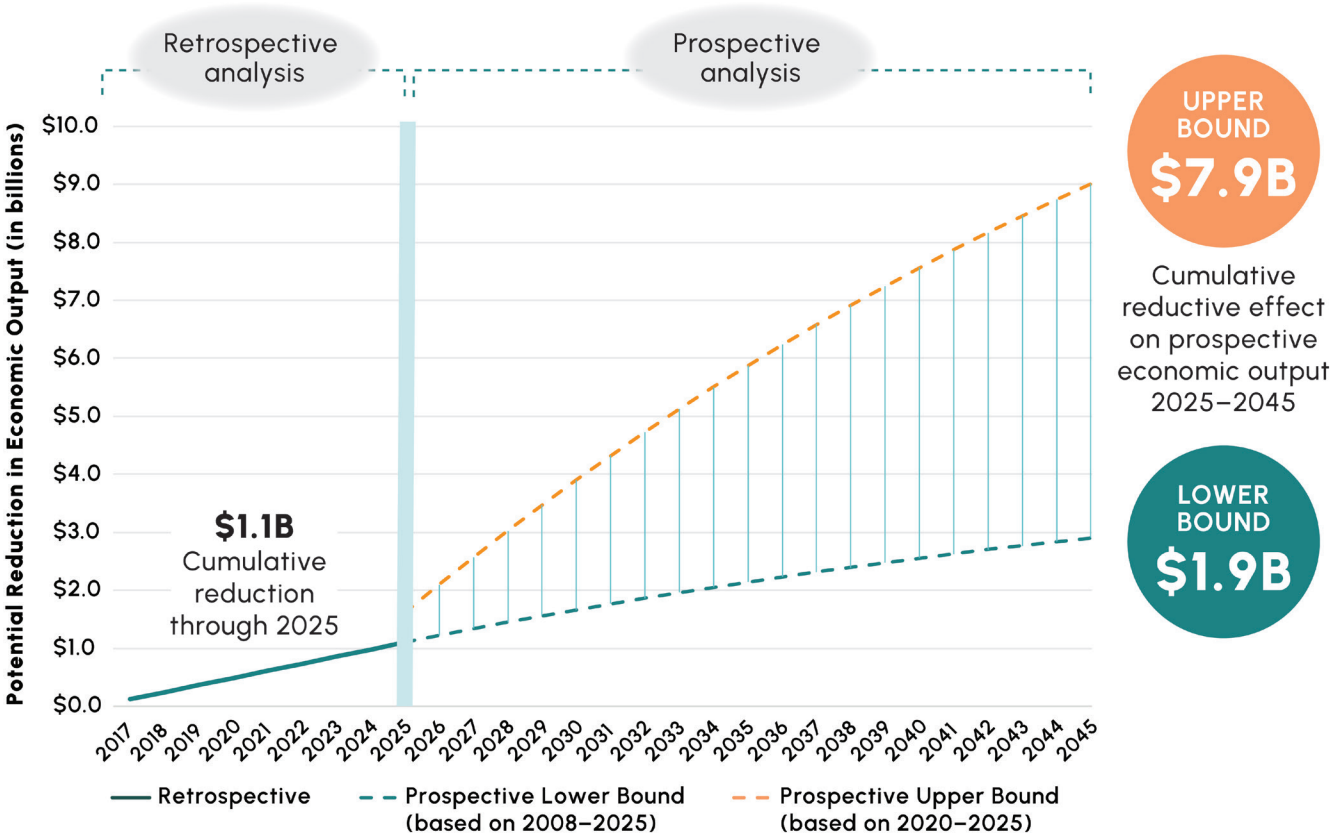

Source: United States Lifesaving Association and Placer.ai

## Declining visitation is producing measurable reductions in visitor spending and regional economic activity.

**When people take fewer trips to affected beaches, the economic effect extends beyond the recreational experience itself.** Visitors spend money at local restaurants, retailers, gas stations, recreation-related businesses, hotels, and other local establishments. Reduced spending directly affects these businesses and their workers; those reductions move through the regional economy as businesses purchase fewer goods and services, and employees have less income to spend elsewhere—creating a feedback loop of lower spending.

Shown in Exhibit 5, the **retrospective analysis** indicates the modeled economic output for San Diego County decreased, on average, by $125.5 million annually (or 0.04 percent of current San Diego County GRP) between 2008 and 2025, for a total of **$1.1 billion for the 10-year historical period**.[1] However, driven by recent reduced beach visitation to Imperial and Coronado Beaches, we estimate the crisis reduces San Diego County's regional economic output by up to **$503.5 million annually.** The **prospective analysis** in Exhibit 5 illustrates the magnitude of the risk if recent visitation patterns persist. Under the lower-bound scenario, based on the longer 2008 to 2025 historical comparison, cumulative foregone economic

**Exhibit 5. Retrospective and Prospective Economic Analysis**




Source: IMPLAN (2024) and ECOnorthwest analysis. Note: All dollar values are presented in millions of dollars and in the 2025 dollar year.

1 Distinct changes in beach tourism behavior occurred post 2017, therefore the 10-year retrospective focuses on the reductions in Economic Output from 2017-2025 which is nine years instead of ten. Our methodology assumes that reductions in economic output begin in 2017; therefore, we implicitly assume that no reductions occurred in 2016.

output reaches approximately **$1.9 billion by 2045,** in 2025 dollars. Under the upper-bound scenario, which places greater weight on the more recent 2020–2025 period, cumulative foregone output reaches **approximately $7.9 billion by 2045,** in 2025 dollars.

These estimates provide a range of potential future economic exposure rather than a prediction of a single outcome. Future reductions in economic activity will depend on pollution conditions, infrastructure investments, public perceptions, and the pace of recovery.

**Future reductions in economic activity will depend on pollution conditions, infrastructure investments, public perceptions, and the pace of recovery.**

## The crisis likely produces broader economic and community effects.

**While lost visitation is the strongest measurable economic pathway to monetized economic impacts, there is evidence of effects well beyond tourism.**
Business-license data show a shift in economic investment through a divergence in business-start trends, specifically in Imperial Beach, relative to comparison communities. This aligns with concerns raised by businesses and residents. School districts serving impacted communities have also experienced greater declines in enrollment and average daily attendance than other districts in the County, although many factors beyond pollution affect these trends and the study cannot attribute the full difference to the crisis. Public agencies and nonprofit organizations have similarly redirected staff time and financial resources toward monitoring, mitigation, emergency response, outreach, and other crisis-related activities.

**The sewage crisis has broader economic and community impacts beyond lost tourism spending, though many cannot be reliably quantified.**

In the full report, we evaluate other potential costs, including **risks to public health, changes in property values, household expenditures, recreation value, and quality of life.** In most cases, available evidence is sufficient to identify or characterize an effect, but not to estimate a reliable monetized value attributable to the sewage crisis. These effects are therefore presented separately from the visitor-spending impacts.



Read the full report to learn more about other potential costs.

## Negative impacts are concentrated in economically vulnerable communities.

**The study area is home to roughly 155,000 residents and includes communities that differ from the County overall on several socioeconomic measures.** Residents here are more likely to rent, have household incomes below $75,000, experience housing cost burden, be unemployed, and lack health insurance. The area also includes a higher share of residents identified by Census measures of social vulnerability.[2]

These conditions do not mean that every resident experiences the crisis in the same way. Some households and businesses may have more difficulty absorbing losses in wages, customers, recreation opportunities, household resources, or public services. In this way, the distribution of impacts is an important part of understanding the crisis: the same dollar loss can result in very different consequences depending on who bears the loss.

**The primary study area includes the set of communities closest to the river and most directly exposed to pollution—Imperial Beach, Coronado, and the South Bay neighborhoods of Otay Mesa, Otay Mesa-Nestor, and San Ysidro.**



## The County can mitigate near-term economic harm, but solving existing infrastructure problems requires state and federal intervention.

**The infrastructure investments ultimately required to stop transboundary sewage flows involve multiple jurisdictions,** federal agencies, and binational coordination and exceed the County's jurisdiction and fiscal capacity acting alone. County leadership has already recognized that permanent resolution requires significant federal engagement and binational infrastructure investment. That does not mean the County lacks a role while longer-term infrastructure solutions advance. The County has undertaken near-term mitigation efforts, including expanded waste-capture and cleanup operations, targeted remediation of the Saturn Boulevard hot spot, distribution of air purifiers to affected residents, sustained federal engagement, and support for ongoing public-health studies. These actions demonstrate current efforts while broader solutions progress.

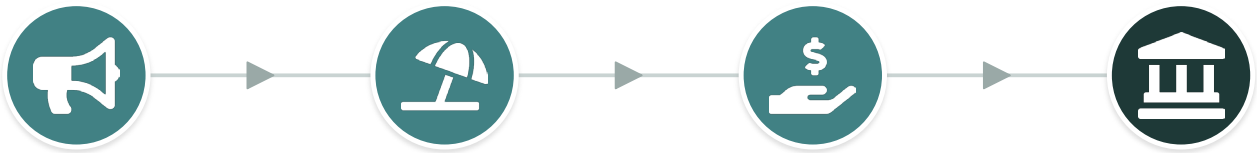
Findings point to opportunities to reduce uncertainty, support businesses and visitors, improve access to information, and strengthen South Bay and Coronado's brand. They also highlight the importance of clearly communicating the scale of the economic consequences to state and federal partners with the authority and resources to address the problem at its source.

2 See Appendix J for additional details.

# Recommendations

The recommended policy directions respond to two distinct needs identified through the analysis. First, the County can take **near-term steps** to reduce the economic consequences experienced by residents, visitors, and businesses while long-term solutions to the crisis are implemented. Second, the magnitude and persistence of the economic effects strengthen the case for **sustained County advocacy and coordination toward a permanent infrastructure solution.**

**NEAR-TERM ACTIONS** → **GOAL: A PERMANENT SOLUTION**



**Improve Communication and Public Awareness**

Keep residents and visitors informed on water quality, closures, health guidance, and government actions to address the crisis.

**Strengthen South Bay's Image and Visitor Economy**

Rebuild the region's reputation and support recovery of tourism and recreation.

**Provide Direct Support to Affected Businesses**

Offer targeted relief to businesses experiencing lost revenue from the crisis.

**Advocate for a Permanent Solution to the Crisis**

Push for the infrastructure investment needed to resolve the problem at its source.

## Improve Communication and Public Awareness

**GOAL Keep residents and visitors informed about environmental conditions, health guidance, beach access, and progress toward addressing the crisis.**

**Our analysis shows that public awareness has increased substantially and that pollution concerns influence where people recreate, visit, and spend money.** Survey participants also identified inconsistent or unclear information about environmental conditions and government response as an ongoing concern. Better communication cannot eliminate the underlying pollution, but it can reduce uncertainty and help residents and visitors distinguish between activities or locations that are affected and those that remain available.

**Potential implementation steps include** designating a consistent County liaison or coordinating function; providing regular, accessible updates on infrastructure projects and government actions; improving dissemination of real-time water- and air-quality information; coordinating messaging with cities, visitor organizations, public-health agencies, news outlets, and other partners; and expanding the use of tools such as real-time alerts and plume forecasting where appropriate.

## Strengthen South Bay and Coronado's Image and Visitor Economy

**GOAL Support recovery of recreation, visitation, and spending, while countering the broader perception that the entire South Bay and Coronado are inaccessible or unsafe.**

**Reduced visitation is the clearest measurable economic effect identified in this study.** The findings also suggest that perceptions of the crisis influence behavior beyond the specific locations or activities affected by a closure. Economic recovery therefore requires both resolving the underlying environmental conditions and maintaining reasons for residents and visitors to continue spending time in affected communities.

**Potential implementation steps include** working with local and regional visitor organizations to highlight activities that remain available; supporting events and programming that bring foot traffic to affected commercial areas; promoting parks, cultural destinations, restaurants, businesses, and recreation opportunities not dependent on ocean access; and incorporating South Bay economic development and destination messaging into broader County and regional initiatives.

## Provide Direct Support to Affected Businesses

**GOAL Help businesses experiencing reduced customers, revenue, or operating challenges remain viable while environmental conditions constrain economic activity.**

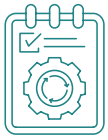
**Business feedback and economic data indicate that the crisis is creating particular challenges for visitor-serving and locally oriented businesses**. Reduced visitor spending can also ripple outward through employment, household income, and purchases from other regional businesses. Targeted business assistance can therefore help mitigate near-term losses even though it cannot substitute for solving the underlying pollution problem.

**Potential implementation steps include** connecting businesses with existing grants, loans, permitting assistance, technical support, and other financial resources; identifying whether additional targeted relief programs are feasible; coordinating promotional efforts with local jurisdictions and business organizations; providing clear information businesses can share with customers; and continuing to monitor business conditions so assistance can be targeted where impacts are greatest.

## Advocate for a Permanent Solution to the Crisis

**GOAL Support the infrastructure investment, operations and maintenance, and binational coordination necessary to resolve the crisis at its source.**

**Our analysis demonstrates that continued pollution carries recurring economic consequences.** If recent visitation impacts persist, the cumulative loss of regional economic output alone could reach billions of dollars over the next two decades, before accounting for many of the health, household, institutional, and quality-of-life effects that cannot be fully monetized.



**Permanent resolution requires resources and authorities that extend beyond the County.** The County can nevertheless use the evidence developed through this study to strengthen advocacy for completion and reliable operation of major wastewater infrastructure, sustained state and federal funding, long-term asset management and monitoring, and coordinated binational planning. County leadership can also continue working with neighboring jurisdictions, regional organizations, state and federal agencies, and other partners so that the economic consequences documented here are considered alongside the public-health and environmental case for investment.

# 1. Background and Purpose

## The Tijuana River Sewage Crisis

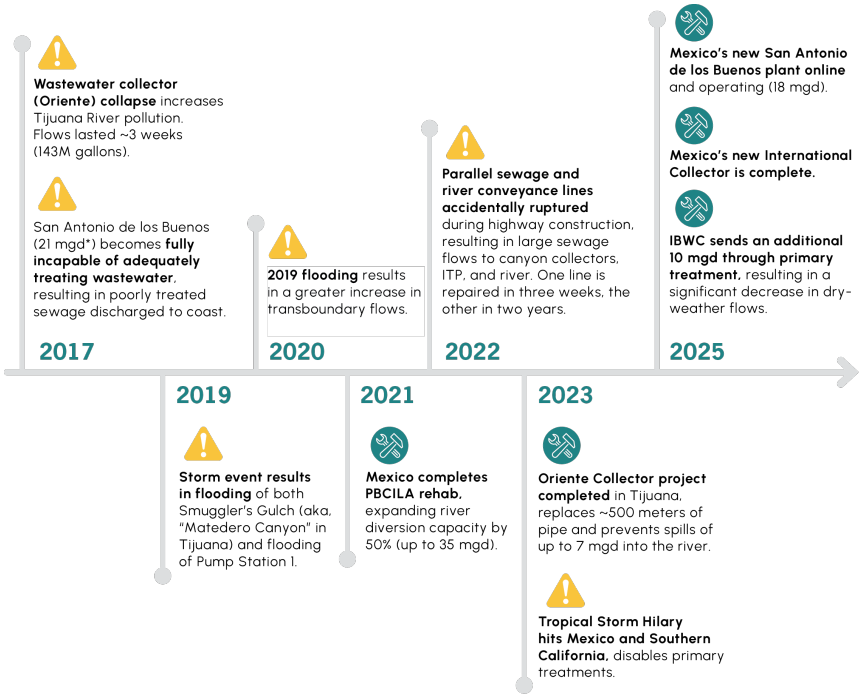
For years, the Tijuana River has carried increasing flows of sewage, industrial waste, and urban runoff north from Tijuana, Mexico, through the Tijuana River Valley and Estuary to the Pacific Ocean. Inadequate wastewater infrastructure and population growth in the region have intensified these flows, particularly following heavy rainfall. Despite the problem originating on the Mexico side of the border, the result is that the persistent environmental and public health crises are also affecting communities on the United States side of the border.

The effects are especially visible along the coast. Pollution transported through the river and coastal waters has contributed to frequent and prolonged beach closures, limiting access to beaches and ocean recreation in Imperial Beach and affecting areas farther north, including Coronado. Air-quality concerns associated with the Tijuana River Valley have created an additional source of concern for nearby residents and workers. The County's original scope identified Imperial Beach, Coronado, the Tijuana River Valley and Estuary, and South San Diego neighborhoods including Nestor, Otay Mesa West, and San Ysidro as the communities most directly affected, while recognizing that economic effects can extend into the broader San Diego region.

Although transboundary pollution is not new, several indicators suggest the scale and visibility of the crisis have increased in recent years. Major infrastructure failures and storm events have contributed to substantial variations in flows over time, with transboundary flows rising notably beginning around 2020 and reaching particularly high levels in 2023 and 2024.[1] The historical visitation analysis similarly identifies the 2017 collector collapse, increased transboundary flows beginning in 2020, and Tropical Storm Hilary in 2023 as important events in understanding changing conditions. Water-quality monitoring also shows elevated bacterial conditions corresponding with periods of higher transboundary flows.

[1] Doug Liden and Maria Elena Giner, "Tijuana River Contamination Crisis: A Five-Pillar Framework for Binational Solutions" (San Diego Regional Chamber of Commerce, March 2026).

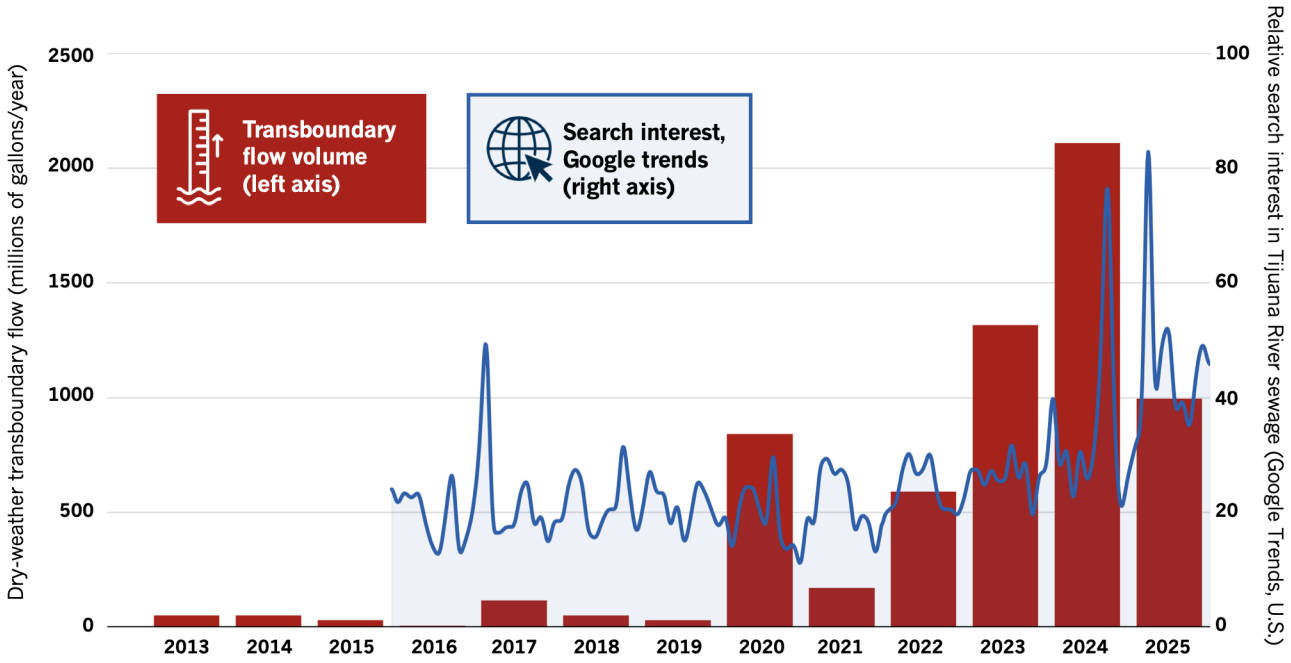
**Exhibit 1. Recent Tijuana River events**




Source: San Diego Regional Chamber of Commerce (2026), Tijuana River Contamination Crisis: A Five-Pillar Framework for Binational Solutions.

Public awareness has grown alongside these conditions. Internet search activity for terms related to the Tijuana River and sewage crisis increased markedly as pollution conditions worsened, suggesting that the crisis has become more visible not only to residents of directly affected communities, but to the broader public (Exhibit 2). This matters economically because perceptions of environmental quality can influence behavior even when an individual does not directly encounter polluted water or air.

**Exhibit 2. Dry-weather transboundary flow volume vs. U.S. search interest in "Tijuana River"**




Source: Attributed from Google Search Results and the San Diego Regional Chamber of Commerce (2026), Tijuana River Contamination Crisis: A Five-Pillar Framework for Binational Solutions.

The pressures underlying the crisis may also continue to grow. Population projections for Tijuana indicate an increase from approximately 1.89 million residents in 2020 to 2.54 million by 2050—a 34 percent increase—while wastewater generation is projected to increase by approximately 41 percent over the same period.[2] These projections do not determine future pollution conditions; infrastructure investments and operations will matter substantially. They do, however, underscore the importance of developing wastewater systems capable of keeping pace with long-term regional growth.

## Why an Economic Study Was Needed

The environmental and public health consequences of the Tijuana River sewage crisis ("the crisis") have received substantial attention and continue to as the crisis persists. Its economic consequences, however, are less well understood. Existing responses fall into three broad categories: investments to reduce pollution at its source, local measures to reduce residents' exposure, and research documenting health and behavioral effects.

Federal (and binational) project fundings and commitments on the Tijuana River and its pollution has focused largely on wastewater infrastructure, that is, on reducing pollution at its source. In 2020, the United States committed $300 million under the United States-Mexico-

[2] Comisión Internacional de Límites y Aguas (CILA), "Formulación del Programa de Saneamiento de la Frontera Norte a Nivel Gran Visión: Informe Final" (2021), 80, http://www.cila.gob.mx/syca/SUIF/PSFN_IF00_General_00_Informe.pdf

Canada Agreement (USMCA) to plan, design, and build treatment projects in the Tijuana River watershed.[3] In 2022, a U.S.-Mexico agreement outlined $474 million for sanitation projects including expansion of the South Bay International Wastewater Treatment Plant and work on treatment facilities and sewer infrastructure in Mexico.[4] More targeted funding followed, including $10 million secured in the 2024 Water Resources Development Act for watershed projects and around $3.5 million recently announced in 2026 for dredging and debris removal at Smuggler's Gulch.[5,6] Between the U.S. and Mexico, December 2025's Minute 333 agreement laid out additional actions for infrastructure planning, spill notification, monitoring, sediment control, and long-term operation and maintenance.[7] In February 2026, the EPA reported that an expansion of the South Bay International Wastewater Treatment Plant had been completed, while other projects and funding obligations under the earlier agreement remained in progress.[8] Over the course of these recent years, the federal government has invested around a billion dollars to respond to the crisis, and more specifically to address the recent infrastructure failures. This suggests that fundamentally improving the pollution problem will require substantially more funding.

While these longer-term investments proceed at the national level, San Diego County has funded measures to address local conditions and reduce residents' exposure. The County's 2026 funding package includes a proposed pipeline extension near Saturn Boulevard, a public health study, and short-term relief for households affected by poor air quality.[9] Through the Air Improvement Relief Effort program, the County's air district distributes air purifiers and replacement filters to eligible South Bay households, prioritizing those closest to the river and households with children or adults over 65 years.[10] A survey of air purifier recipients reflected reduced sewage odors in their homes, demonstrating the program's provision of near-term relief as opposed to removing pollution from the source.[11]

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[3] US EPA, OW. 2021. "USMCA Tijuana River Watershed." Overviews and Factsheets. January 13. https://www.epa.gov/sustainable-water-infrastructure/usmca-tijuana-river-watershed.

[4] US EPA, OA. 2022. "U.S. and Mexico Agree to Invest $474M to Address Tijuana River Sewage Problem." News Release. August 18. California. https://www.epa.gov/newsreleases/us-and-mexico-agree-invest-474m-address-tijuana-river-sewage-problem.

[5] "Padilla, Vargas, Peters Announce Efforts to Address Tijuana River Pollution Crisis." n.d. Senator Alex Padilla. Accessed September 22, 2026. https://www.padilla.senate.gov/newsroom/press-releases/padilla-vargas-peters-announce-efforts-to-address-tijuana-river-pollution-crisis/

[6] NBC San Diego. 2026. "$3.5M in Funding Secured to Address Cross-Border Pollution in Tijuana River Valley." NBC 7 San Diego, January 15. https://www.nbcsandiego.com/news/local/funding-cross-border-pollution-tijuana-river-valley/3962062/.

[7] US EPA, OW. 2025. "Minute No. 333." Reports and Assessments. December 14.

[8] US EPA, OA. 2026. "Administrator Zeldin Returns to San Diego as Trump EPA Continues Implementation of 100% Solution to Tijuana River Sewage Crisis." News Release. February 9. https://www.epa.gov/newsreleases/administrator-zeldin-returns-san-diego-trump-epa-continues-implementation-100-solution.

[9] Abumughaiseeb, Adam. n.d. "Board of Supervisors Vote in Favor of $8.75 Million for Tijuana River Crisis." News. The UCSD Guardian. Accessed September 22, 2026. https://ucsdguardian.org/2026/02/02/board-of-supervisors-vote-in-favor-of-8-75-million-for-tijuana-river-crisis/.

[10] "Air Improvement Relief Effort Program - San Diego County Air District." n.d. Accessed September 22, 2026. https://www.sdapcd.org/content/sdapcd/about/tj-river-valley/aire.html.

[11] "Air Purifier Survey Highlights: Air Improvement Relief Effort Program - San Diego County Air District." n.d. Accessed September 22, 2026. https://www.sdapcd.org/content/dam/sdapcd/documents/tjrv/aire/Air%20Purifier.pdf.

The County and academic researchers have also documented specific dimensions of the crisis's effects on residents. Untreated sewage, sediment, and trash carried by the Tijuana River have created both water and air quality concerns for South Bay communities. In October 2024, the County conducted a household health survey, to assess residents' concerns and contact with the polluted river and beach water.[12] The survey found that 7.7 percent of households reported that a member had contacted river water in the previous month, and 16.2 percent reported contact with water at nearby beaches during closures.[13] Pollution also reaches residents through the air. Researchers measured hydrogen sulfide near the Saturn Boulevard river crossing at levels that exceeded California's one-hour air quality standard and found that concentrations fell sharply when wastewater flow decreased.[14] Community surveys describe related burdens on health and daily life. Respondents to San Diego State University's Healthy Water, Healthy Air survey reported upper respiratory symptoms, including nasal irritation, sore throat, and cough, as well as unpleasant odors and subsequently reduced outdoor activity.[15] The county survey similarly documented health symptoms and disruptions to household routines, and found that 44.2 percent of households frequently avoided certain areas because of sewage contamination.[16]

Each of these efforts addresses a component of the crisis rather than its full economic scope. Infrastructure funding targets the source of pollution, relief programs help reduce household exposure, and surveys and monitoring studies document exposure, health symptoms, and behavioral change. None translates these effects into monetary terms or assesses them across the region. Previous efforts to quantify economic losses have generally addressed individual aspects of the crisis rather than its broader regional consequences. As a result, decisionmakers have lacked a consistent estimate of what the crisis has cost the region to date, or what it may cost if current conditions persist.

This study is designed to fill that gap. Its economic framework traces the pathways from degraded environmental conditions, through changes in behavior, to their resulting economic costs and impacts. The analysis accounts for market and non-market costs and for direct, indirect, and induced effects on the regional economy. It also identifies the communities and economic sectors that bear a disproportionate share of these costs. By pairing a 10-year retrospective assessment with high- and low-end 20-year projections of damages if current conditions persist, this study estimates both the losses already incurred and the potential cost of continued pollution.

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[12] "CDC CASPER Study." 2026. https://www.sandiegocounty.gov/content/sdc/hhsa/programs/phs/community_epidemiology/south-region-health-concerns/casper-study.html.

[13] "CDC CASPER Study." n.d. Accessed September 22, 2026. https://www.sandiegocounty.gov/content/sdc/hhsa/programs/phs/community_epidemiology/south-region-health-concerns/casper-study.html.

[14] "Tijuana River's Toxic Water Pollutes the Air." 2025. https://today.ucsd.edu/story/tijuana-rivers-toxic-water-pollutes-the-air.

[15] Russo, Greg. 2025. "Survey Results." Tijuana River Public Health, June 17. https://tjriver.sdsu.edu/survey-results/.

[16] "CDC CASPER Study." n.d. Accessed September 22, 2026. https://www.sandiegocounty.gov/content/sdc/hhsa/programs/phs/community_epidemiology/south-region-health-concerns/casper-study.html.

The findings of earlier research provide the starting point for these pathways. The beach contact, area avoidance, reduced outdoor activity, and respiratory symptoms documented in the County and SDSU surveys each carry economic consequences. Beach closures and pollution concerns can change where people recreate, whether and how long visitors spend time in South Bay and Coronado, where households spend their time and money, and how businesses and investors view affected communities. These effects are interconnected. A visitor who forgoes a beach trip may spend less at nearby restaurants, shops, hotels, or recreation businesses. Those businesses may respond to reduced demand by cutting employee hours, postponing investment, or purchasing fewer goods and services. Residents who avoid nearby recreational resources lose something of value even if they spend their money elsewhere, and residents experiencing symptoms may incur medical expenses or miss work and school. Public agencies and nonprofit organizations may devote staff time and funding to monitoring, mitigation, communication, and emergency response that could otherwise support other priorities. Over time, these individual choices can translate into lost recreation value and visitor spending, reduced business activity, changes in property and investment conditions, lower public revenues, and additional costs for households, schools, governments, and community organizations.

The County commissioned this study to quantify these costs, with particular attention to impacts on small businesses, property values, and regional tourism in the Tijuana River Valley and surrounding communities. The County's stated purpose for this study is to strengthen future funding and mitigation efforts. It is also intended to give local, state, and federal leaders evidence to understand the scale of the regional economic impacts and to inform future investment strategies.

## Research Questions Guiding the Economic Study

The framework for our overall analysis was designed to systematically identify, describe, quantify, and value the economic consequences of Tijuana River pollution. This included answering questions involving what, where, to whom, and at what cost. It also involved translating those effects into consequences of relevance to the public and officials. Collectively the analyses convey a regional economic picture. Our approach was to link exposure and closures to behavior effects, then to direct business losses and costs, to regional economic spillovers, and finally to equity impacts and policy implications. For more details about our overall framework for analysis, see the next chapter of this report.

Our analysis framework was used to support answering the **primary research questions** that were identified by the County for this study:

- **What is the total economic loss attributable to the sewage crisis over the last 10 years?**
- **What could the total economic loss be over the next 20 years without mitigation?**

Together, these questions frame both the scale of losses experienced to date and what could remain at stake if the crisis continues.

This study supports the County's direction to provide a more comprehensive economic assessment, by considering both impacts that can be expressed in monetary terms and effects for which the available evidence is better suited to quantitative or qualitative characterization. The purpose is not simply to produce a single dollar figure, but to develop a more complete understanding of how the crisis affects economic activity, community well-being, and public resources—and where those impacts are concentrated.

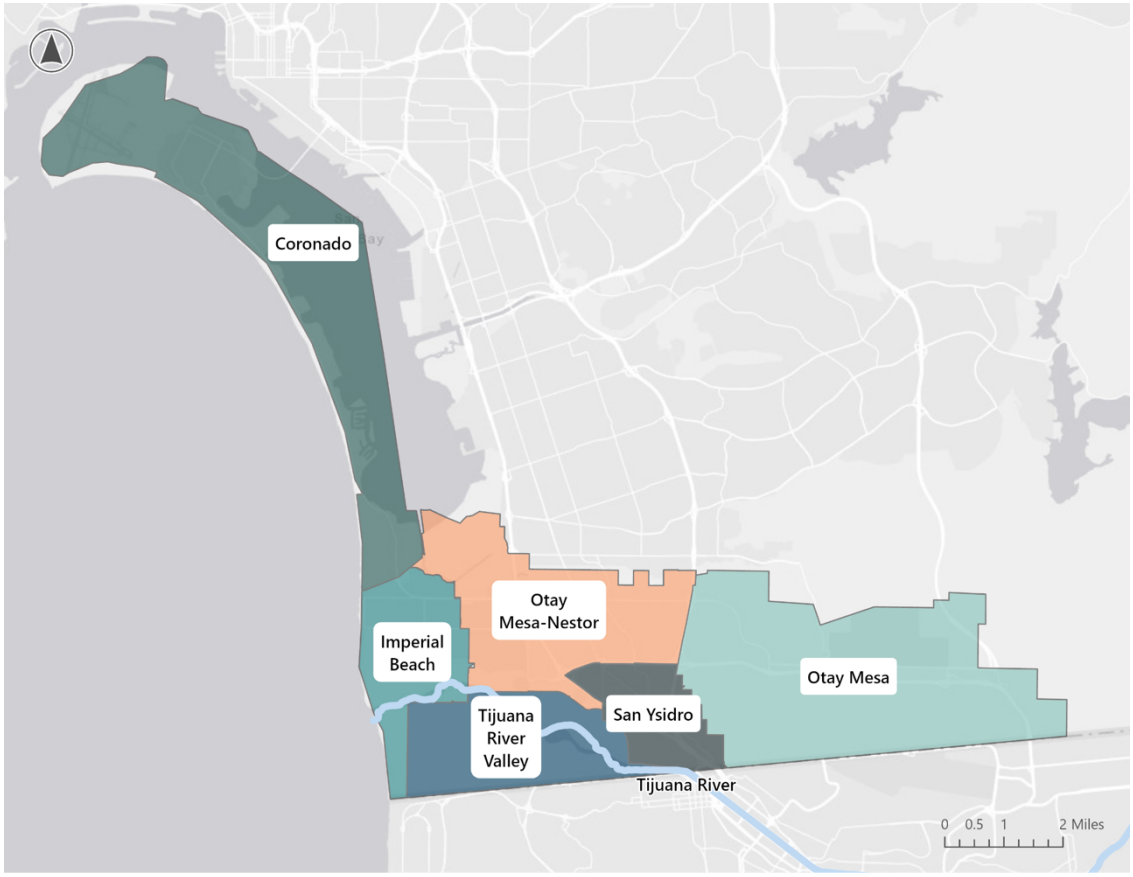
## Study Area Details

The Tijuana River runs through the southwestern corner of San Diego County. It enters the County from Tijuana, Mexico, near San Ysidro and Border Field State Park, and empties into the Pacific Ocean through the Tijuana River Estuary. Sewage-related pollution travels by both water and air, so this study defines its geography at three scales, the primary study area, broad and regional study area, to understand the local and regional impacts.

### Primary Study Area

The **primary study area** is the set of communities closest to the river and most directly exposed to pollution: Imperial Beach, Coronado (including Silver Strand State Beach), the Tijuana River Valley Regional Park and Estuary, and the South Bay neighborhoods of Otay Mesa, Otay Mesa-Nestor, and San Ysidro (Exhibit 3). Existing literature and County staff expertise identify these areas as the most affected, because of their proximity to the river and the river mouth.

**Exhibit 3. Primary Study Area map**




Source: ECOnorthwest

In 2024, the combined primary study area had a population of 155,265, representing 4.7 percent of total county population. The following items breakdown the demographic and economic landscape of the area. For more details, please refer to Appendix I.

- **San Diego South Bay Neighborhoods**: **Otay Mesa, Otay Mesa-Nestor, San Ysidro, Tijuana River Valley.** This area has the highest concentration of Hispanic residents of the three primary study area geographies compared in Appendix I (74 percent, a location quotient "LQ" of 2.15), and the lowest share of adults with a bachelor's degree or higher among the three (19 percent, an LQ of 0.43). San Ysidro anchors this pattern as a binational community built around the San Ysidro Port of Entry, the busiest land border crossing in the Western Hemisphere.[17] Otay Mesa, just east of San Ysidro, handles nearly all northbound commercial truck traffic for the San Diego–Tijuana region and remains one of the busiest commercial truck crossings in the country, moving roughly one million loaded trucks a year—an economic role for these

[17] "The International Gateway," City of San Diego. https://www.sandiego.gov/sites/default/files/legacy/planning/community/profiles/pdf/cp/cpsypegateway.pdf.

neighborhoods that is distinct from, but adjacent to, the pollution exposure documented in this report.[18]

- **Coronado.** Demographics diverge sharply from the rest of the primary study area: residents are more likely to be non-Hispanic white (67 percent, an LQ of 1.6) and to hold a bachelor's degree or higher (65 percent, an LQ of 1.5), and roughly 15 percent of the population lives in group quarters (about 4.7 times the county's rate) reflecting the more than 36,000 active-duty, reserve, and civilian personnel across Naval Base Coronado's installations, which include Naval Air Station North Island and the Naval Amphibious Base, within city limits (see Appendix I).[19] Census Bureau estimates put Coronado's median household income at roughly $134,500, nearly double the county median, underscoring that Coronado brings substantially more financial resources to the crisis than the primary study area's other communities.[20] Tourism has anchored Coronado's economy since the Hotel del Coronado opened in 1888 and helped establish the city as a resort destination; the Hotel del Coronado, Coronado Island Marriott, and Loews Coronado Bay Resort remain three of the primary study area's largest visitor-serving employers today.[21]
- **Imperial Beach.** The population of Imperial Beach is majority Hispanic, (53 percent, an LQ of 1.5), renter-occupied (69 percent, an LQ of 1.5), and living below the federal poverty line (15 percent, an LQ of 1.4) relative to San Diego County as a whole (see Appendix I). Independent Census Bureau estimates put Imperial Beach's poverty rate at a comparable 14.8 percent and its median household income at roughly $80,000-$86,000, consistent with this report's finding that the community experiencing the clearest measured effects of the crisis already has comparatively fewer financial resources to draw on.[22] Imperial Beach's identity has long been tied to its coastal recreation economy: the city's own historical accounts describe waterman Dempsey Holder first surfing the Tijuana Sloughs break in 1937, and by 1950 the area had drawn surfboard designer Bob Simmons and other Southern California surfers seeking what were then the largest waves on the U.S. mainland.[23]

[18] “SR 11/Otay Mesa East, Port of Entry.” SANDAG, 2019. https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and-programs/featured-projects/sr-11-otay-mesa-east-port-of-entry/sr-11-otay-mesa-east-port-of-entry-economic-impact-2019-07-01.pdf

[19] “Total Force Manpower.” CNIC. Accessed September 2026. https://cnrsw.cnic.navy.mil/About/Total-Force-Manpower/.

[20] U.S. Census Bureau. American Community Survey 5-Year Estimates, Table B19013 (Median Household Income), Coronado city, California.

[21] “History of the Hotel del Coronado.” Hotel del Coronado. Accessed September 2026. https://www.hoteldel.com/press/brief-history-hotel-del-coronado/

[22] U.S. Census Bureau. American Community Survey 5-Year Estimates, Table B19013 (Median Household Income) and Table B17001 (Poverty Status), Imperial Beach city, California.

[23] "About Imperial Beach." City of Imperial Beach, California. Accessed September 2026. https://www.imperialbeachca.gov/462/About-Imperial-Beach.

## Regional and Broad Study Areas

Three features of the regional economy shape how the sewage crisis spreads beyond the communities where pollution is concentrated:

- **Tourism is a major traded sector.** In 2025, San Diego County had roughly 32.4 million visitors who spent an estimated $14.4 billion.[24] In fiscal year 2025, that activity generated about $425 million in transient occupancy tax (TOT) revenue countywide.[25] The industry employs about one in eight people in San Diego.[26] Beach tourism in the primary study area is a meaningful part of this sector: before 2017, visitor spending associated with Imperial Beach and Coronado Beach alone supported approximately 13,000 jobs in San Diego County.[27]
- **Defense is one of the region's largest economic drivers.** The 2025 Military Economic Impact Report estimates that defense activity generated about $61.3 billion in Gross Regional Product, or 22.2 percent of the regional total, and supported roughly 357,000 jobs (direct and indirect), or 22.4 percent of regional employment.[28] Naval Base Coronado installations sit within the primary study area.
- **The region's economy is also binational.** A 2021 San Diego Association of Governments (SANDAG) study estimated that border crossing delays in 2016 cost the San Diego–Tijuana combined region at least $3.4 billion in economic output and 88,000 jobs.[29] Average crossing times that year ranged from 43 minutes at Tecate to almost 80 minutes at San Ysidro.[30] The border also shapes where the region's workers commute from: roughly 60,000 people live in Tijuana and commute daily to jobs in San Diego.[31]

In terms of regional demographic features, the county's population growth has slowed sharply. The San Diego region added about 1 million people between 1980 and 2000, but

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[24] San Diego Tourism Authority (SDTA). 2026. "National Travel & Tourism Week in San Diego." Web Page. San Diego, California. https://www.sandiego.org/about/national-travel-and-tourism-week.
[25] SDTA, "National Travel & Tourism Week in San Diego."
[26] San Diego Regional Economic Development Corporation (San Diego Regional EDC). 2026. "Tourism." Web Page. San Diego, California. https://www.sandiegobusiness.org/about-the-region/tourism/.
[27] See "Spending Losses Ripple Through the Regional Economy" in Chapter 4, Exhibit 16. Changes in Economic Activity Resulting from crisis, of this report (ECOnorthwest IMPLAN analysis).
[28] San Diego Military Advisory Council (SDMAC) and UC San Diego Rady School of Management. 2025. "2025 San Diego Military Economic Impact Report." Research Report. November. San Diego, California. https://sdmac.org/wp-content/uploads/2025/11/2025-SDMAC-Report-WEB-Single.pdf. City of San Diego. 2026. "Proposed Budget, Volume 1: City Profile." Budget Document. San Diego, California. https://www.sandiego.gov/sites/default/files/pb_v1cityprofile.pdf.
[29] San Diego Association of Governments (SANDAG). 2021a. "New SANDAG Report Finds Border Delays Caused $3.4 Billion Drop in Economy, Including the Loss of 88K Jobs." News Release. February 26. San Diego, California.
[30] San Diego Association of Governments (SANDAG). 2021b. "Impacts of Border Delays at California – Baja California Land Ports of Entry." InfoBits Report. February 1. San Diego, California. https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and- programs/featured-projects/sr-11-otay-mesa-east-port-of-entry/impacts-of-border-delays-at-california-baja-california-land-ports-of-entry-2021-02-01.pdf.
[31] KPBS. 2023. "Tijuana Rents Rising Twice as Fast as San Diego's." News Article. September 21. San Diego, California. https://www.kpbs.org/news/border-immigration/2023/09/21/tijuana-rents-rising-twice-as-fast-as-san-diegos.

only about half that in the following two decades.[32] SANDAG's 2042 forecast projects an eventual population decline, driven by rising deaths, falling births, and flat migration.[33] Census Bureau population estimates presented in Appendix I also show that net population change in San Diego County has declined over the past two decades.[34] Slower growth, an aging population, and high housing costs affect school enrollment, household formation, and labor supply across the region. These are the same indicators this study uses to assess conditions in the primary study area.

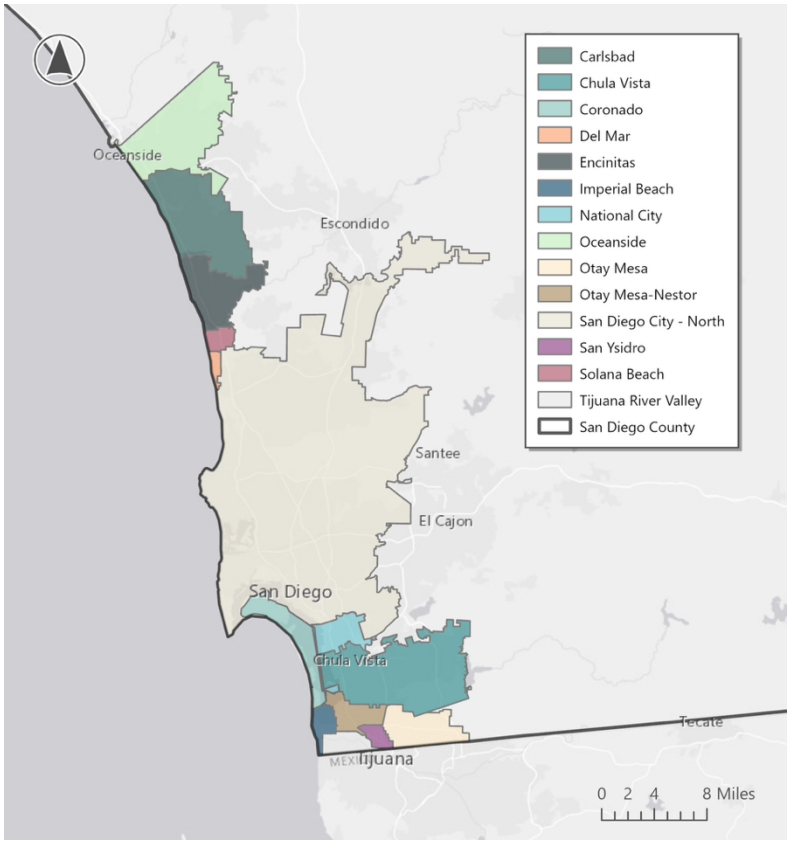
In addition to using San Diego County as contextualization for primary study area trends, this study evaluates how the primary study area compares to geographies in the broader area. Three groups of jurisdictions are added to place the primary study area within the larger region:

1. National City and Chula Vista,
2. the remainder of the City of San Diego (San Diego City – North), and
3. the Northern Coastal Cities of Oceanside, Carlsbad, Encinitas, Solana Beach, and Del Mar.

Exhibit 4 below, demonstrates the geography of the broad study area in relation to the county and primary study area.

[32] Axios San Diego. 2023. "San Diego Projects an End to Perpetual Population Growth." News Article. August 14. San Diego, California. https://www.axios.com/local/san-diego/2023/08/14/san-diego-population-decline-forecast.
[33] Axios San Diego, "San Diego Projects an End to Perpetual Population Growth."
[34] See Appendix I of this report (U.S. Census Bureau Population Estimates Program, components of population change, San Diego County, 2001–2025).

**Exhibit 4. Broad Study Area map**




Source: ECOnorthwest

Each of these additional jurisdictions carry local socioeconomic conditions that help distinguish crisis-related effects from regional trends. Below is a summary of the local characteristics of the areas within the broad study area.

- **National City and Chula Vista.** Together, these cities are home to about 335,000 residents, roughly 10 percent of the county's population, and have grown slightly since 2015–2019.[35] Both are majority Hispanic (approximately 61 to 64 percent, compared with 35 percent countywide), and National City has a higher share of renters and a lower median household income than the county, while Chula Vista's median income is close to the county's.[36]
- **San Diego City - North.** The City of San Diego is home to about 1.39 million residents, roughly 42 percent of the county's population. Its residents are slightly less likely to

[35] County of San Diego, Health and Human Services Agency, Public Health Services, Community Health Statistics Unit. 2021. "City Demographic Profiles, San Diego County (2015–2019 American Community Survey 5-Year Estimates)." Research Report. May. San Diego, California. https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/CHS/2024%20City%20Demographic%20Profiles.pdf.

[36] County of San Diego 2026. https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/CHS/2024%20City%20Demographic%20Profiles.pdf

be Hispanic than the county as a whole (30 percent), more of its households rent, and its median household income is similar to the county's.[37]

- **Northern Coastal Cities.** Together, these five cities have about 365,000 residents, roughly 11 percent of the county's population, and their combined population has declined slightly since 2015–2019.[38] Their residents are older and have higher incomes than the county overall, and every city except Oceanside has a smaller Hispanic share than the county.

## Geographic Scope of the Analysis

This study focuses on economic impacts occurring within San Diego County and the U.S. communities most directly affected by the Tijuana River sewage crisis. Although the crisis is binational and may also create impacts in Mexico, quantifying and estimating a comprehensive economic impact was out of scope for this project. However, relevant Mexican data are incorporated where they provide context for understanding the source, scale, or future trajectory of the crisis.

[37] County of San Diego 2026. https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/CHS/2024%20City%20Demographic%20Profiles.pdf. Note: citywide figures include the primary study area's San Diego south bay neighborhoods.

[38] County of San Diego 2026. https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/CHS/2024%20City%20Demographic%20Profiles.pdf.

# 2. Analytical Framework and Approach

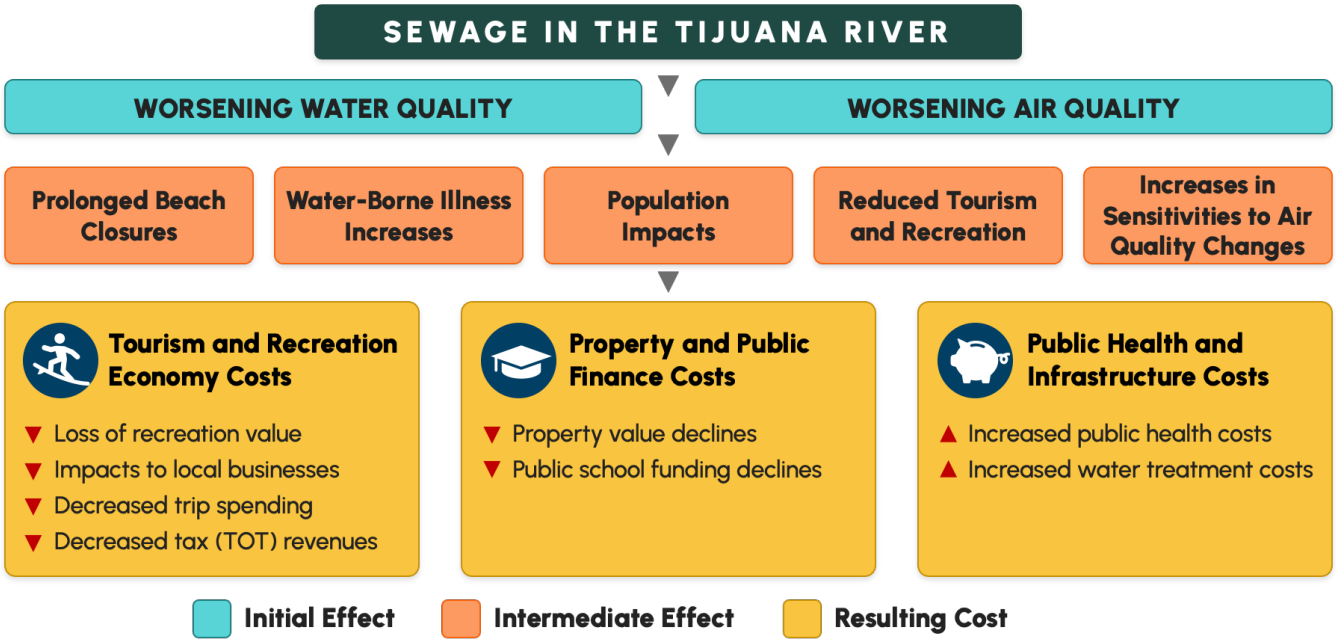
## How Pollution Creates Economic Effects

The economic consequences of the Tijuana River sewage crisis do not arise from pollution alone. They emerge through a series of connected effects. Sewage in the Tijuana River can worsen water and air quality, which can lead to beach closures, health concerns, reduced tourism and recreation, and changes in where people choose to live, visit, and spend time. Those behavioral and environmental changes can then translate into economic consequences for households, businesses, property owners, public agencies, and the broader regional economy.

The cost pathways framework (Exhibit 5 below) illustrates these potential connections. It organizes the analysis into three stages: the **initial effects** of worsening water and air quality; the **intermediate effects** that influence behavior or exposure, such as prolonged beach closures, illness, population impacts, and reduced tourism and recreation; and the **resulting economic costs**, including lost recreation value, impacts to local businesses, reduced trip spending and tax revenues, property-value effects, school-funding impacts, and increased public health or infrastructure costs.

The framework is intended to show our approach for evaluating how the crisis might create economic effects: through multiple pathways rather than suggest that every pathway is equally measurable or attributable to pollution. Some effects are more directly observable than others, and some can be translated into monetary terms with greater confidence. The sections that follow explain how this study distinguishes among economic costs and economic impacts, the types of evidence used to evaluate each pathway, and the limitations on drawing causal conclusions.

**Exhibit 5. Potential cost pathways**




Source: ECOnorthwest

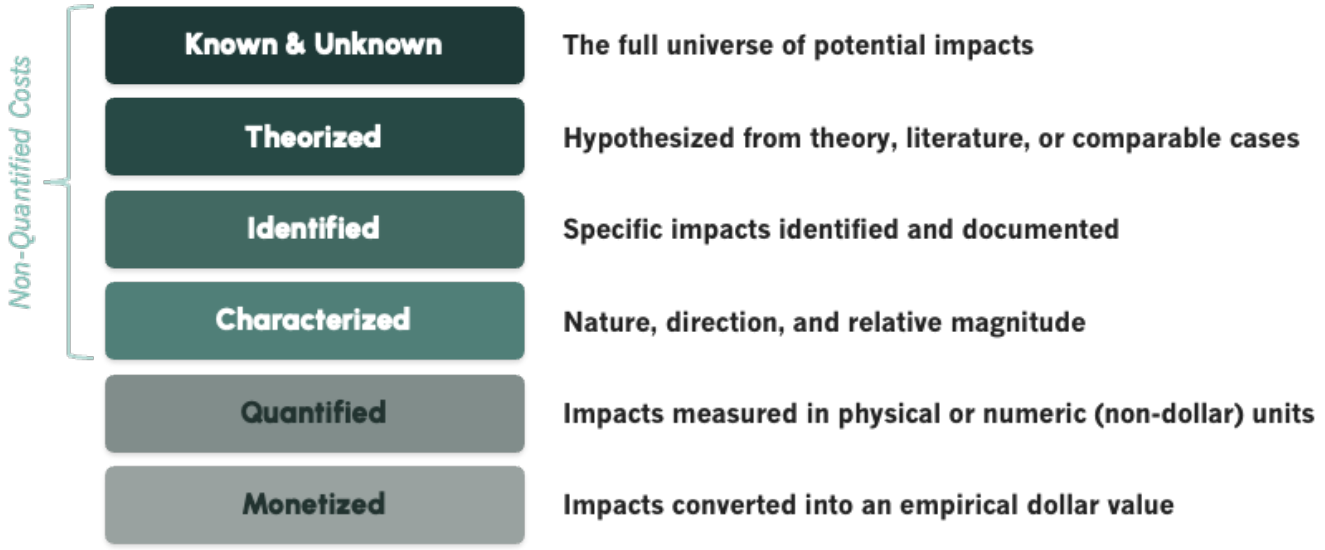
## How to Interpret the Impacts Presented in This Study

The Tijuana River sewage crisis creates a wide range of potential economic impacts, but not every effect can be measured with the same level of precision. Some impacts can be directly observed and converted into dollar values; others can be documented or quantified without a monetary estimate; and still others are supported primarily by theory, prior research, or stakeholder experience.

For the purposes of this study, we have organized the potential economic impacts into a hierarchy of costs: monetized, quantified, and non-quantified. The definitions of these three categories are as follows:

- **Monetized Costs**: These represent cost estimates that should be used to inform the magnitude of the cost resulting from the crisis and potential cost of a continuing crisis, rather than the specific dollar amount. The extent of the cost could vary depending on water management and policy decisions.
- **Quantified Costs**: Unlike the market-based costs that could be monetized, quantified costs lack sufficient information about either the change that could occur or the costs that could arise from the crisis. These non-monetary values represent opportunities for further study and should be applied with caution.
- **Non-Quantified Costs**: These costs include those that resist quantification either because of a lack of available information or because the value is not something that can or should be appropriately quantified. These include Characterized, Identified, Theorized, and Known & Unknown costs.

**Exhibit 6. Hierarchy of costs**




Source: ECOnorthwest

This framework is important because a lack of monetization does not mean that an effect is absent or unimportant. Rather, it reflects the limits of available data and the strength of the evidence needed to attribute a specific effect to the sewage crisis. For example, an effect may be well documented through surveys, administrative data, or prior research but still lack the information needed to isolate its magnitude in dollars. Throughout this report, results are therefore presented at the strongest level supported by the available evidence rather than forcing all effects into a single monetary estimate.

## Data and Methods at a Glance

This study uses a mixed-methods approach that combines environmental, economic, demographic, and other administrative data with direct input from residents, visitors, businesses, community organizations, and other stakeholders.

For the strongest measurable pathway, changes in beach visitation, the analysis combines historic visitation data to distinguish local and non-local visitation, estimates visitor spending using established tourism and recreation spending profiles, and uses IMPLAN to estimate the direct, indirect, and induced economic activity supported by that spending. The analysis evaluates multiple comparison periods as visitation patterns differ across Imperial Beach and Coronado and because no single year provides a perfect representation of conditions absent the crisis. Other analyses examine trends in business formation and employment, school enrollment and attendance, recreation value, property and investment conditions, public health, and government expenditures. Taken together, these methods provide multiple lines of evidence rather than relying on any single dataset or model.

Exhibit 7 below summarizes the key metrics and primary data sources used for each analysis pathway. For more detailed information within each topic, see the relevant technical appendices.

**Exhibit 7. Analysis Pathway Framework and Data Summary**

| Analysis Pathway | Key Metrics | Primary Data Sources |
|---|---|---|
| **Visitation Trends and Economic Contributions**<br><br>(see Appendix A and Appendix B for more detail) | • Beach visitation trends<br>• Local jurisdiction visitation trends<br>• Recreation and visitation spending patterns<br>• Retroactive and prospective economic contributions, pre-2017 and pre-2023 | • Placer.ai mobile geolocation visitation data<br>• United States Lifesaving Association (USLA) beach attendance<br>• Dean Runyan Associates visitor spending patterns<br>• US Forest Service recreational spending patterns<br>• IMPLAN's regional economic model |
| **Business and Employment**<br><br>(see Appendix C for more detail) | • Business start trends<br>• Industry clusters trends<br>• Retail vacancy trends<br>• Taxable sales trends | • California (CA) Employment Development Department (EDD) Quarterly Census Employment and Wages (QCEW)<br>• Census Longitudinal Employment-Household Dynamics (LEHD)<br>• CoStar retail vacancy data<br>• CA Taxable Sales |
| **Transient Occupancy Tax**<br><br>(see Appendix D for more detail) | • Transient occupancy tax (TOT) revenue trends | • California State Controller's Office<br>• CoStar Group |
| **Property Values**<br><br>(see Appendix E for more detail) | • Property sales trends<br>• Property values trends | • San Diego County Assessor parcel and property data |
| **Public Health**<br><br>(see Appendix F for more detail) | • Enterococcus Levels by Beach<br>• Water Recreators by Season by Beach<br>• Hydrogen Sulfide (H2S) Levels by Monitoring Station | • Literature Review<br>• US EPA Recreational Water Criteria Methodology<br>• California State Water Resources Control Board (SWCRB) Beach Water Quality Data<br>• San Diego County Air Pollution Control Board Hydrogen Sulfide monitoring data |
| **School Funding**<br><br>(see Appendix G for more detail) | • School Proximity to Pollution<br>• Fall School Enrollment trends<br>• Average Daily Attendance trends<br>• LCFF Funding Levels (Base Grant Entitlement) | • California Department of Education data<br>• Literature Review |

| | | |
|---|---|---|
| | • School District Demographics (Free/Reduced Price Meal Status, Race/Ethnicity)<br>• Chronic Absenteeism | |
| **Community and Stakeholder Engagement**<br><br>(see Appendix H and the callout box at the end of this chapter for more detail) | • How people are changing how and where they spend their time and money | • Four focus groups<br>• Four total surveys for community members, visitors, businesses, and organizations |

This study's approach is anchored in comparisons to a small number of inflection points, benchmarking the primary study area against comparison geographies, and relying on broad economic indicators rather than pollution-specific measures. This is what makes it possible to describe the patterns presented throughout this report. They are also the source of most of the limitations discussed next: an inflection-point comparison cannot rule out other events that occurred around the same date, a comparison geography is never a perfect counterfactual for the primary study area, and a broad economic indicator cannot, by itself, distinguish the sewage crisis's effect from every other factor influencing that indicator. The following section describes these limitations in more detail, pathway by pathway.

## Stakeholder and Community Engagement

Stakeholder and community engagement was designed both to incorporate local experience into this study and to strengthen the economic analysis by identifying impacts that may not be visible in existing datasets. The **engagement approach was conducted in two stages**. First, Kearns & West facilitated **virtual focus groups** with stakeholders representing Imperial Beach, Coronado, San Ysidro/Nestor, and the broader region. Participants included local governments, business and tourism organizations, environmental and community organizations, economic-development groups, and others with direct experience of the crisis. These discussions gathered qualitative information about effects on businesses, recreation and tourism, community activities, investment, public services, and quality of life, while also helping identify economic pathways, data gaps, and priorities for the subsequent surveys. The focus groups primarily occurred in Spring of 2026 prior to other data collection stages of the project. This staged approach was intended to use early qualitative engagement to inform a broader and more structured collection of evidence.

The second stage consisted of **four surveys**, offered in English and Spanish, designed for community members, visitors, businesses, and organizations. Each survey captured a different perspective on the crisis. The community survey focused on changes in daily activities, recreation, spending, and other household decisions; the visitor survey examined changes in trips, recreation, and visitor experience; and the business survey focused on customer activity, revenues, workforce effects, and operational changes. A separate organization survey was developed for nonprofits, business-support organizations, public agencies, and other community-serving entities whose impacts differ from those of an individual business—for example, increased demand for services, disrupted programming, or staff and resources being redirected from an organization's core mission toward crisis response.

Survey outreach relied on a dedicated project webpage, direct email outreach, and partnerships with chambers of commerce, tourism organizations, community-based organizations, public agencies, business groups, and other trusted local partners. Partners were provided English- and Spanish-language outreach materials for newsletters, social media, websites, and their own networks, with targeted follow-up and additional outreach used to broaden participation across geographies and stakeholder groups. The surveys were intended to capture whether respondents had been affected by the crisis and, importantly, how their behavior had changed as a result—including where people and spending may have shifted. Because the surveys were distributed through targeted outreach rather than a statistically representative sampling design, the results are used as complementary evidence of behaviors, perceived impacts, and lived experiences rather than as estimates representative of the entire population. The survey was launched in May of 2026 and kept open for the duration of the project. Additional outreach was conducted to boost participation during July of 2026 (e.g., follow up emails, direct flyering to local businesses). For this report, survey findings reflect responses downloaded from SurveyMonkey on September 11, 2026.

## Study Limitations

The strength of the attribution between the sewage crisis and the patterns identified through each pathway varies considerably. For beach visitation and the visitor spending associated with it, the analysis compares observed visitation to a constructed counterfactual, noting that other events such as the COVID-19 pandemic and major storms (such as Tropical Storm Hillary in 2023) limit the ability to link all change in visitation to the pollution. However, this study also identifies some of the visitation loss is corroborated by survey respondents who directly attribute changed behavior to pollution. This combination of evidence supports a comparatively high degree of confidence that changes in visitation, and the regional economic activity that depends on it, are connected to the crisis.

For most of the other pathways examined in this report, the connection is more limited. These outcomes are shaped by many factors beyond pollution, including national and regional economic cycles, migration trends, interest rates, and the COVID-19 pandemic, and the available data cannot fully isolate the effect of the sewage crisis from these other influences. In these cases, the report generally identifies a correlation, a pattern, divergence, or trend that is consistent with an effect of the crisis, rather than establishing that the crisis caused the observed change.

Readers should therefore distinguish between the monetized cost estimates in this report, which are grounded in the visitation pathway and its documented counterfactual, and the quantified and non-quantified findings presented for other topics, which describe patterns that warrant continued attention and monitoring rather than proven causal effects.

# 3. Evidence that the Crisis is Changing Economic Behavior

## Pollution and Closure Conditions Have Intensified

The environmental conditions associated with the Tijuana River sewage crisis have varied over time, but multiple indicators show a clear escalation in recent years. Transboundary sewage flows increased substantially beginning around 2020 and reached especially high levels in 2023 and 2024. These increases occurred alongside major infrastructure failures and storm events, including the 2017 collector collapse and Tropical Storm Hilary in 2023, which help explain some of the variation in flows over time.

Higher transboundary flows have also been reflected in water-quality conditions along the coast. Monitoring data show elevated bacterial concentrations at affected beaches during periods of higher flows[39], reinforcing the connection between upstream sewage conditions and downstream recreational impacts. These conditions have contributed to frequent and prolonged beach closures, particularly in Imperial Beach, where loss of reliable beach access has become one of the most visible consequences of the crisis.

The increase in pollution conditions has also been accompanied by a sharp rise in public awareness. Google Trends data show growing search interest in terms such as “Tijuana River,” “Tijuana River Sewage,” “Tijuana Sewage Crisis,” and “Tijuana River Pollution,” with search activity increasing markedly in the most recent years. This matters because the economic effects of the crisis are shaped not only by physical exposure to pollution, but also by what residents and visitors know or believe about conditions in affected areas.

Together, these trends establish an important foundation for the economic analysis that follows. The crisis has become more severe in physical terms and more visible to the public. As environmental conditions worsen and awareness grows, residents and visitors may respond by avoiding beaches, shortening trips, choosing other destinations, or shifting where they spend time and money. The next section examines whether those behavioral responses are evident in stakeholder engagement and other available data.

## People are Changing How and Where they Spend Their Time and Money

The environmental conditions described above matter economically because they influence how people behave. The stakeholder engagement conducted for this study provides direct evidence that residents, visitors, businesses, and community organizations are changing where they spend time, where they spend money, how they operate, and in some cases whether they remain in affected communities. The surveys provide the clearest quantitative

[39] For more details on beach monitoring data, see Chapter 5 (of this report) “Public Health Costs”

evidence of these behavioral changes, while the discussion groups help explain how and why those changes are occurring.

The engagement findings should be interpreted as one line of evidence alongside the other quantitative analyses in this report. The surveys were designed to capture experiences and behavioral responses that are not readily observable in administrative datasets, while the discussion groups provided additional detail on economic pathways, local conditions, and differences among affected communities. The survey responses are not statistically representative of the broader population, but they provide consistent evidence of changes in behavior among people and organizations directly experiencing the crisis.

To better understand how the pollution is affecting behavior, spending, and business outcomes, ECOnorthwest conducted multiple surveys. These surveys targeted local residents, visitors, businesses, and other organizations and were provided in both English and Spanish. There were a total of 17 focus group participants and 246 responses across all four surveys. Survey and focus group findings are referenced in the following sections and full results are available in Appendix H.[40]

Across these groups, a consistent pattern emerges: respondents report avoiding affected places and activities, shifting spending to other areas, shortening or canceling visits, and adapting business or organizational operations. The earlier discussion groups identified many of the same behaviors before the surveys were fielded, which helped shape the survey questions and provided additional context for interpreting the results. The engagement therefore suggests that the pollution crisis is not only affecting environmental conditions; it is also changing economic decisions.

## Residents and Community Members Are Changing Activities

Community survey respondents report changing routine activities, where they spend money, and where they may live. Of 161 respondents, 66 percent said they were spending less time in their neighborhood or surrounding areas because of pollution, and another 18 percent answered somewhat. Of 159 respondents, 69 percent said pollution had influenced them to use businesses outside the affected area, with another 16 percent answering somewhat.

**"It is heartbreaking that my children often ask to go into the ocean, and I have to tell them no every time because it is not safe."**

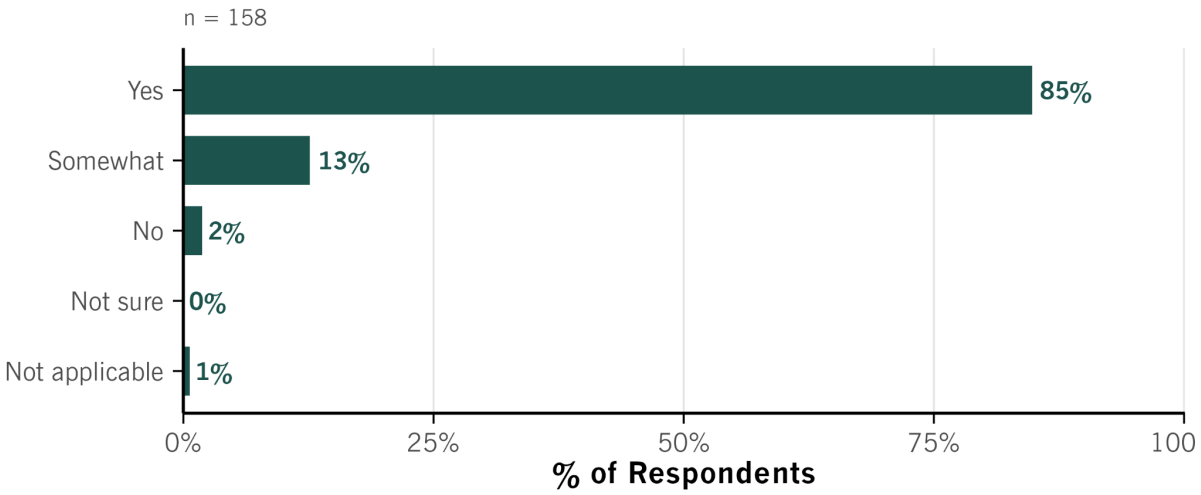
Open-ended responses reveal where activity and spending are being diverted to. Among respondents who described an alternative recreation destination, 35 percent primarily named North County or northern San Diego beaches, 16 percent named Chula Vista, East County, or other South Bay cities, and 9 percent said they stayed home or indoors. Among respondents who described where they shop instead, 36 percent primarily named Chula

[40] Note, survey responses were downloaded from SurveyMonkey on 9/11/2026. All results reflect survey data as of that date.

Vista, East County, or other South Bay or inland areas, while 22 percent named North County or coastal San Diego. Other comments described keeping windows closed, relying on air conditioning, using delivery, and avoiding outdoor time as household responses to odor and perceived health risks.

Exhibit 8 provides a clear measure and description of day-to-day behavior change. Ninety-eight percent of respondents reported at least some limit on recreation, while only 2 percent said no. Because the question includes walking, swimming, shopping, and dining, the result indicates that avoidance extends beyond direct water contact to neighborhood public spaces and in-town activities.

**Exhibit 8. Are you limiting your recreational activities in the affected area (i.e., walking, swimming, shopping, dining) due to pollution?**




Source: ECOnorthwest analysis of SurveyMonkey survey results.

The discussion groups provide additional context for these survey findings. In Imperial Beach, participants described a loss of community identity and quality of life, including children growing up without using the ocean and recreational activities such as surfing and junior lifeguard programs being relocated elsewhere. In San Ysidro and the Tijuana River Valley, participants similarly described residents traveling north to access cleaner beaches and recreational spaces, resulting in additional transportation costs and spending outside the immediate area.

Longer-term decisions are also affected: 66 percent of 163 respondents had considered moving, although only 7 percent of 166 respondents reported that they had already moved. Discussion-group participants echoed this concern, particularly in Imperial Beach and the Tijuana River Valley, where some stakeholders described families or individuals relocating because of odors, health concerns, or diminished access to recreational amenities. These accounts do not demonstrate the extent to which the crisis is driving population change, but they suggest a pathway that warrants consideration alongside the broader demographic and property-market analyses.

## Visitors Are Changing Their Trips

**"Never visiting again."**

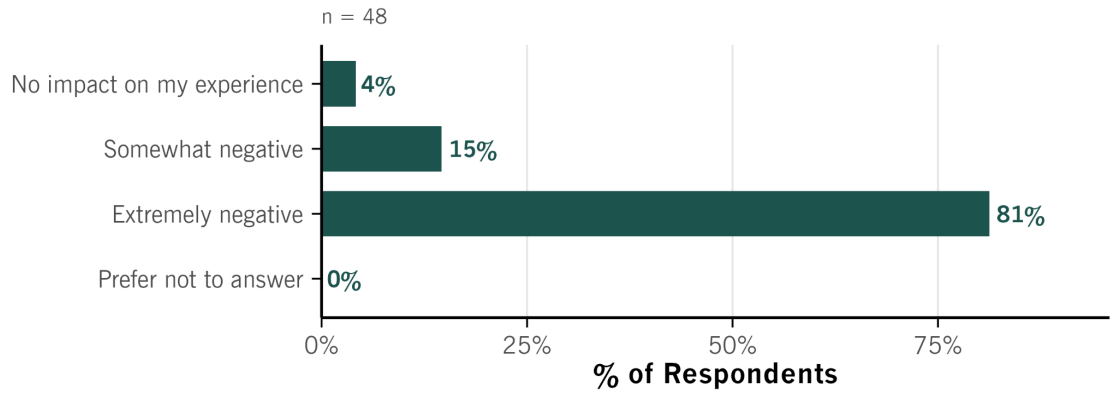
**"It has tarnished the legacy and appreciation of Coronado as a destination."**

Visitor survey responses indicate that the crisis is affecting not only what people do once they arrive, but whether they come, how long they stay, and whether they intend to return.

Survey responses indicated that visitors most often changed activities at the beach, but the effects also reached trip length and destination choices. Among 48 respondents describing behavior during a visit, 77 percent avoided water contact at the beach and 69 percent avoided certain beaches or areas. Only 6 percent of visitors reported no change to their plans whereas many respondents canceled plans (42 percent), shortened visits (42 percent), or chose a different destination (33 percent).

These immediate changes appear to carry into future travel intentions. Eighty-one percent of respondents described the effect on their experience as extremely negative and another 15 percent as somewhat negative (Exhibit 9). Respondents also gave relatively low ratings for their likelihood of returning within two years and high ratings for the importance of pollution and beach closures to that decision—on a five-point scale, the average likelihood of visiting again within two years was 2.6 while the importance of pollution and beach closures to that decision averaged 4.7 (from 1 to 5). In open-ended responses about the next five years, about half of respondents primarily said they would stop visiting entirely and 29 percent said they would reduce or limit future visits.

**Exhibit 9. Overall, what was the effect of the Tijuana River pollution on the quality of your experience?**




Source: ECOnorthwest analysis of SurveyMonkey survey results.

The focus groups reinforce this distinction between changing activities during a trip and changing the trip itself. Coronado tourism stakeholders described guests canceling stays, requesting refunds, leaving negative reviews, and asking whether the water would be safe before booking meetings or conferences. Participants also reported that travel agents and visitors were increasingly considering other coastal destinations.

The discussion groups also highlighted the importance of perception. Coronado participants noted that visitors may avoid the area altogether when they hear that the "beach is closed," even though restrictions may apply specifically to water contact rather than access to the sand or nearby businesses. This distinction matters economically: the effects of a closure may extend beyond the activity that is physically restricted if visitors perceive the broader destination as unavailable or undesirable.

## Business and Organizations Observe Similar Changes

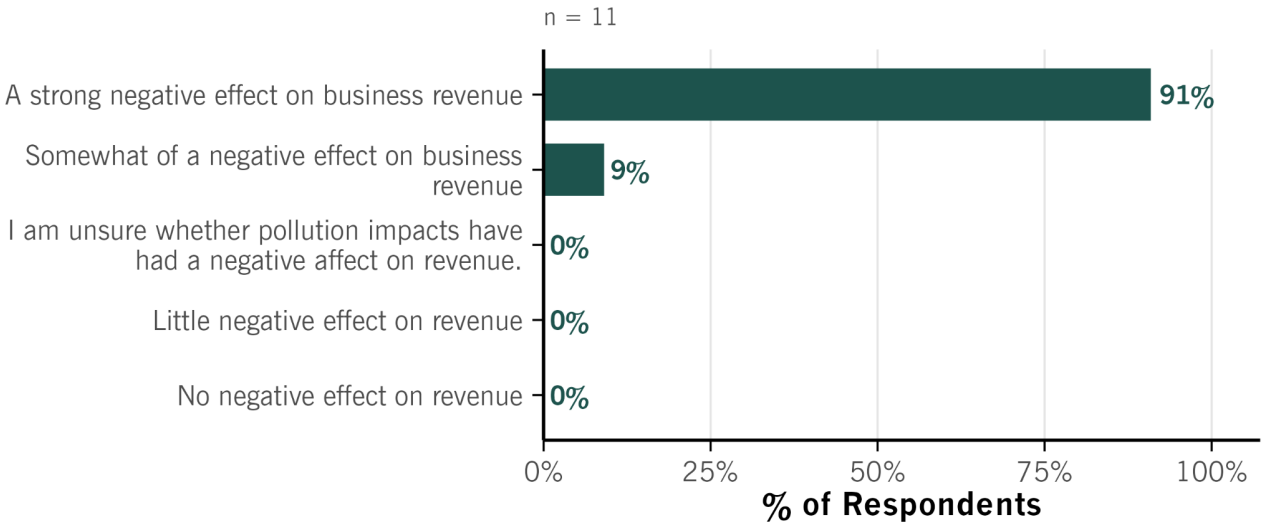
**"We will close or relocate."**

The business survey tells a similar story as was reported by residents and visitors. All 12 respondents who answered the question said they had struggled to attract new customers because of pollution, and 82 percent agreed that they had struggled to retain existing customers. The same share, 82 percent, agreed that customers were choosing businesses in other parts of the County. When asked about the effects of the pollution on revenue, almost all (91 percent) characterized the effect as strongly negative (Exhibit 10).

Businesses also reported adapting their operations in response. Survey respondents cited reducing staff (45 percent), changing products or services (36 percent), reducing wages (18 percent), and reducing operating hours (9 percent). Looking ahead, three of seven open-ended responses focused on closure or relocation, while two focused on financial and staffing decline, if conditions persist.

Organizations reported comparable operational strain. Two of the six organization respondents described restricted outdoor or public-facing operations, and two described relocation or a shift from their core mission to crisis response. One described increased service demand related to illness, and one described health symptoms that impaired capacity. When asked about the next two to five years, two of six responses centered on continued diversion of resources from the organization's core mission, while one centered on financial and staffing strain due to the pollution. These results indicate that the pollution can affect organizations through both strained capacity and higher demand for services.

**Exhibit 10. In your view, pollution in the Tijuana River has had:**




Source: ECOnorthwest analysis of SurveyMonkey survey results.

The discussion groups provide concrete examples of these mechanisms. In Coronado, participants reported lower foot traffic along Orange Avenue during beach closures and described beach-dependent businesses such as surf schools, camps, wedding planners, and picnic companies as downsizing, relocating, or closing. They also noted that these losses can extend to connected businesses such as caterers, equipment-rental companies, hotels, and restaurants.

Imperial Beach participants similarly described the loss of events and tourism activity, commercial vacancies, difficulty attracting investment, and concerns that visitors are choosing other coastal communities. The regional discussion group broadened this concern beyond visitor-facing businesses, with stakeholders describing the crisis as an emerging deterrent to business investment and workforce-location decisions in the South Bay.

Community-serving organizations reported related operational effects. Survey respondents described restrictions on outdoor or public-facing activities, relocation, increased service demand, and diversion of staff and resources away from their core missions toward crisis response. Discussion-group participants provided similar examples, including canceled environmental events, reduced programming, staff time spent rescheduling activities, relocation of nonprofit operations, and local-government staff time devoted to explaining beach closures and posting signage.

## What the Engagement Findings Show

Taken together, the engagement findings point to a common economic mechanism. Pollution and related beach closures are changing how people perceive and use affected communities. Residents report spending less time locally and shifting recreation and purchases elsewhere. Visitors report avoiding activities, shortening trips, changing destinations, or reconsidering future visits. Businesses report fewer customers and pressure on revenues and operations, while organizations and public agencies report diverting resources toward crisis response.

These findings do not by themselves establish the magnitude of the region's economic losses. They do, however, provide direct evidence of the **behavioral changes that connect environmental conditions to economic effects**. The chapters that follow examine whether those behaviors are also visible in quantitative indicators such as beach visitation, visitor spending, business activity, property markets, and other economic measures.

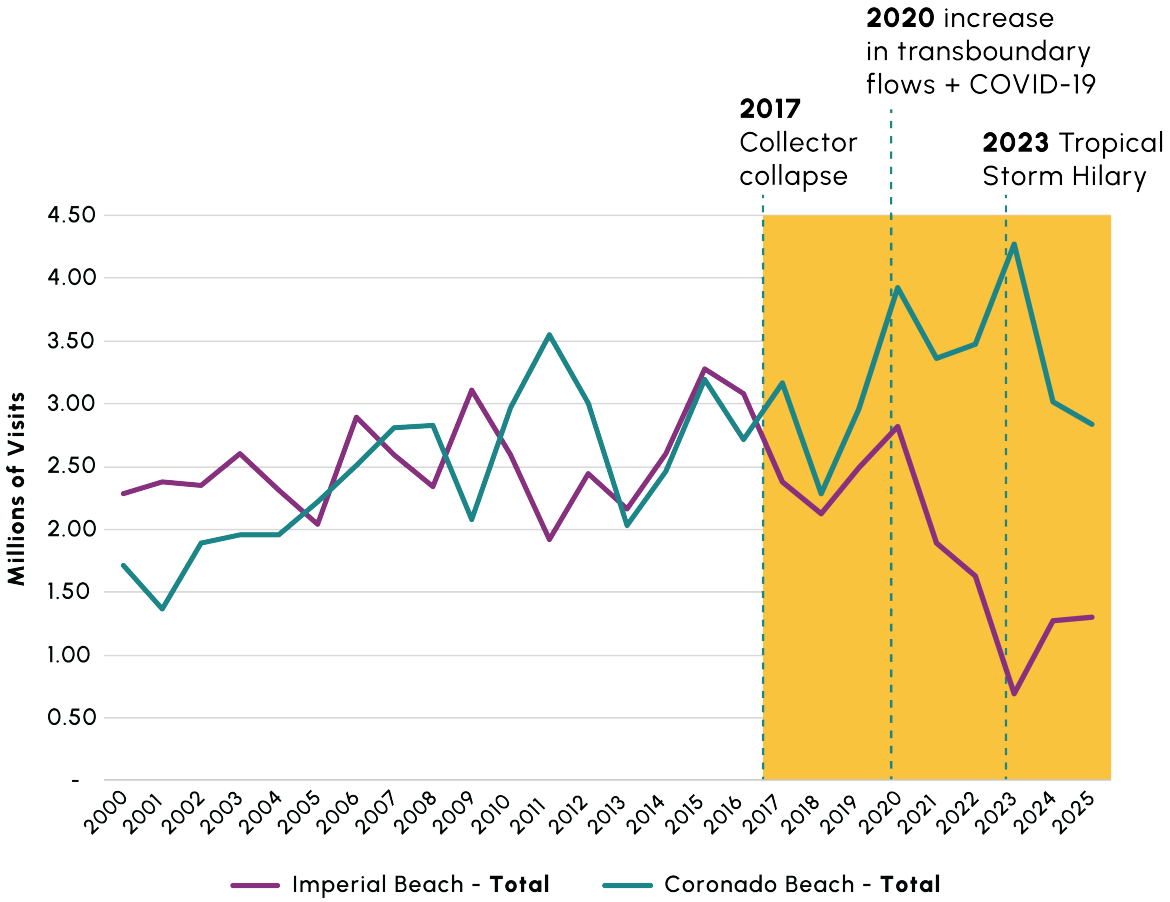
# 4. Reduced Visitation Creates the Largest Measurable Economic Impact

Though other novel impacts can be inferred, through extensive research, the principal causal link made between the crisis and economic changes in San Diego County is observed changes in visitation trends to Imperial Beach and Coronado Beach. In this context, using a combination of Placer.ai and United States Lifesaving Association (USLA) data, ECO estimates the split of visitation to the two beaches between Local visits—visitors are within 50 miles of the destination—and Non-Local visits—visitors who come from 50+ miles of the destination. Using visitor spending data from Dean Runyan Associates for San Diego County, ECO estimates the amount of visitor spending per trip for local and non-local visits and then estimates the amount of economic activity that is supported in San Diego County by that visitor spending using IMPLAN's input-output software. Non-local visitor spending represents net-new dollars to an economy, while local spending is money that is generally substituted from one sector of the economy to another. If a local spends less at a local beach, they will likely spend that money elsewhere in the economy, resulting in a net-neutral overall impact, but a shift in distributional impacts within the County.

## Beach Visitation Has Shifted

Visitation to Imperial and Coronado Beaches has seen significant changes over the last quarter century—especially in the last decade. From 2000 to 2016, visitation remained relatively flat and stable between the two beaches until 2017 when the trends between the two beaches diverged. Coronado Beach saw precipitous growth in visitation—reaching peak visitation in 2023— while Imperial Beach saw precipitous declines. One plausible explanation for this divergence is the collapse of the Tijuana Sewage Pipeline in 2017 which worsened the sewage crisis and has led to significant beach closures at Imperial Beach.

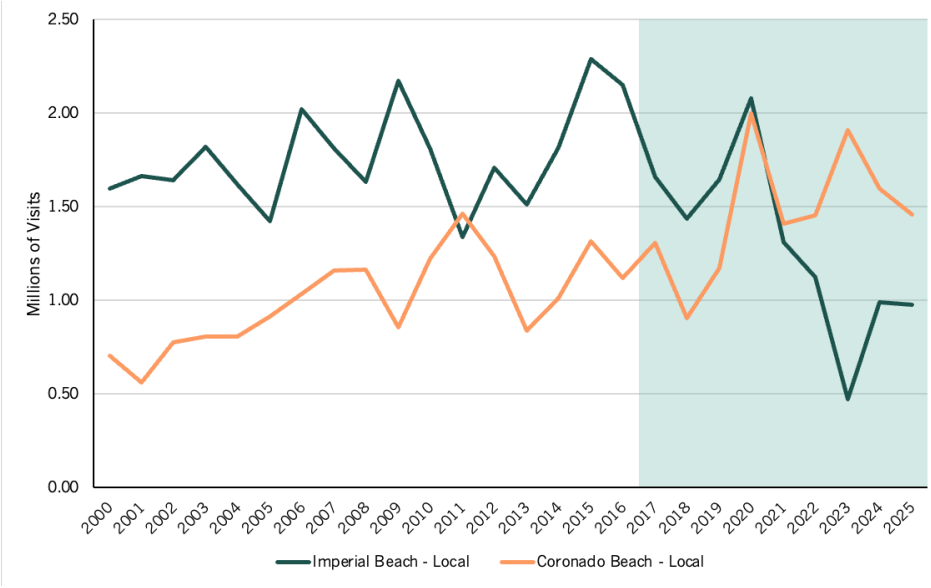
**Exhibit 11. Historic visitation to Imperial and Coronado Beaches (2000 to 2025)**




Source: United States Lifesaving Association and Placer.ai

The increased visitation to Coronado Beach post-2017 is likely due to locals (those living within 50 miles of the beaches) substituting trips to Imperial Beach with trips to Coronado Beach (Exhibit 12). This substitution effect is most notable during the Covid-19 Pandemic in 2020-2021. While decreased local visitation at Imperial Beach and increased local visitation at Coronado Beach may affect surrounding businesses differently, the effect to the San Diego County economy as a whole is net neutral. Local spending can be shifted to different sectors of the economy leaving little change to the overall economy. However, changes in non-local spending (those living outside 50 miles) represents new expenditures into the economy and changes in non-local visitation to beaches could be a boon or drag for the local economy.

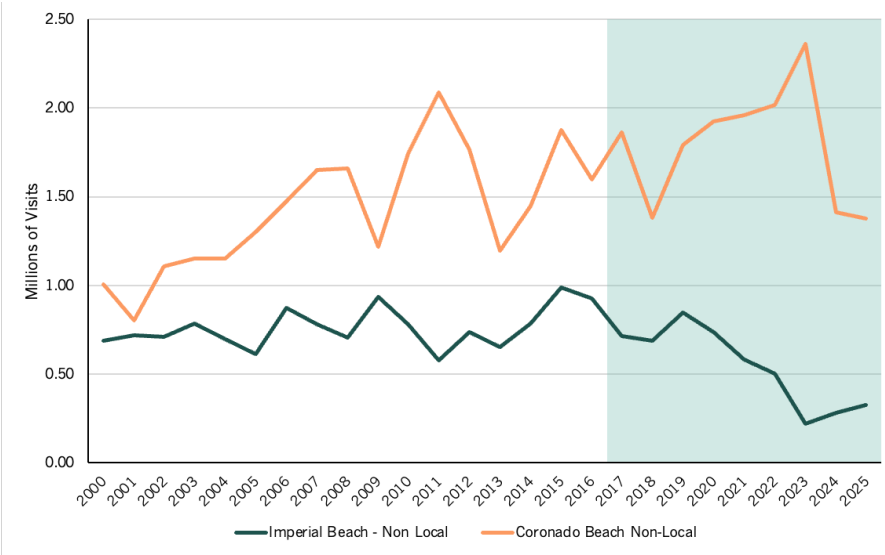
**Exhibit 12. Historic local visitation to Imperial and Coronado Beaches (2000 to 2025)**




Source: United States Livesaving Association and Placer.ai

Non-Local visits to Coronado Beach have always been higher than Imperial Beach over the last quarter century. However, post-2017, non-local visits to Coronado increased—until 2023—and non-local visits to Imperial Beach decreased. Changes to non-local visitation and the associated spending at tourism-related businesses would negatively affect the San Diego County economy more than changes in spending associated with changes in local visitation.

**Exhibit 13. Historic non-local visitation trends to Imperial and Coronado Beaches (2000 to 2025)**




Source: United States Livesaving Association and Placer.ai

Based on the visitation charts above, two distinct time frames are used to estimate the potential changes in economic activity related to changes in visitation trends to the two beaches. The first time frame looks at changes in visitation trends from 2008 – 2025 which uses 2017 as a treatment date based on increased pollution load. The difference between

the pre-2017 and post-2017 visitation trends show that the geometric average of visitation decreased at Imperial Beach by 868,00 visits but increased at Coronado Beach by 491,000 visits. In recent years Coronado Beach has experienced intermittent closures due to poor water quality; therefore, we looked at a more recent trend in visitation from 2020 – 2025 for this location, which the pre- and post-periods centered around 2023. Beach visitation trends between the pre-2023 and post-2023 decreased for both Imperial and Coronado Beach by over 1 million and 264,000 visits, respectively. The changes in visitation trends are used to estimate changes in visitor spending and economic impacts to the County.

## Lost Visits Mean Lost Visitor Spending

Using publicly available data, we are able to estimate the amount visitors may be spending on visits within San Diego County and what industries are benefiting from that spending (Exhibit 14). The industries that benefit are restaurants, hotels, retail, entertainment, and transportation. Using tourism data from San Diego Tourism Marketing District (SDTMD) we are able to estimate the split between day visits and overnight visits. In general, non-local visitors spend more per visit than local visitors and overnight stays spend more due to more meals and accommodations. By applying this spending pattern to shifts in visitor trends, we can evaluate changes in total expenditures and simulate their broader economic impacts using IMPLAN.

**Exhibit 14. Estimated visitor spending pattern per visit – day and overnight visits**

| | Non-Local | | Local | |
|---|---|---|---|---|
| Spending Category | Day | Overnight | Day | Overnight |
| Accommodations | $0.00 | $157.41 | $0.00 | $0.00 |
| Food Service | $134.90 | $134.90 | $51.69 | $0.00 |
| Arts, Entertainment, & Recreation | $67.03 | $67.03 | $22.07 | $0.00 |
| Retail Sales, Food Stores, & Gas Purchases | $97.23 | $97.23 | $57.16 | $0.00 |
| Local Transportation (e.g., Public and Private) | $20.01 | $20.01 | $5.52 | $0.00 |
| Air Transportation | $34.11 | $34.11 | $0.00 | $0.00 |

Source: Dean Runyan Associates, US Forest Service, San Diego Tourism Marketing District, and ECOnorthwest Analysis

Note: We assume that local visitors to these beaches are not making overnight trips and are not using air transportation.

Exhibit 15 shows the changes in average annual visitor spending by beach across the two visitor trends scenarios that were modeled. In both trends' scenarios, Imperial Beach sees a decrease in visitor spending by $202 million and $234 million, respectively. Coronado Beach, on the other hand, saw an increase of $113 million in visitor spending when looking at the longer trends visitation but saw a decrease of $125 million when looking at the 2020-2025 visitor trend period. In total, across both scenarios, visitor spending decreased between $90 million and $359 million, respectively. These decreases in visitor spending have a significant impact on the San Diego County economy.

**Exhibit 15. Total visitor spending, by beach, across scenarios**




Source: Dean Runyan Associates, US Forest Service, San Diego Tourism Marketing District, and ECOnorthwest Analysis

## Spending Losses Ripple Through the Regional Economy

IMPLAN is used to estimate the economic impact of reduced visitation to Imperial and Coronado Beaches as a result of the crisis (Exhibit 16). The left-hand side of the graphic shows the economic activity supported by visitor spend pre- and post-2017. Pre-2017 visitor spending supported approximately 9,000 direct jobs and 4,000 secondary jobs (indirect + induced) for a total of 13,000 jobs in the San Diego economy. Visitor spending supported $694 million in labor income, $1,183 million in value add, and $1,985 million in economic output. Post-2017, visitor spending supported 790 fewer jobs, $43 million less in labor income, $73.1 million less in value add, and $122.5 million less in economic output.

The right-hand side of the graphic shows the economic activity supported by visitor spend pre- and post-2023. Pre-2023 visitor spending supported approximately 9,610 direct jobs and 4,250 secondary jobs (indirect + induced) for a total of 13,860 jobs in the San Diego economy. Visitor spending supported $743 million in labor income, $1,268 million in value add, and $2,127 million in economic output. Post-2023, visitor spending supported 3,270 fewer jobs, $176 million less in labor income, $300 million less in value add, and $503.5 million less in economic output.

**Exhibit 16. Changes in economic activity resulting from the crisis**

| | Impact | Employment | Labor Income | Value Added | Economic Output |
|---|---|---|---|---|---|
| Pre-2017 | Direct | 8,970 | $416.3 | $685.8 | $1,162.7 |
| | Indirect | 1,900 | $141.7 | $230.4 | $409.0 |
| | Induced | 2,060 | $135.6 | $267.3 | $413.0 |
| | **Total** | **12,930** | **$693.5** | **$1,183.4** | **$1,984.7** |

| | Impact | Employment | Labor Income | Value Added | Economic Output |
|---|---|---|---|---|---|
| Pre-2023 | Direct | 9,610 | $446.1 | $735.0 | $1,246.2 |
| | Indirect | 2,040 | $151.8 | $246.9 | $438.3 |
| | Induced | 2,210 | $145.3 | $286.4 | $442.6 |
| | **Total** | **13,860** | **$743.2** | **$1,268.3** | **$2,127.1** |

| | Impact | Employment | Labor Income | Value Added | Economic Output |
|---|---|---|---|---|---|
| Post-2017 | Direct | 8,410 | $390.5 | $643.4 | $1,091.0 |
| | Indirect | 1,790 | $132.9 | $216.1 | $383.7 |
| | Induced | 1,940 | $127.2 | $250.7 | $387.4 |
| | **Total** | **12,140** | **$650.6** | **$1,110.2** | **$1,862.1** |

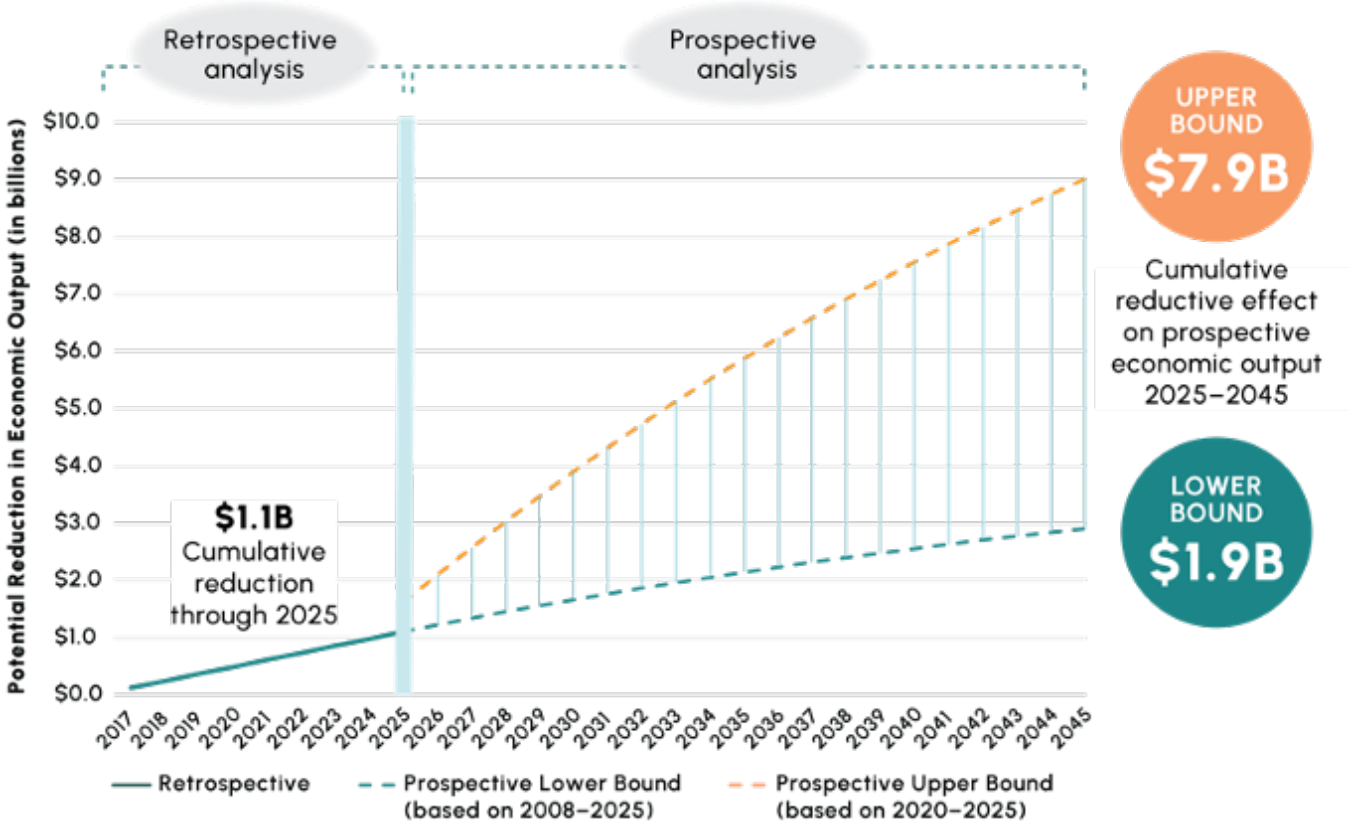
| | Impact | Employment | Labor Income | Value Added | Economic Output |
|---|---|---|---|---|---|
| Post-2023 | Direct | 7,340 | $340.6 | $561.0 | $951.1 |
| | Indirect | 1,560 | $115.9 | $188.5 | $334.6 |
| | Induced | 1,690 | $111.0 | $218.7 | $337.9 |
| | **Total** | **10,590** | **$567.4** | **$968.1** | **$1,623.6** |

Source: IMPLAN (2024) and ECOnorthwest Analysis

Note: All dollar values are presented in millions of dollars and in the 2025 dollar year.

The retrospective analysis indicates that the modeled economic output for San Diego County decreased by, on average, $125.5 million annually (or 0.04 percent of San Diego County GRP) during the period of 2008 to 2025, for a total of **$1.1 billion for the retrospective period of 2017 to 2025**. However, driven by reduced beach visitation to Imperial and Coronado Beaches in recent years, the crisis is estimated to reduce San Diego County's regional economic output on average between $125.5 million and $503.5 million annually. The prospective analysis illustrates the magnitude of the risk if recent visitation patterns persist. Under the lower-bound scenario, based on the longer 2008 to 2025 historical comparison, cumulative foregone economic output reaches approximately **$1.9 billion by 2045**. Under the upper-bound scenario, which places greater weight on the more recent 2020–2025 period, cumulative foregone output reaches approximately **$7.9 billion by 2045**, in 2025 dollars. These estimates should be interpreted as a range of potential future economic exposure rather than a prediction of a single outcome; future losses will depend on pollution conditions, infrastructure investments, public perceptions, and the pace of recovery.

**Exhibit 17. Retrospective and prospective economic analysis**




Source: IMPLAN (2024) and ECOnorthwest Analysis

Note: All dollar values are presented in millions of dollars and in the 2025 dollar year.

# 5. The Crisis is Likely Producing Broader Economic and Community Effects

This chapter turns from the primary measure of economic pathway examined in this report (declining beach visitation and the regional spending it supports) to a wider set of trends in local businesses, employment, property values, public health, and public institutions. Some of these pathways, such as business license activity, commuting patterns, and public health risk, are supported by administrative or survey data that allow this report to describe the direction and approximate scale of change with reasonable confidence. Others, including property values and education, rely on a thinner evidentiary base, and are presented here to describe trends that may be related to the pollution rather than to report a settled finding. Across all of these pathways, the chapter's purpose is the same: to describe trends that are consistent with an economic effect of the sewage crisis, while being explicit about what the underlying data can and cannot demonstrate about cause and effect.

## Local Businesses and Economic Development

Beyond the visitation-driven spending losses, this study examines whether the sewage crisis is also visible in broader indicators of local business and economic activity. Business license records, employment and commuting data, retail vacancy rates, and taxable sales are not designed to isolate a pollution effect on their own; they are general-purpose measures of local economic health that are available consistently across jurisdictions and over time. Examining them together, alongside the same comparison geographies and inflection points used elsewhere in this report, helps establish whether the primary study area, and Imperial Beach in particular, has diverged from its peers in ways consistent with a sustained economic disruption, even where the data cannot attribute that divergence to pollution with the same confidence as the visitation findings.

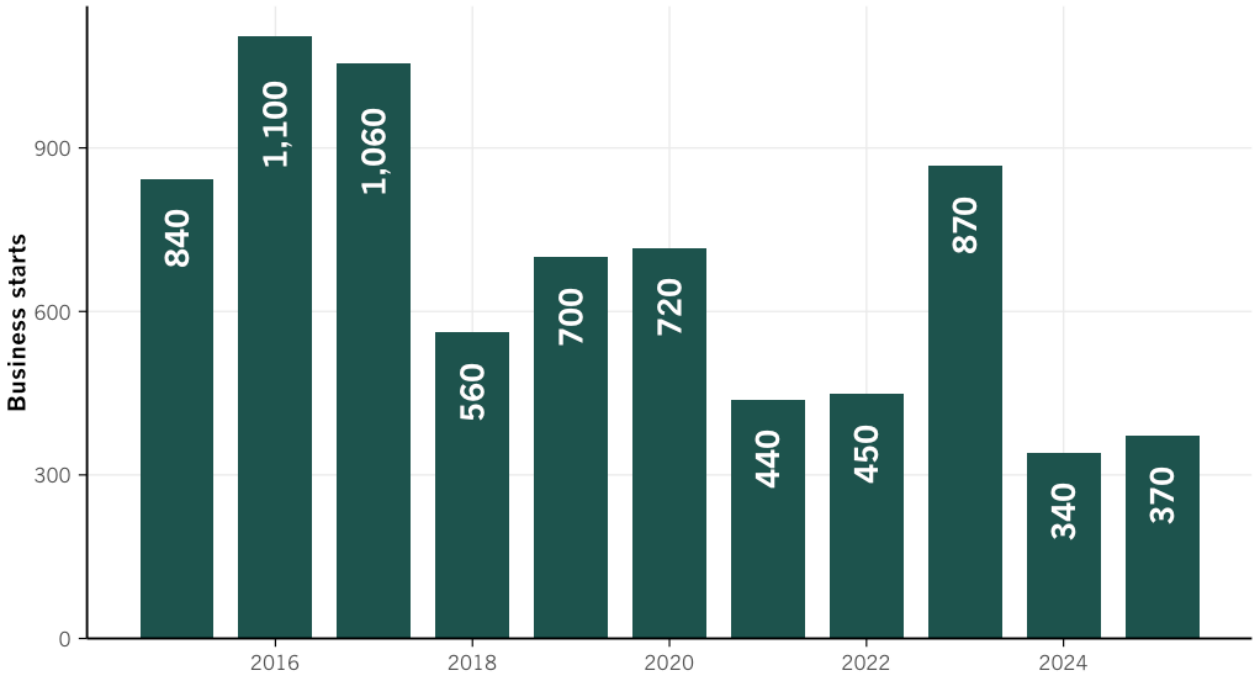
### Business Trends

To understand the broader impacts of the pollution on the business activity within the study area, this study analyzed business license data over time. Business licenses are required by certain jurisdictions within the broad study area for businesses operating within city limits, and are thus a useful metric to understand the rate at which new businesses are opening in a given geography. These data were gathered from various jurisdictions in and around the primary study through public records requests and online platforms, where available and applicable.[41]

[41] See Appendix C for full methodology details

Within the primary study area, business starts have seen a decreasing trend from 2016 to 2025. While many factors may influence annual business start rates, such as lease costs, permitting and zoning, and regional or national economic cycles, Exhibit 18 shows a general downward trend in annual starts within the primary study area. Between 2017 and 2025 there was a 65 percent decline in business starts within the primary study area.

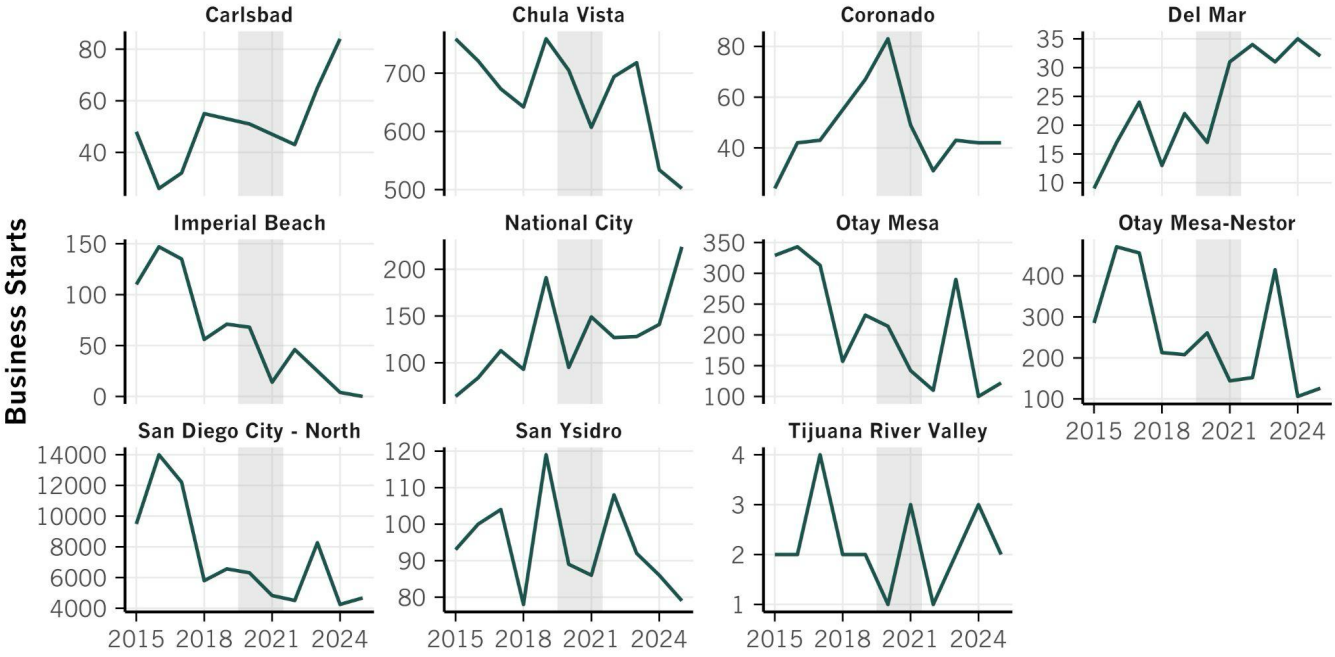
**Exhibit 18. Nominal annual business starts, Primary Study Area, 2015-2025**




Source: Business license data collected from jurisdictions via public records requests or public websites; ECOnorthwest analysis

Decreasing business starts began pre-COVID in multiple areas including Imperial Beach and San Diego City – North. To further understand the downward trend in Exhibit 18, trends are disaggregated by municipality and neighborhood in Exhibit 19, below. Both Imperial Beach and San Diego City – North show declines in business starts beginning around 2017. Pre-Covid declines in business starts are also seen in Otay Mesa and Otay Mesa-Nestor. For all of these areas, this trend has continued into 2025. For Coronado however, the decline in businesses began during the COVID-19 period, creating a level shift in business starts that is below pre-COVID levels.

**Exhibit 19. Nominal annual business starts, disaggregated areas, 2015-2025**




Source: Business license data collected from jurisdictions via public records requests or public websites; ECOnorthwest analysis

Note: Shaded region shows primary timeframe of COVID-19. Geographies are not reflective of the full broad study area due to data availability limitations. The 2023 spike in the data from San Diego geographies is reflective of an administrative change and not an increase in business starts, per the City of San Diego. Carlsbad's 2025 value is not shown. See the Appendix C for more information on data limitations.

Comparing growth in business starts over time, the velocity of business start growth is lower in the primary study Area relative to nearby geographies. Since 2017, the average annual growth rate (AAGR) of business starts in the primary study area has declined at a faster rate, while the rate has remained relatively steady in Chula Vista and National City and increased in San Diego City (North). AAGR is calculated from 2016 to 2017, 2017 to 2021 and 2021 to 2025 to capture the primary inflection point in the pollution timeline and the large economic effects that occurred from COVID-19. From 2021 to 2025, the AAGR of business starts in the primary study area was negative 6.1 percent, compared with negative 4 percent in Chula Vista and National City and positive 1.2 percent in San Diego City – North (Exhibit 20). This downward trend is largely driven by business start declines in Imperial Beach. While the entirety of the decline in the rate of business starts cannot be attributed to the pollution, the larger effect compared to its peers which are farther from the river is consistent with, though not proof of, a link between proximity to the pollution source and the severity of the decline.

**Exhibit 20. Average annual change in business starts by study area, 2016-2025**

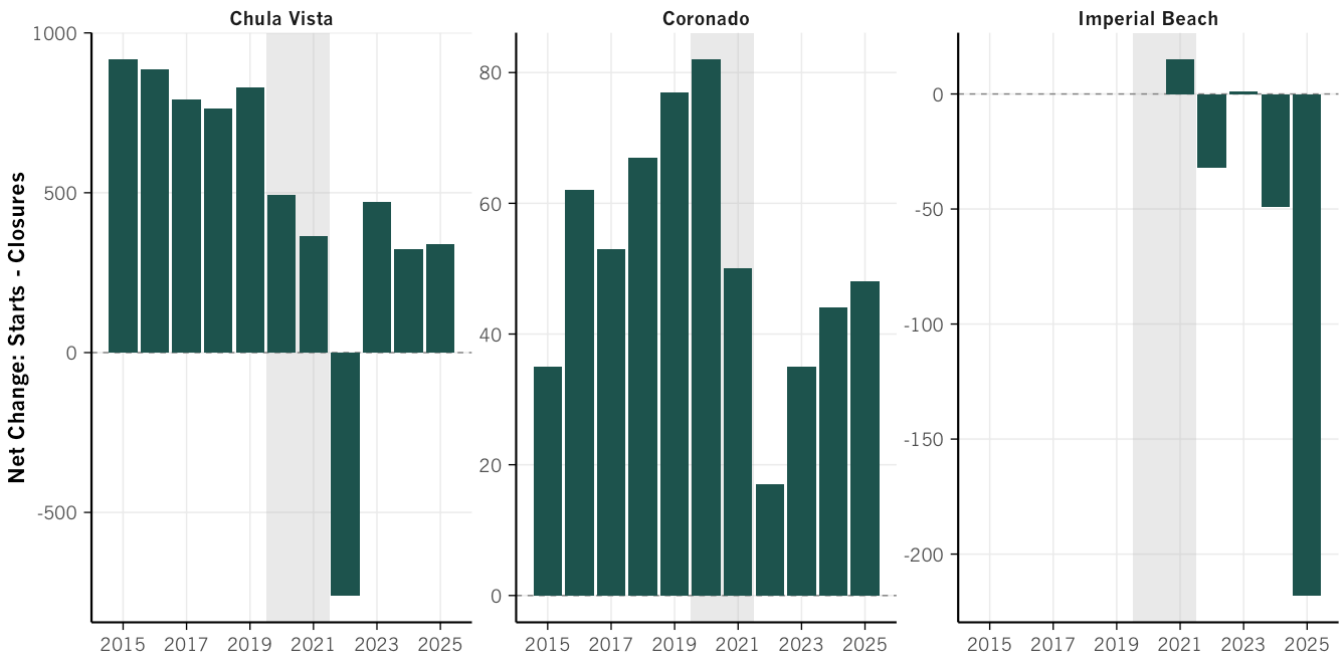



Source: Business license data collected from jurisdictions via public records requests or public websites; ECOnorthwest analysis

In Imperial Beach, Chula Vista, and Coronado, business closure data was available in addition to business license start dates. Using counts of business starts, and business closures, Exhibit 21 below shows the net count of businesses from 2015 through 2025 for the three geographies (2021 through 2025 for Imperial Beach, where closure records are usable only for those years). The greatest decline in net businesses was in Imperial Beach during 2025, which had a net loss of more than 200 businesses. In Chula Vista and Coronado, businesses have primarily seen net gains (aside from 2022 in Chula Vista), although the magnitude of those net gains has shrunk over time. This is consistent with a broader regional squeeze on business margins rather than a falloff in business formation itself: county-wide, restaurant and retail operators (the industries most concentrated in the primary study area) have reported declining customer traffic and profit margins compressed to roughly 3–5 percent, down from 8–10 percent before the pandemic, amid rising minimum wages and commercial rents.[42] With only five years of net business change data (2021–2025), Imperial Beach has seen three years of business loss (2022, 2024, and 2025), seen below in Exhibit 21.

[42] Frank Sabatini Jr., "'No Breaks Anywhere' for San Diego-Area Restaurateurs — So Many Are Opting to Close Up Shop," Times of San Diego, March 1, 2026. https://timesofsandiego.com/business/2026/03/01/san-diego-restaurants-closing-rent-wages/

**Exhibit 21. Net business change by study area, 2015-2025**




Source: Business license data collected from jurisdictions via public records requests or public websites; ECOnorthwest analysis

Note: Business closure information was only available for Chula Vista, Imperial Beach and Coronado.

These data patterns are also consistent with independent accounts of business conditions in Imperial Beach. In 2024, San Diego's congressional delegation formally asked the U.S. Small Business Administration to examine assistance options for businesses affected by Tijuana River Valley pollution, citing three consecutive summers of beach closures that left tourism-dependent small businesses struggling to remain open; SBA officials subsequently visited Imperial Beach to hear directly from affected business owners.[43,44] This external corroboration does not establish a causal link on its own, but it indicates that the divergence in business starts and closures documented above reflects a pattern business owners and elected officials in the community were also observing in real time.

## Retail Vacancies and Taxable Sales Trends

Reduced visitor spending and business disinvestment can, in principle, reinforce one another: fewer beach visitors mean fewer customers for nearby businesses, which can weaken the local retail sector and discourage further private investment. Taxable sales and retail vacancy rates offer two different ways to look for signs of this pattern in the primary

[43] Brian White, "Federal SBA official visits Imperial Beach as border sewage crisis takes toll on small businesses," CBS 8 News, 2025. https://www.cbs8.com/article/news/local/imperial-beach-tj-sewage-crisis-toll-on-small-businesses/509-98de4e50-7fcf-4975-bc35-603b54187145

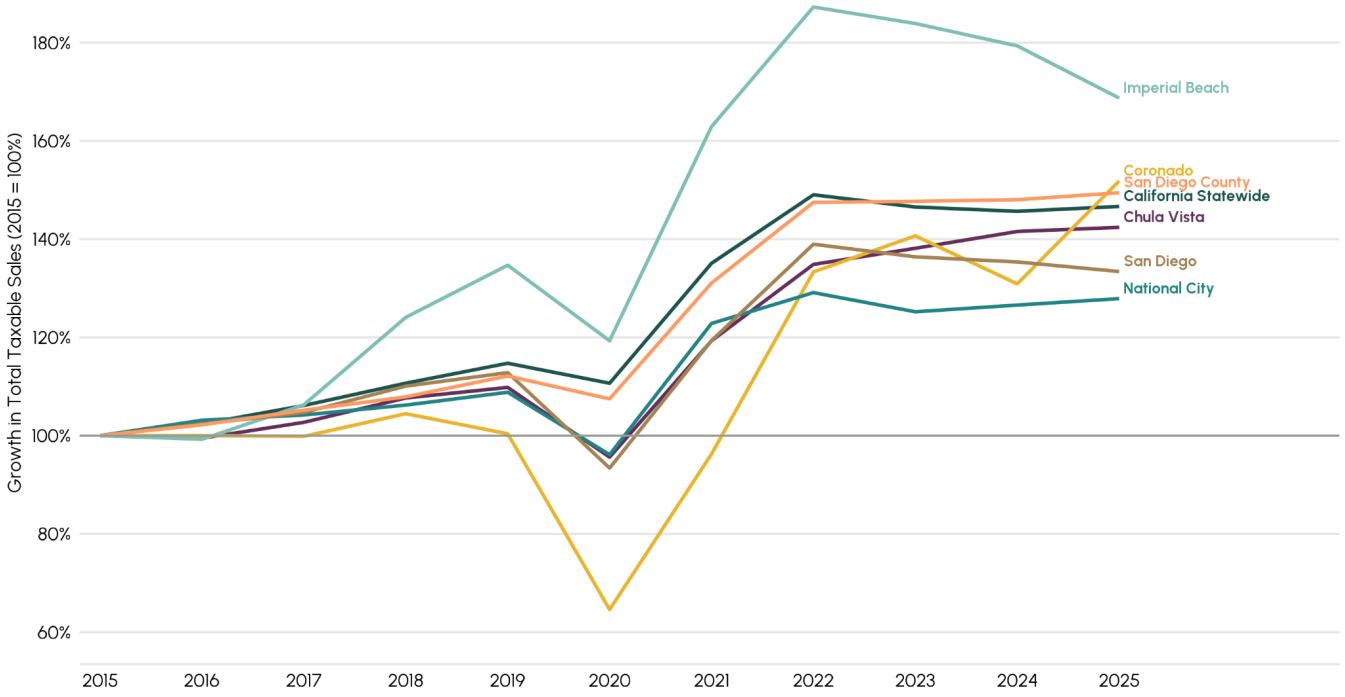
[44] Local lawmakers ask small business admin for Tijuana River Valley support, Clty News Service, NBC San Diego, 2024. https://www.nbcsandiego.com/news/local/local-lawmakers-ask-small-business-admin-for-tijuana-river-valley-support/4037018/

study area, though none of them can establish a direct causal link between beach closures and business activity or investment.

## TAXABLE SALES

Nominal taxable sales in Imperial Beach have grown faster than every comparison geography examined, including San Diego County, California statewide, Coronado, Chula Vista, and National City, rising from a 2020 pandemic low to a peak of roughly 187 percent of 2015 sales in 2022 (Exhibit 22). Since that peak, however, Imperial Beach's taxable sales have declined for three consecutive years, falling to about 169 percent of the 2015 baseline by 2025, still well above every comparison geography, each of which grew more steadily to a narrower range of roughly 127 to 152 percent over the same period. This shift, from outsized post-pandemic growth to a multi-year decline while every comparison geography continued to grow, is a pattern worth continued monitoring, though taxable sales are also affected by inflation, the pace of regional tourism recovery, and other local economic conditions that are not unique to the sewage crisis.

**Exhibit 22. Taxable sales by geography in Primary Study Area, 2015-2025**



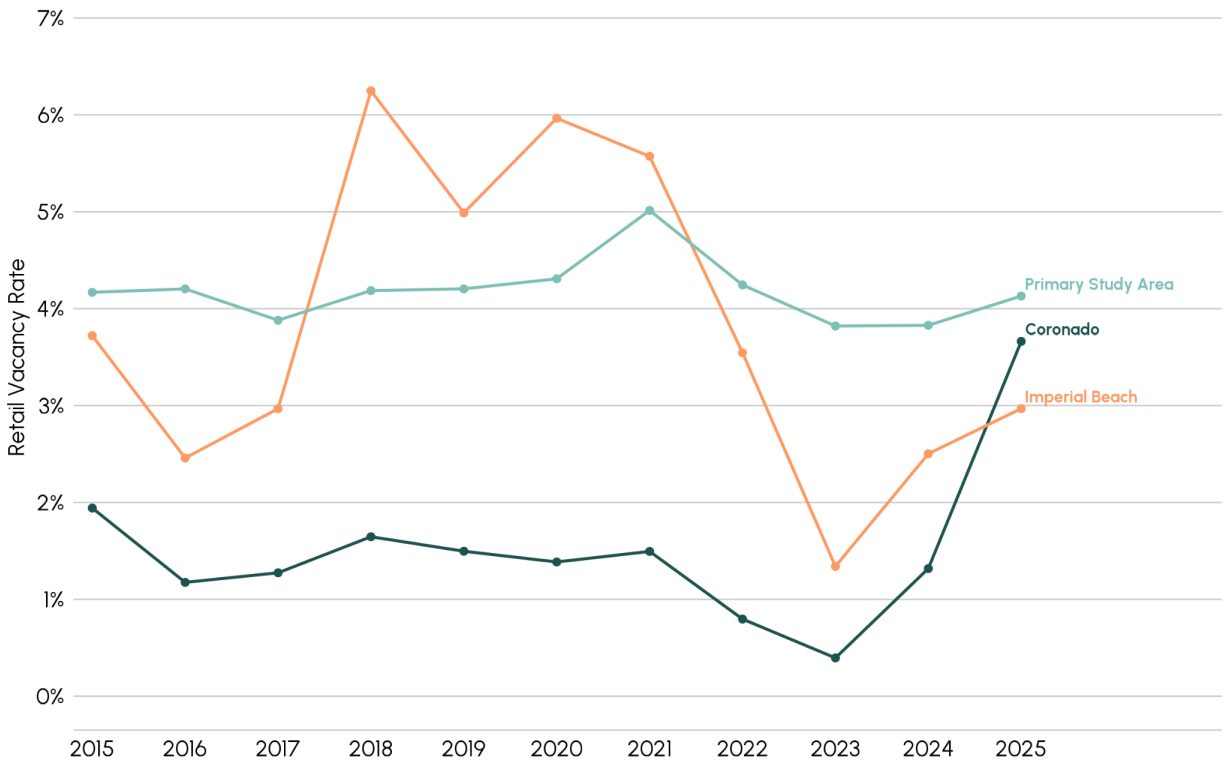

Source: California Department of Tax and Finance, "Taxable Sales - Counties by Type of Business (Taxable Table 3)", "Taxable Sales - Cities by Type of Business (Taxable Table 4)", "Taxable Sales, by Type of Business (Taxable Table 1)", 2015-2025, Accessed June 2026.

## RETAIL VACANCIES

Retail vacancy rates show a more mixed picture. Imperial Beach's vacancy rate was consistently the highest of the three geographies examined from 2018 through 2021, reaching roughly 6 percent in 2018 and remaining above 5 percent as recently as 2021,

compared to a primary study area average in the 4 to 5 percent range over the same years (Exhibit 23). Imperial Beach's vacancy rate then fell sharply, reaching a low of about 1.3 percent in 2023, before rising again to roughly 3 percent by 2025, a level that remains below the primary study area's 2025 average of about 4.1 percent. Coronado's retail vacancy rate, by contrast, stayed the lowest of the three geographies for most of the period but rose sharply in 2025 to nearly 3.7 percent, its highest recorded rate since 2015. Together, these data do not show a single, sustained increase in total retail vacancies concentrated in Imperial Beach; instead, vacancy rates in both Imperial Beach and Coronado have moved in different directions at different points, underscoring that retail vacancy alone is not a reliable stand-alone indicator of the crisis's economic effect. We note that data on retail vacancies available show primary vacancies, and that as a point-in-time estimate, vacancies can be underrepresented where a leaseholder maintains a lease agreement but the business is not currently active.

**Exhibit 23. Retail vacancy rates, Primary Study Area, 2015-2025**




Source: Costar Real Estate Data, 2015 -2025

## Employment and Commute Trends

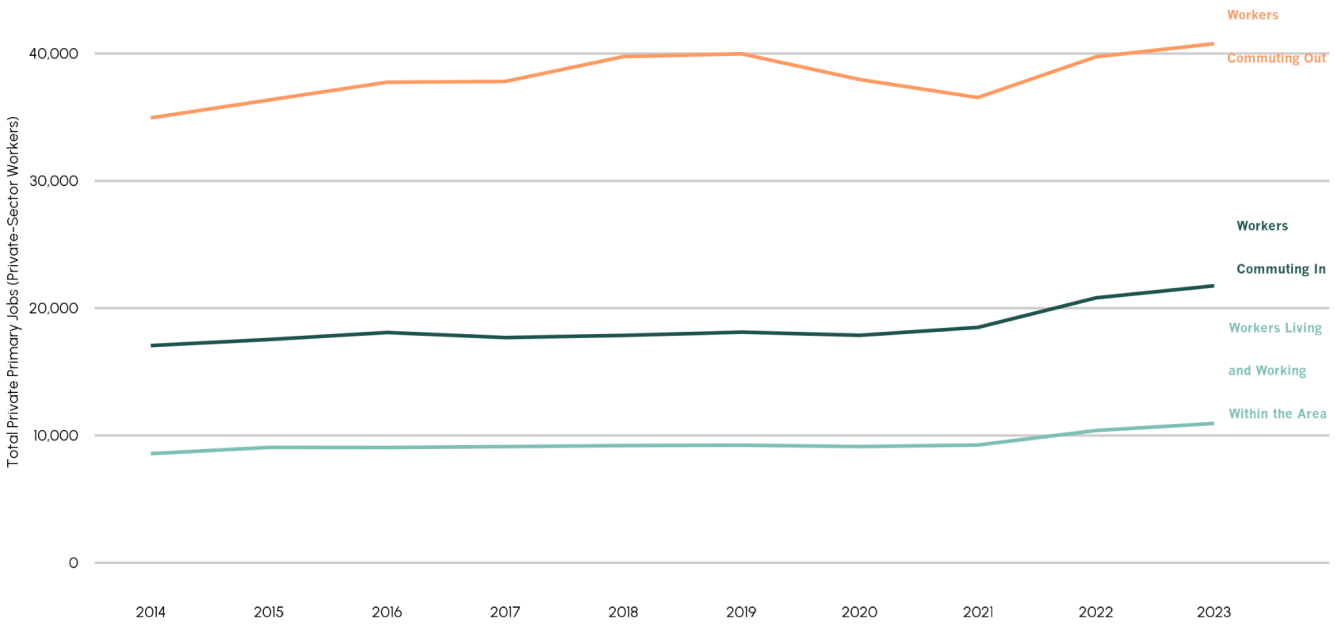
Business starts, taxable sales, and retail vacancy rates describe the demand side of the local economy, whether businesses are opening, closing, and generating sales. Employment and commuting data describe the labor side: who works in the primary study area, where they live, and which industries anchor local jobs. Because a sustained decline in visitor spending

would be expected to show up first in the industries most exposed to visitors (e.g. accommodation, food service, and recreation) before it shows up in broader employment or commuting totals, this section looks at both the area-level commuting patterns and the industry composition of employment within the primary study area.

## COMMUTE TRENDS

Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES) data show the majority of the primary study area's private sector workers have historically commuted out of the area for work, as opposed to commuting in, or working within the area. Exhibit 24 below shows that while the number of workers commuting out has remained higher than the number of workers commuting in or within the study area, the number of workers who commute in, exceeded its pre-pandemic levels much faster than those who commute out.

**Exhibit 24. Commute trends, Primary Study Area, 2014-2023**



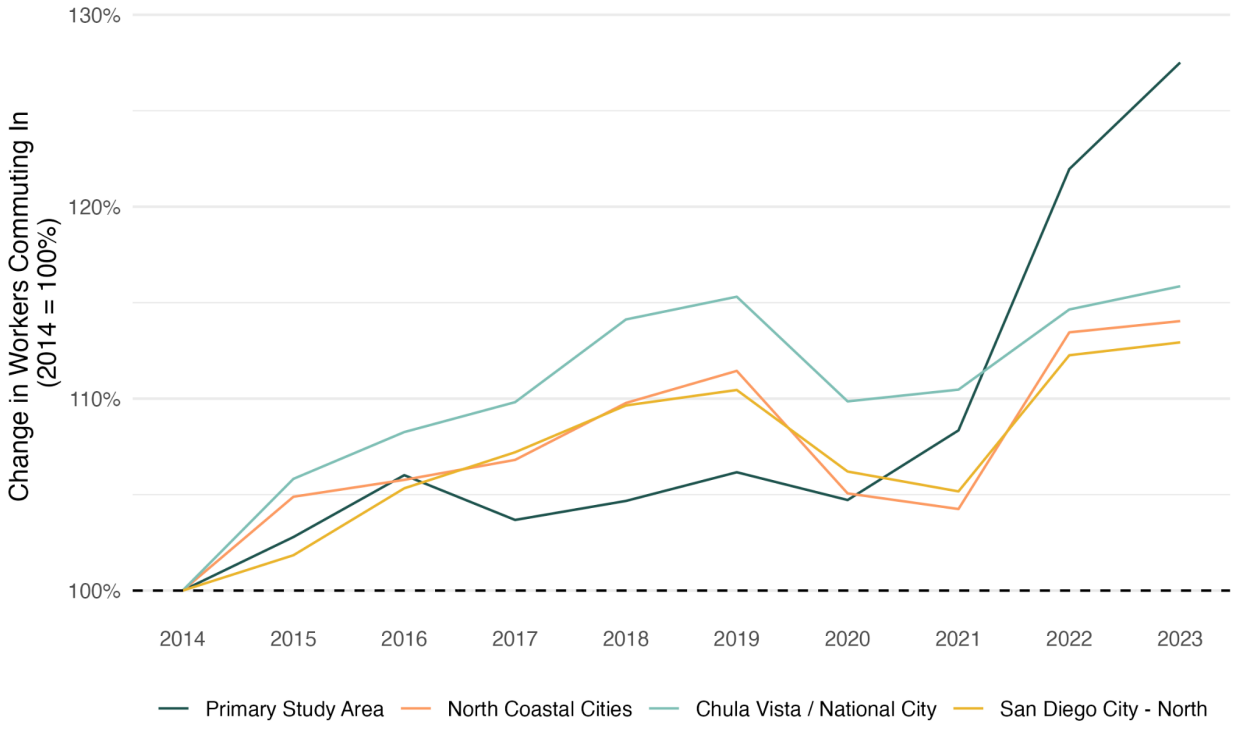

Source: Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES), Origin-Destination files, 2014-2023.

The exhibits below show trends in rates of commute type more acutely by comparing the commuting patterns in the primary study area to geographies in the broad study area. The number of primary jobs[45] held by workers who live outside the primary study area and commute in grew steadily through 2016, dipped during the 2017 pollution inflection point, slowly started to recover and then dipped once more during the pandemic, after which it grew sharply, reaching roughly 128 percent of the 2014 baseline by 2023, seen in Exhibit 25

[45] Some people hold more than one job in a given year. To avoid counting the same person multiple times, only each worker's top-earning job is included. As a result, the number of primary jobs matches the number of individual workers in the selected area, time period, or industry group.

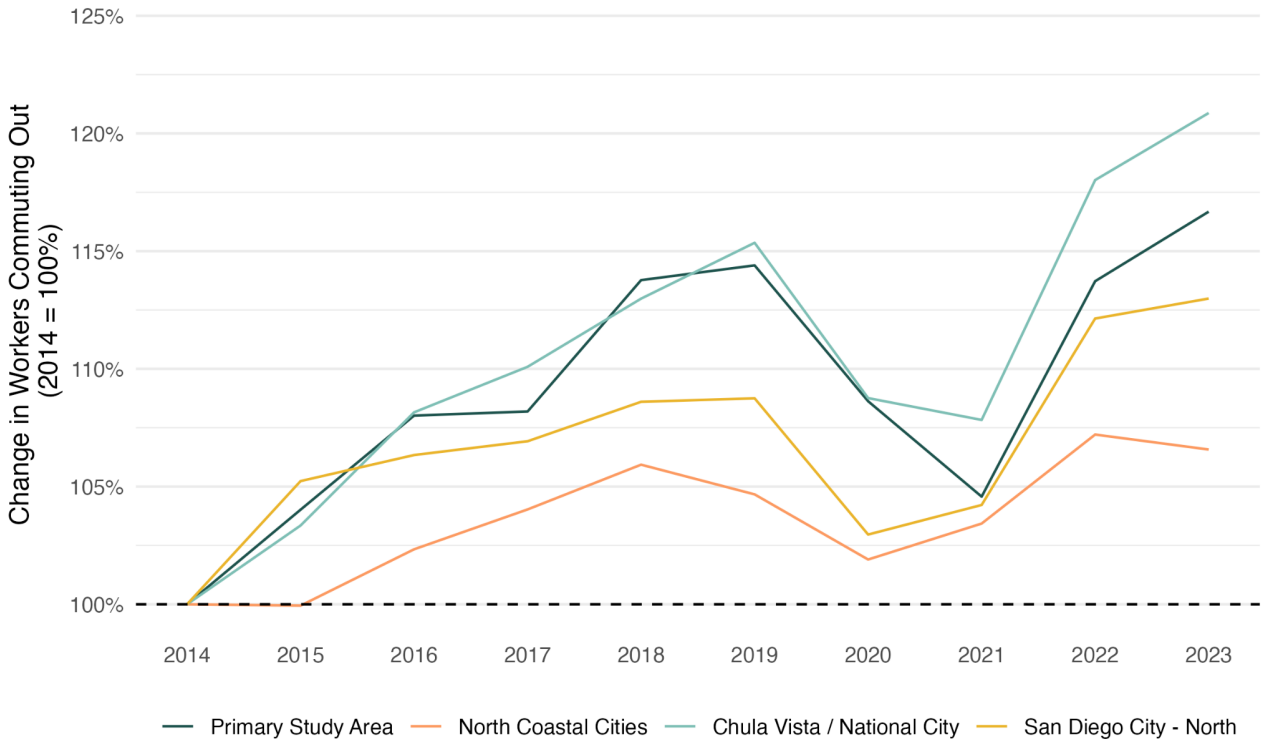
below. It had the highest change in workers commuting in to work, relative to the other geographies in the broad study area: about 116 percent in the combined Chula Vista and National City area, 114 percent in the North Coastal cities, and 113 percent in the San Diego-North area over the same period. The number of primary jobs held by study-area residents who commute out for work shows a slightly different pattern, rising to about 117 percent of the 2014 baseline by 2023, the second highest growth in commuters out relative to the other broad study areas. The highest change in workers commuting out is seen in the combined Chula Vista and National City area, showing 122 percent change from 2014, shown in Exhibit 25 below. That said, the primary study area saw a sharp increase in commuters out of the area in 2017 and remained at the new level up until the COVID-19 pandemic, reinforcing the potential negative effects of the pollution labor shed in the area.

**Exhibit 25. Geographic comparisons of jobs from commuters in, Primary Study Area and North Coastal Cities, 2014-2023**




Source: Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES), Origin-Destination files, 2014-2023.

**Exhibit 26. Geographic comparisons of jobs from commuters out, Primary Study Area and North Coastal Cities, 2014-2023**




Source: Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES), Origin-Destination files, 2014-2023.

## EMPLOYMENT

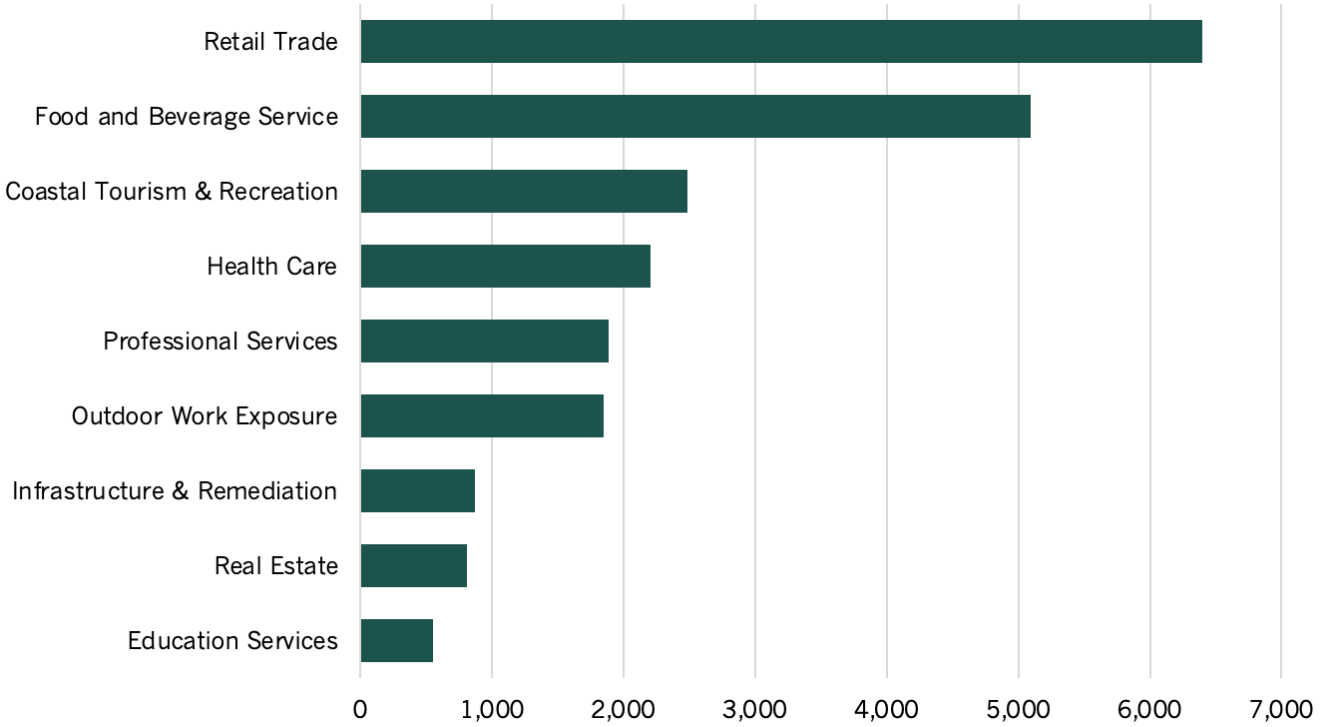
While commute patterns can tell about an area's capacity to retain employment, it does not give insight into where that employment is situated within the economy's sectors. This kind of information is better represented through industry-level employment trends. For this study, industries were grouped together for two related reasons. First, aggregating detailed North American Industry Classification (NAICS) codes into broader categories reduces the number of small-employment cells subject to confidentiality suppression, which is especially important given how small the primary study area's constituent cities and neighborhoods are. Second, and more substantively, standard government industry classifications do not cleanly separate the distinctions this study cares about most: which industries depend on visitor spending, which employ workers who spend substantial time outdoors near the river or coast, and which are tied to environmental monitoring, remediation, or infrastructure work.[46] This distinction matters for interpreting the crisis's economic footprint.

In 2025, the top three largest industry groups in the primary study area were retail trade (28 percent of total private covered employment), food and beverage services (22 percent of total

[46] See Appendix C for a full list of industries included in the industry groups represented in Exhibit 27.

private covered employment) and coastal tourism and recreation (11 percent of total private covered employment), shown in Exhibit 27 below.

**Exhibit 27. Private employment by industry group, primary study area, 2025**



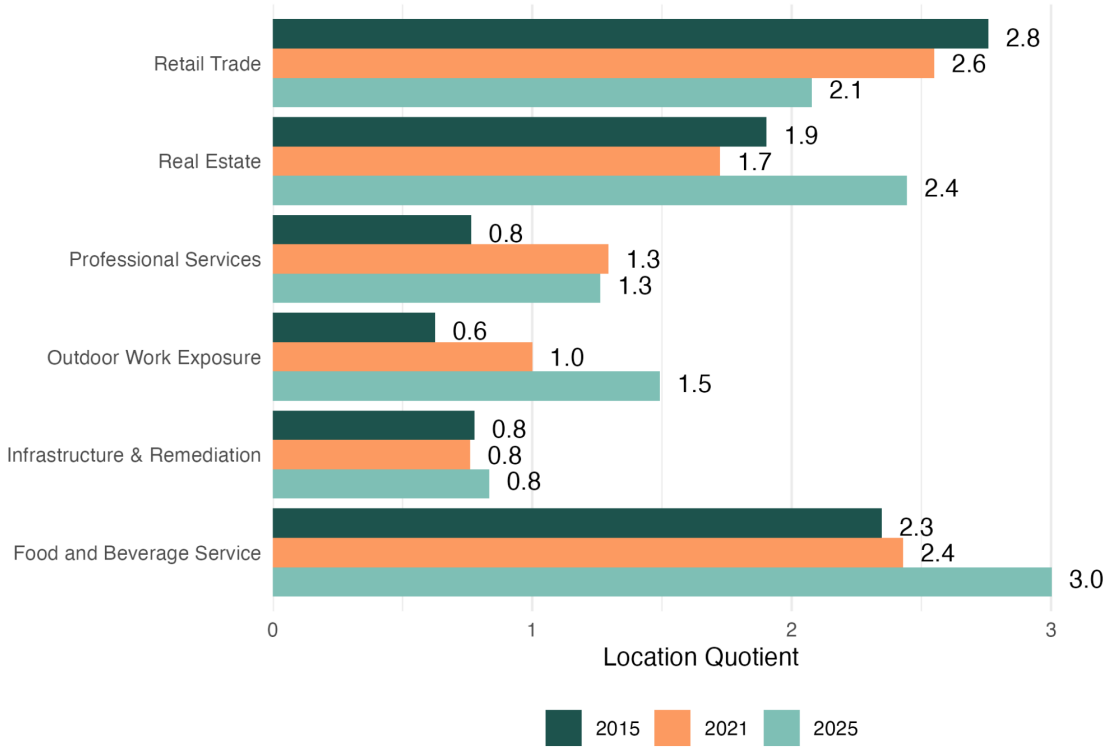

Source: California Employment Development Department (EDD), Quarterly Census of Employment and Wages (QCEW), 2025.

Note: Employment has been aggregated across geographies included in the primary study area, except for the Tijuana River Valley. Total covered employment in the Tijuana River Valley was 15 employees, and 71 employees in 2015 and 2025 respectively; total employment was too low to disaggregate by industry group due to suppression. In addition, San Ysidro is not included in the Education Services and Health Care industry groups due to suppression. Industry groups shown above represent roughly 95 percent of total covered employment.

To understand how these industries shape the local economy of the primary study area, it is useful to utilize location quotients. Location quotients (LQs) provide a way to compare how concentrated an industry, or any other characteristic, is in the primary study area relative to San Diego County as a whole. An LQ is calculated as the primary study area's share of a variable divided by the county's share of that same variable; an LQ of 1.0 means the study area's share matches the county's, an LQ above 1.0 means the study area is more concentrated in that variable than the county, and an LQ below 1.0 means it is less concentrated. Applied to industry employment, Exhibit 28 shows that the primary study area's economy is substantially more concentrated in retail trade and food and beverage service than San Diego County's as a whole, with LQs consistently above 2.0 across 2015, 2021, and 2025 for both industries. However, the concentration of retail trade in the primary study area relative to the county has been declining since 2015, while the food and beverage

service's concentration has been rising, from 2.3 in 2015 to 3.0 in 2025. Real estate and outdoor work exposure have also grown more concentrated in the study area over this period, with real estate's LQ rising from 1.9 to 2.4 and outdoor work exposure's more than doubling, from 0.6 to 1.5. Professional services and infrastructure and remediation, by contrast, remain close to or below county-level concentration throughout. Because retail trade and food and beverage service are also the industries most exposed to visitor spending, their persistently high concentration in the primary study area is part of why this report treats the local economy as structurally exposed to a sustained decline in beach visitation (see Costs to Emerging Industries).

**Exhibit 28. Industries of specialization, Primary Study Area, 2025**




Source: California Employment Development Department (EDD) Labor Market Information Division (LMI) Quarterly Census of Employment and Wages (QCEW), 2015-2025.

Note: The coastal tourism and recreation industry group was also analyzed, however due to high levels of suppression in 2015, the LQ is not shown in the Exhibit above.

These business and employment indicators display a unique set of trends, but do not point in a single, uniform direction. Business starts have declined most clearly and consistently in Imperial Beach, and that decline predates the pandemic and is corroborated by outside accounts of business owners' experiences. Taxable sales and retail vacancy rates, by contrast, show more mixed patterns: periods of outsized growth followed by multi-year declines, or vacancy rates that rise in one geography while falling in another, which are consistent with a local economy under some strain but do not by themselves establish that the sewage crisis is the cause. Employment and commuting trends add a further layer of nuance: the primary

study area's commuting workforce has grown faster than comparison geographies in both directions even as employment growth is concentrated in accommodation and food service.

Read together, these indicators support the same conclusion reached in Data and Methods at a Glance: broad economic indicators like these are useful for describing where the primary study area's economy has diverged from its peers, but only the visitation pathway in this report supports a more confident causal claim.

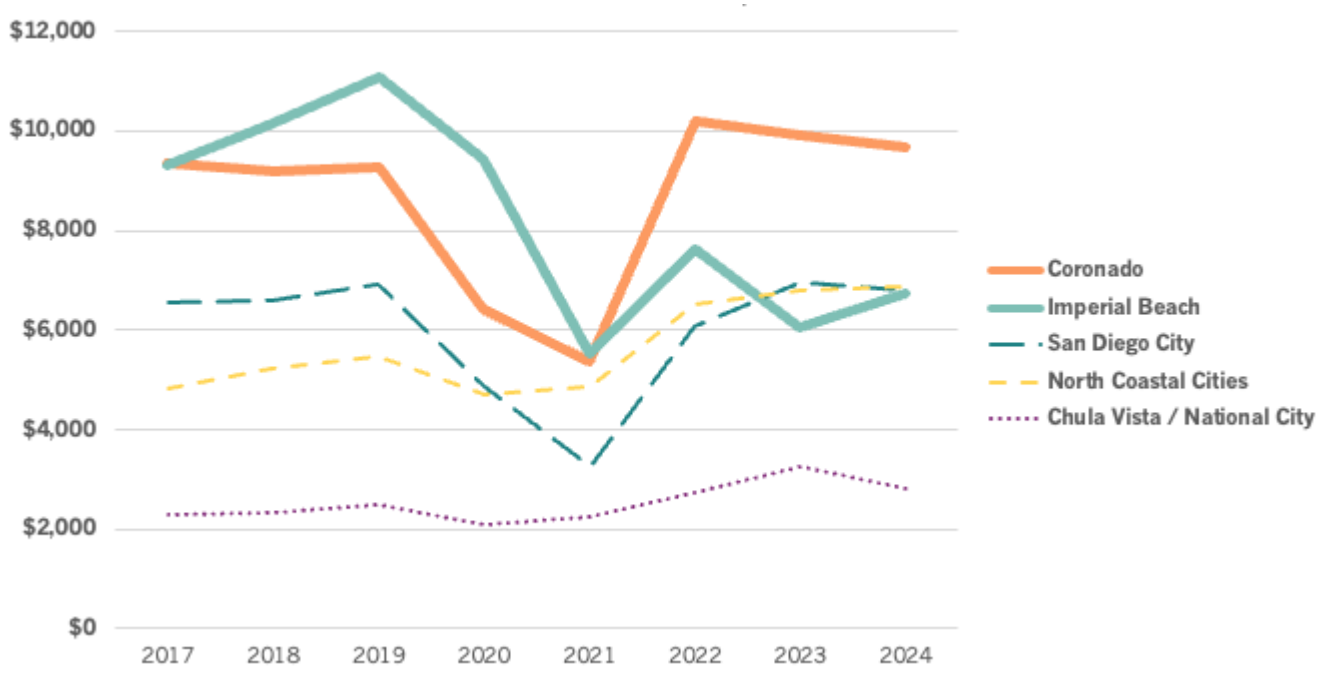
## Transient Occupancy Taxes

Transient occupancy tax (TOT) provides another lens into changes in the visitor economy. Because lodging taxes depend on taxable hotel revenue, they reflect a combination of hotel occupancy and average room rates while also representing an important source of local public revenue. To compare trends across jurisdictions with different hotel inventories, we divided annual TOT collections[47] by the number of hotel rooms reported by CoStar[48] and converted all values to 2025 dollars. We also adjusted Imperial Beach collections after its TOT rate increased from 10 percent to 14 percent in 2023 (the only jurisdiction we evaluated that had a rate change in the study period), estimating what revenues would have been under a consistent 10 percent rate so that the tax-rate change would not drive the trend.

The results show a notable divergence in Imperial Beach. Inflation-adjusted TOT revenue per room declined from about $9,300 in 2017 to $6,700 in 2024—a decrease of approximately 28 percent (Exhibit 29). Over the same period, Coronado and San Diego returned to roughly their 2017 levels, while several other coastal comparison communities experienced increases. Imperial Beach also did not experience the same post-pandemic recovery evident in several comparison markets: after rebounding to about $7,600 per room in 2022, adjusted revenue (accounting for the TOT rate increase) fell to approximately $6,100 in 2023 before increasing modestly in 2024.

[47] California State Controller's Office, "City Transient Occupancy Tax (TOT) for Fiscal Years 2017 to 2024," California Open Data, collected July 8, 2026.
[48] CoStar Group, "Hotel Property and Room Inventory Data for San Diego County," CoStar, accessed July 8, 2026.

**Exhibit 29. Annual TOT revenue, per hotel room, 2017-2025**




Source: California State Controller's Office, CoStar Group, ECOnorthwest analysis

The development pipeline suggests another potential sign of weakness in the local hotel market. Imperial Beach has several planned hotel projects that CoStar classifies as abandoned, excluding one planned project with a reported construction date of 2036. This pattern may reflect challenges to new hotel investment, although the available data do not establish why individual projects failed to move forward. Financing conditions, development costs, site constraints, and broader market conditions may also contribute.

Taken together, these findings point to comparatively weak hotel revenue performance in Imperial Beach. The analysis does not isolate the sewage crisis from the many other factors that influence hotel occupancy, room rates, development, and investment. However, the TOT trend aligns with the broader evidence in this study showing reduced visitation and changes in visitor behavior. It also illustrates a potential fiscal consequence: weaker lodging activity can reduce local TOT revenue at the same time that affected jurisdictions face additional costs associated with responding to the crisis.

## Property Values and Investment

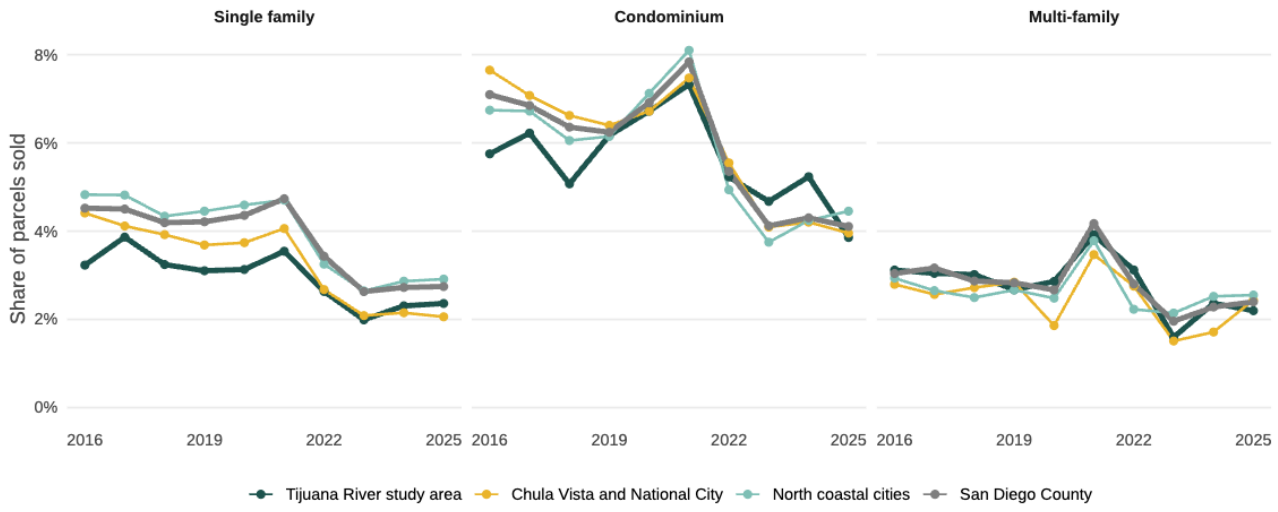
Another cost we examined was whether worsening pollution conditions may have reduced residential property values or slowed growth in the local property-tax base. We focused on residential properties because they provide enough transactions to compare market activity over time. Commercial properties turn over much less frequently, and private ownership structures make market transactions harder to observe consistently. California's Proposition 13 also shapes how changes in market demand translate into assessed

values generally grow slowly until a property sells or undergoes new construction, when reassessment can bring taxable value closer to market value. We therefore tested two related pathways—whether affected properties sold less frequently and whether their market and assessed values grew more slowly than properties elsewhere in the County

## Property Sales

Our first hypothesis focused on property turnover, or "churn." If pollution reduced demand for homes in affected communities, properties might sell less frequently, resulting in fewer Proposition 13 reassessments and slower growth in the tax base. The data do not show that pattern. The study area has historically had somewhat lower residential turnover than the rest of the County, but that difference predates the recent escalation of the crisis. For example, 3.5 percent of single-family parcels in the study area sold annually during the 2016–2017 baseline period, compared with 4.5 percent elsewhere in the County. By 2022–2025, turnover had declined across the regional housing market, and the gap between the study area and comparison geographies had narrowed rather than widened (Exhibit 30). Condominium turnover improved the most relative to the County, while multifamily turnover showed little change.

**Exhibit 30. Share of residential parcels sold each year, by residential type**



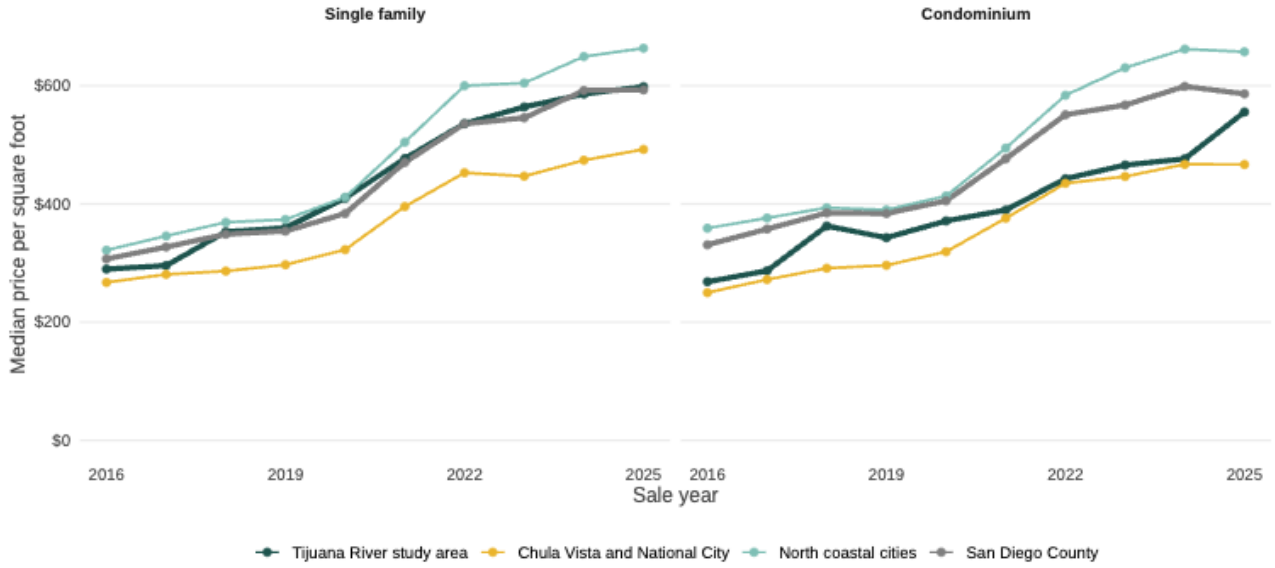

Source: San Diego County Assessor, ECOnorthwest Analysis

## Property Values

Home-price trends also do not show broad evidence of suppressed residential demand. Single-family sale prices per square foot in the study area increased to about 1.94 times their 2016–2017 level by 2022–2025, compared with 1.78 times Countywide and 1.88 times in the north coastal comparison cities. Condominium prices followed a similar trajectory to the County. The study area's relatively strong percentage growth likely reflects, in part, its

lower starting prices: lower-cost homes can post faster percentage appreciation while remaining less expensive than homes elsewhere in the region.

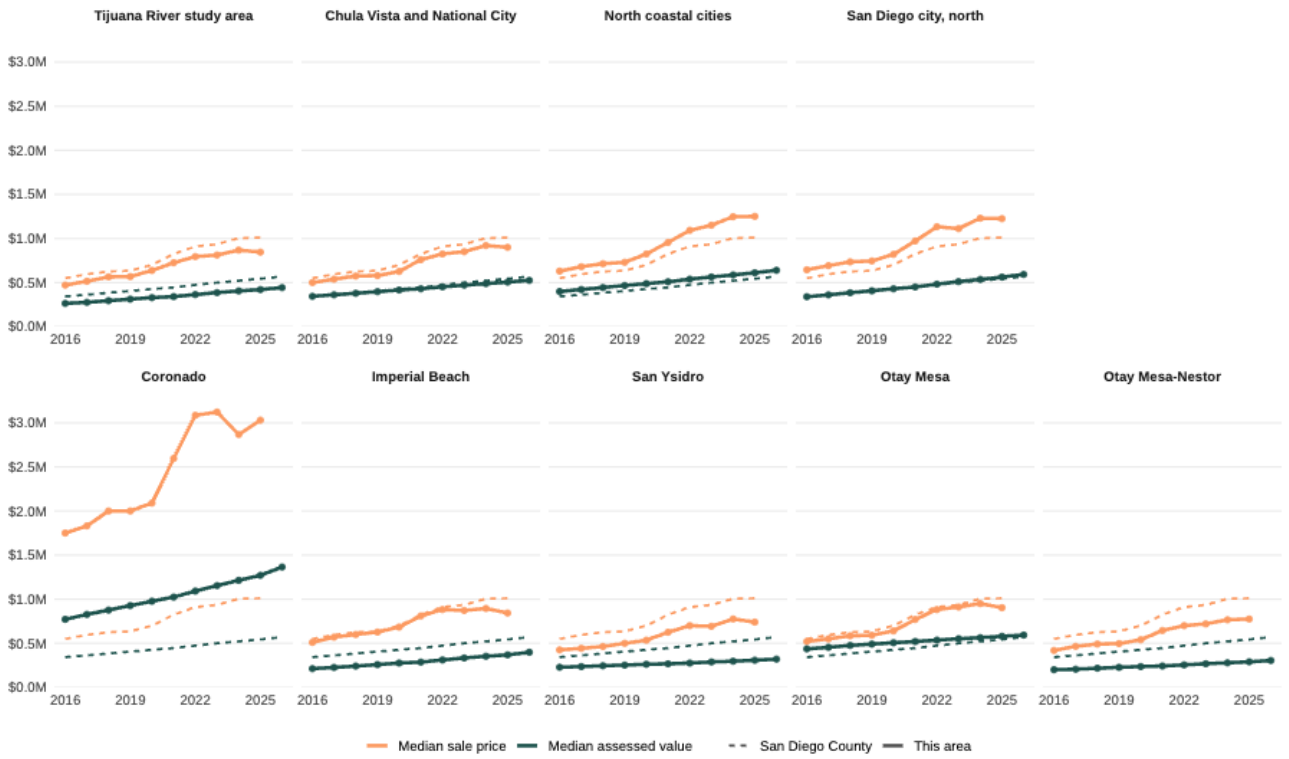
**Exhibit 31. Median sale price per square foot of living area, by residential type, by study area**




Source: San Diego County Assessor, ECOnorthwest Analysis

Because Coronado differs so substantially from Imperial Beach and the South Bay communities in both price level and market structure, we disaggregated the primary study area to examine single-family sale prices and assessed values by subarea. The results show that percentage growth alone can obscure important differences in nominal value. Lower-value communities often recorded faster percentage appreciation from a much smaller base, while Coronado remained far more valuable in absolute terms. This subarea analysis helps explain why aggregate study-area results can look strong even when individual communities follow different trajectories.

**Exhibit 32. Median sale price and median assessed value of single-family homes, by study area**

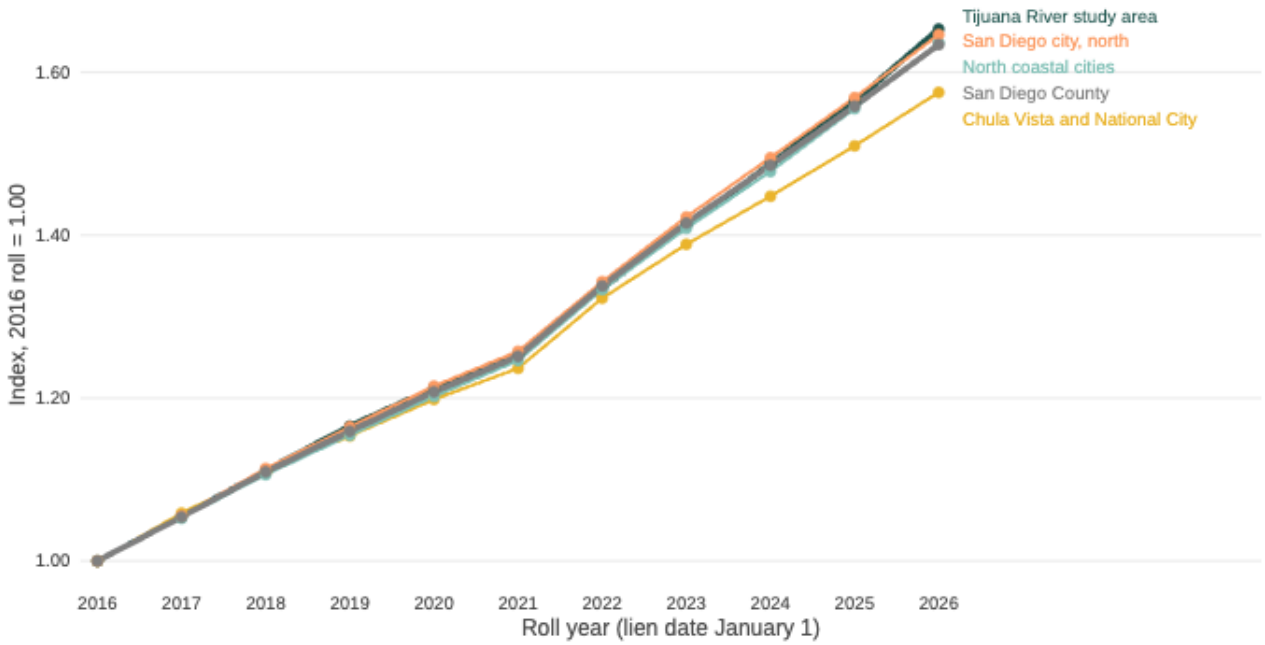



Source: San Diego County Assessor, ECOnorthwest Analysis

Note: sales price is arm's length sales in the calendar year; assessed value is every single family parcel on that year's roll.

Assessed-value trends reinforce this overall finding. We created a "constant panel" of residential parcels that appeared on both the 2016 and 2026 assessment rolls, excluding parcels that entered the roll or changed land uses over that period. This approach holds the underlying set of properties constant and reduces the influence of new development on measured growth. Across these parcels, assessed value in the study area increased to 1.65 times its 2016 level, compared with 1.63 Countywide, 1.58 in Chula Vista and National City, 1.64 in the north coastal cities, and 1.65 in northern San Diego.

**Exhibit 33. Gross assessed value of the same residential parcels, indexed to the 2016 roll**




Source: San Diego County Assessor, ECOnorthwest Analysis

The aggregate results mask some noteworthy differences within the study area. Coronado's high-value properties account for a disproportionate share of the area's assessed-value base, so each reassessment can have a relatively large effect on aggregate value. At the same time, much of the overall primary study area's housing stock is concentrated in lower-value communities farther south and east. Therefore, parcel-level comparisons show stronger assessed value growth in Coronado, roughly comparable growth in Imperial Beach and Otay Mesa, and slower growth in Otay Mesa-Nestor and San Ysidro relative to similarly valued parcels elsewhere in the County. Broader South Bay communities show some of the same pattern, however, which makes it difficult to attribute these differences specifically to pollution rather than to broader housing-market conditions, location, starting values, interest rates, or other neighborhood factors.

Taken together, the property data do not show broad evidence that the sewage crisis has reduced residential turnover or suppressed aggregate assessed-value growth across the study area to date. The analysis does identify localized differences in appreciation, particularly in lower-value South Bay communities, but assessor data alone cannot establish whether pollution caused those differences. Compared with the visitation and tourism analyses, the property-value pathway is difficult to distinguish from broader regional housing-market dynamics and therefore provides weaker evidence of a measurable crisis-related economic loss.

Property-value growth does not mean that people can easily respond to worsening environmental conditions by moving elsewhere. High housing costs and limited availability

across the region can constrain household mobility, a challenge seen in other high-cost housing markets as well. For people who are concerned about air quality or other health effects associated with the sewage crisis, those constraints may carry greater consequences: households may remain in affected areas not because conditions are acceptable, but because comparable housing elsewhere is unaffordable or unavailable.

The property analysis therefore captures only one dimension of the property-value-related effects of the crisis. It shows that residential values have generally continued to grow, but it does not measure whether people feel financially or practically able to relocate. In this context, strong market values can coexist with a different kind of economic burden—reduced mobility and fewer options for people seeking to avoid ongoing environmental and public-health concerns.

## Public Health Costs

Degraded water and air quality associated with the crisis creates costs for residents, visitors, businesses, and public agencies in San Diego County. Exposure to contaminated recreational water can increase the risk of gastrointestinal illness, while elevated concentrations of hydrogen sulfide ($H_2S$) can cause odors and symptoms such as headaches, nausea, and respiratory discomfort. These impacts can generate costs through medical treatment, lost work and school days, reduced productivity, and actions households and businesses take to avoid or reduce exposure.

To assess these impacts, this study analyzed water-quality conditions at Imperial Beach and Coronado Beach and $H_2S$ concentrations recorded at monitoring stations near the Tijuana River. The analysis provides indicators of the potential public-health burden associated with degraded environmental conditions; it does not represent a count of illnesses clinically confirmed to have been caused by the crisis.

### Bacterial Levels at Local Beaches Routinely Exceed the Federal Recreational Water-Quality Benchmark

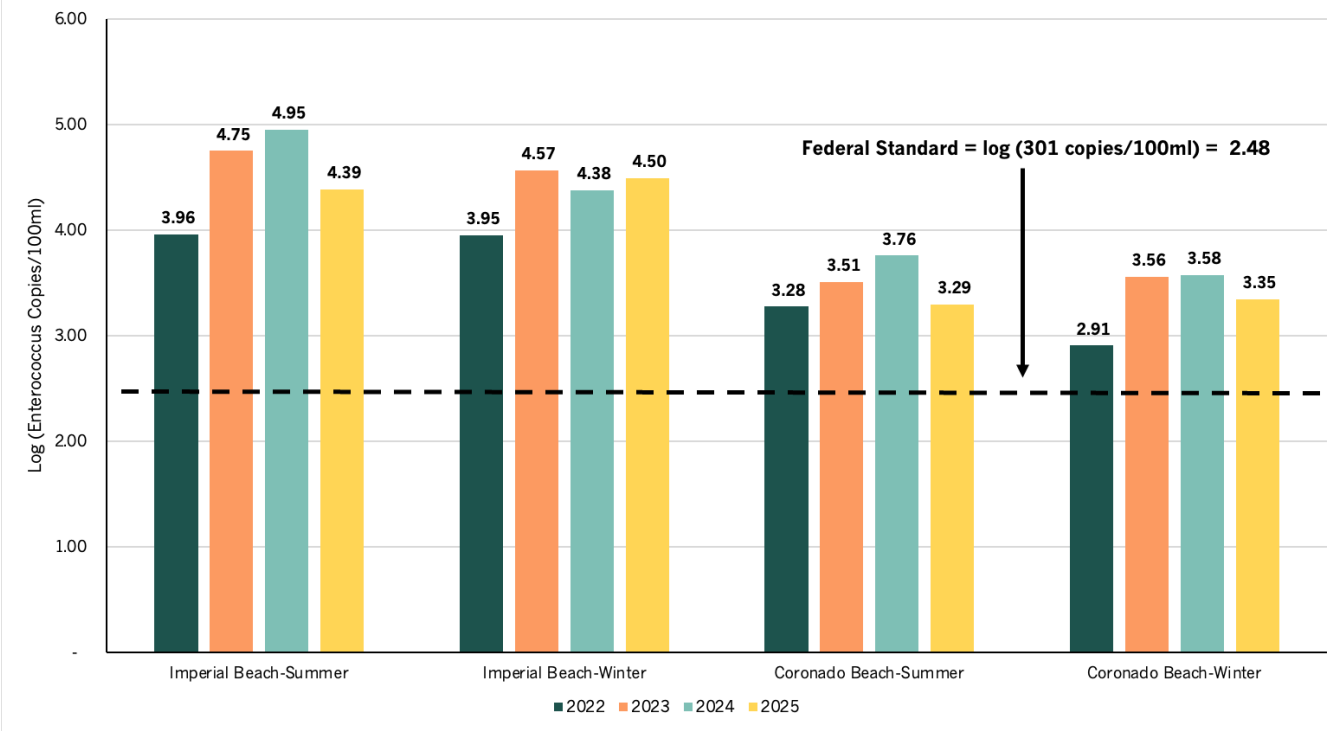
The U.S. Environmental Protection Agency (EPA) establishes recreational water-quality criteria intended to limit the risk of gastrointestinal illness among people who swim, surf, or otherwise come into contact with the water. The federal benchmark used in this analysis is associated with an illness rate of approximately 32 gastrointestinal illnesses per 1,000 recreational water users.[49]

Using monitoring data from the California State Water Resources Control Board, this study analyzed enterococcus concentrations at Imperial Beach and Coronado Beach between 2022 and 2025. Across the years and seasons examined, average bacterial concentrations at both beaches exceeded the federal recreational water-quality benchmark. Conditions were

[49] U.S. Environmental Protection Agency. 2012. Recreational Water Quality Criteria. EPA Office of Water Publication No. 820-F-12-058\. Washington, DC: U.S. Environmental Protection Agency.

generally worse at Imperial Beach than at Coronado Beach, consistent with the more prolonged water-quality impacts experienced at Imperial Beach.

**Exhibit 34. Enterococcus levels at Imperial Beach and Coronado Beach relative to the federal recreational water-quality benchmark**




Source: California SWRCB, US EPA[50], and ECOnorthwest Analysis

## Poor Water Quality Can More Than Double Expected Illnesses During High-Use Periods

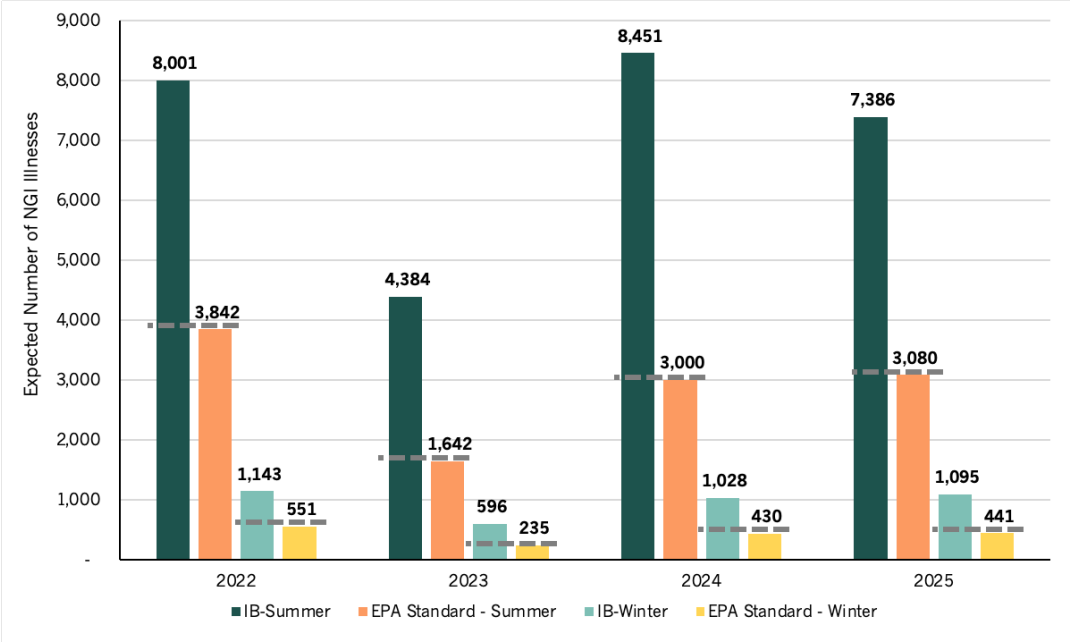
EPA methods allow observed enterococcus concentrations to be translated into expected rates of gastrointestinal illness among people who enter the water. Applying those methods to the observed conditions at Imperial Beach and Coronado Beach indicates illness risks above the federal benchmark in each period examined. At their highest observed levels, estimated illness risk reached approximately 90 illnesses per 1,000 recreational water users at Imperial Beach and 62 per 1,000 at Coronado Beach, compared with the benchmark of 32 per 1,000.

ECOnorthwest combined these estimated illness rates with available beach-visitation data and estimates of the share of visitors who swim or surf to approximate the number of gastrointestinal illnesses expected under observed water-quality conditions. These estimates were then compared with the number expected if water quality met the federal benchmark.

[50] U.S. Environmental Protection Agency. 2012. Recreational Water Quality Criteria. EPA Office of Water Publication No. 820-F-12-058\. Washington, DC: U.S. Environmental Protection Agency.

At Imperial Beach, the analysis indicates that expected gastrointestinal illnesses during summer periods can exceed twice the number expected at the federal benchmark. Estimated illnesses are also elevated during winter periods.

**Exhibit 35. Estimated gastrointestinal illnesses under observed water quality compared with the federal benchmark, Imperial Beach**

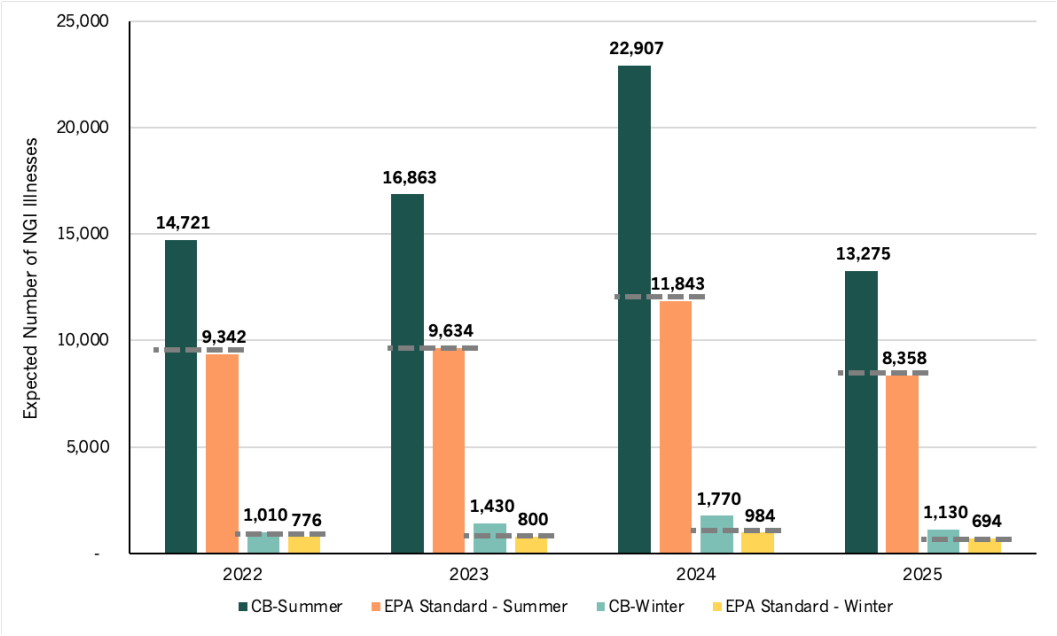



Source: United States Livesaving Association, US EPA51, and ECOnorthwest Analysis.

Coronado Beach shows the same general pattern as Imperial Beach, although the difference from the federal benchmark is smaller, particularly during winter.

[51] U.S. Environmental Protection Agency. 2012. Recreational Water Quality Criteria. EPA Office of Water Publication No. 820-F-12-058\. Washington, DC: U.S. Environmental Protection Agency.

**Exhibit 36. Estimated gastrointestinal illnesses under observed water quality compared with the federal benchmark, Coronado Beach**




Source: United States Livesaving Association, US EPA52, and ECOnorthwest Analysis.

These estimates represent **expected illnesses based on measured bacterial concentrations, recreational exposure assumptions, and EPA risk relationships**. They should not be interpreted as counts of clinically observed illnesses attributable to the Tijuana River. Detailed assumptions and calculations are provided in Appendix F.

Even relatively short gastrointestinal illnesses impose costs on affected individuals, employers, and the broader community. These costs can include over-the-counter and prescription medications, physician or emergency-department visits, and lost productivity from missed work. Based on the literature reviewed for this analysis, the estimated economic cost of a gastrointestinal illness ranges from approximately **$76 to $431 per case in 2025 dollars**, depending on its severity and the medical care required.[53]

## Elevated Hydrogen Sulfide Has Persisted for Thousands of Hours Near the Tijuana River

Degraded air quality represents a second pathway through which the sewage crisis can affect nearby communities. Hydrogen sulfide is a gas associated with sewage and other decomposing organic material. Exposure can produce strong odors and, depending on

[52] U.S. Environmental Protection Agency. 2012. Recreational Water Quality Criteria. EPA Office of Water Publication No. 820-F-12-058\. Washington, DC: U.S. Environmental Protection Agency.

[53] DeFlorio-Barker S, Wade TJ, Jones RM, Friedman LS, Wing C, Dorevitch S. 2017. Estimated costs of sporadic gastrointestinal illness associated with surface water recreation: a combined analysis of data from NEEAR and CHEERS Studies. Environ Health Perspect
125:215–222; http://dx.doi.org/10.1289/EHP130

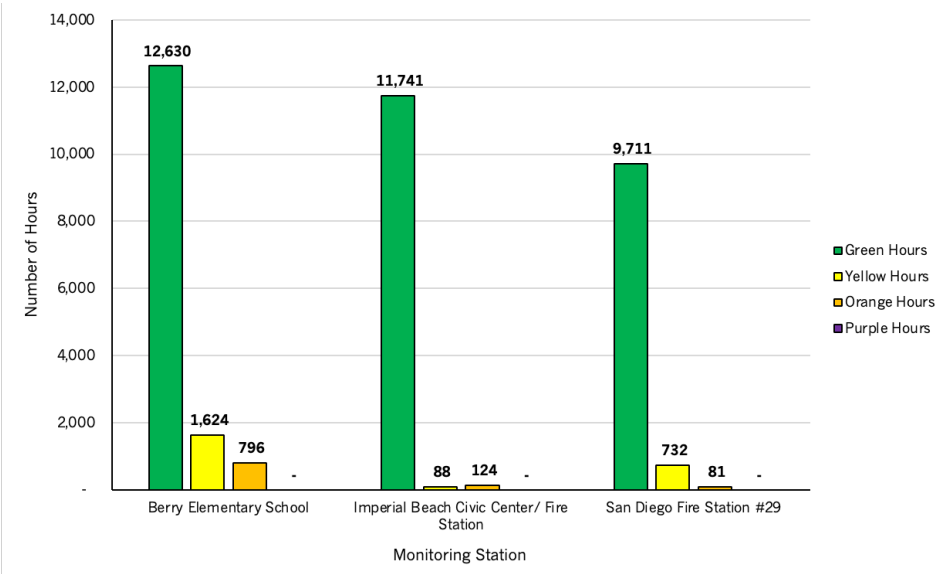
concentration, duration, and individual sensitivity, symptoms including headaches, nausea, eye and respiratory irritation, and other discomfort.

The San Diego County Air Pollution Control District (SDAPCD) operates three monitoring sites near the Tijuana River that measure hourly $H_2S$ concentrations. SDAPCD groups concentrations into color-coded categories that correspond with recommended actions for residents and businesses.

Most monitored hours between 2024 and 2026 fell within the Green category, when the County provides no specific exposure recommendations. However, elevated concentrations occurred with meaningful frequency. Across the three monitoring locations, more than 2,000 monitored hours fell within the Yellow category, during which sensitive individuals may experience odors, headaches, nausea, or respiratory discomfort and may be advised to limit outdoor activity.

More than 200 monitored hours reached the Orange category. At these concentrations, odors are expected to be noticeable to many people, and SDAPCD recommends additional steps for households and businesses to reduce exposure and indoor odors. No monitored hours during the period analyzed reached the County's Purple category, its highest $H_2S$ advisory level.

**Exhibit 37. Hours of Hydrogen Sulfide Exposure by SDAPCD Advisory Category**




Source: San Diego County Air Pollution Control District, and ECOnorthwest Analysis

The persistence of Yellow and Orange conditions matters economically even when concentrations do not reach the County's highest advisory category. Residents may experience discomfort or alter outdoor activities, while households and businesses may incur costs to reduce exposure or odors. These effects represent potential economic burdens in addition to direct medical costs.

The monitoring data document the frequency of elevated $H_2S$ concentrations but do not, by themselves, establish the number of health conditions caused by those exposures. The health

literature and additional methodological discussion supporting this analysis are presented in Appendix F.

### Measured Health Costs Capture Only Part of the Sewage Crisis's Public-Health Burden

The available evidence indicates that degraded water and air quality associated with the crisis creates multiple pathways for public-health costs. Contaminated recreational water increases the expected incidence of gastrointestinal illness, while periods of elevated $H_2S$ can create health symptoms, discomfort, and costs associated with avoiding exposure.

The estimates presented here capture only those effects that can be reasonably characterized using available environmental monitoring, visitation, and economic data. They do not capture every potential health outcome, quality-of-life impact, avoidance behavior, or longer-term consequence associated with degraded environmental conditions. As a result, the quantified costs presented in this report should be interpreted as a partial measure of the broader public-health burden associated with the crisis.

## School and Education

The crisis may impact educational outcomes and public-school funding in the region. Poor health outcomes linked with the pollution may adversely affect students' ability to attend school as well as their educational development.[54, 55] Exposure can have life-long economic consequences for individuals and communities such as lost earnings. This is because the affected students may have poorer grades as well as worse higher education opportunities, eventually resulting in lower access to higher paying jobs.

If the crisis has meaningfully affected attendance rates in schools, this may have also affected public school funding for schools in the region. This is because California's public school district funding is tied to the attendance rates in each district. The Local Control Funding Formula (LCFF) is a per-student formula based on a district's average daily attendance (ADA), or the average number of students in class each day. ADA is calculated as the total days of student attendance divided by the total days of instruction in the school year. Low attendance rates can thus bring down district ADA and have an impact on funding.

Any decrease in ADA could mean significant funding lost, likely from state funds. Approximately 80 percent of a district's funding can come from the LCFF base grant, which is calculated by multiplying the ADA by a base rate. Local property taxes fill this funding level first, and the state supplements any remaining amount. ADA has decreased in impacted

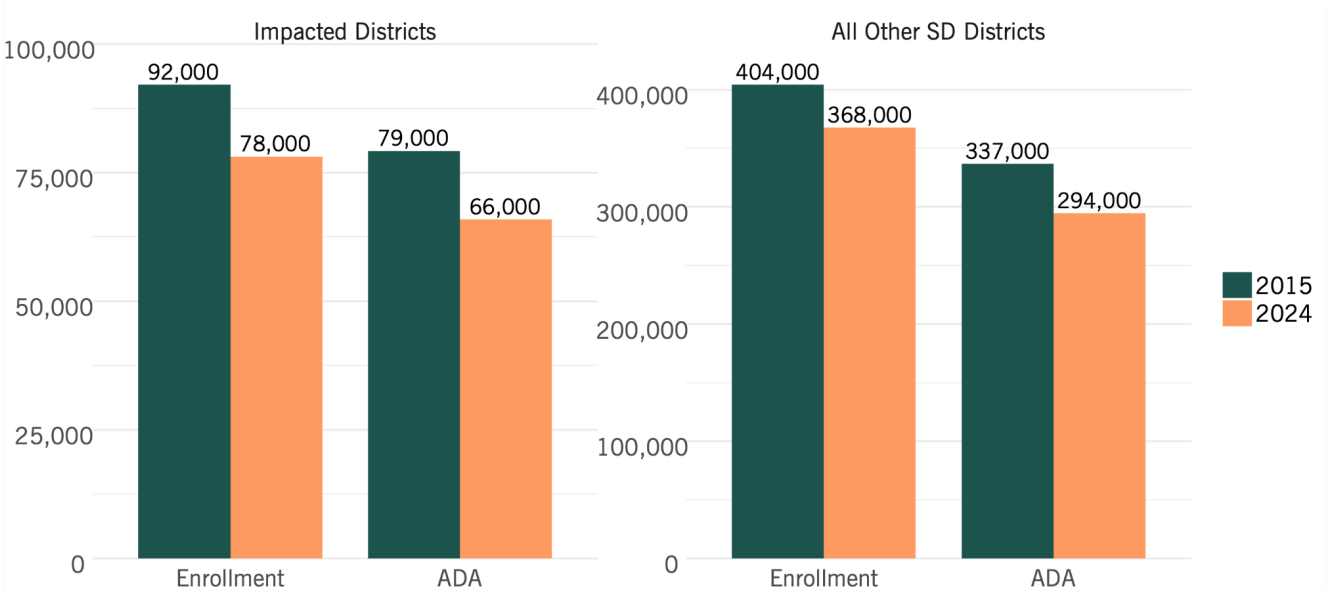
54 Janet Currie, Joshua Graff Zivin, Jamie Mullins, Matthew Neidell. 2014. What Do We Know About Short- and Long-Term Effects of Early-Life Exposure to Pollution?. Annual Review of Resource Economics 6:217-247. https://doi.org/10.1146/annurev-resource-100913-012610

55 Isen, Adam, Maya Rossin-Slater, and W. Reed Walker. 2017. "Every Breath You Take—Every Dollar You'll Make: The Long-Term Consequences of the Clean Air Act of 1970." The Journal of Political Economy (Chicago) 125 (3): 848–902. https://doi.org/10.1086/691465.



school districts (school districts proximate to the pollution) more than other school districts in San Diego County since 2016.

**Exhibit 38. Difference in ADA and Fall Enrollment for impacted versus other San Diego School Districts from 2015-16 to 2024-25**




Source: ECOnorthwest analysis of California Department of Education data.

If the difference in ADA declines across impacted districts and other districts is fully attributable to pollution, we estimate that impacted districts have foregone approximately $15.7 to $38.4 million in funding since 2015. See Appendix G for details on the counterfactual calculation.

However, not all of the foregone funding can be directly attributed to the TRJV pollution. Attendance rates are not the sole driving factor affecting average daily attendance. Average daily attendance can differ from enrollment due to student mobility, dropouts, and independent charter reporting. Decreases in enrollment and changing demographics in the area due to general county-wide migration patterns may also be contributing to the decrease in ADA. We explored a linear regression model to control for other major factors affecting attendance, but did not find a large statistically significant and robust relationship between ADA and proximity to pollution source. We were limited by data availability and granularity however further studies could look into this relationship using more granular data. A summary of the regression analysis is also included in Appendix G.

Ultimately, ADA is reported at the district level, annually. While this limits our ability to examine a causal relationship between attendance and proximity to pollution, it remains the basis of funding given to school districts. A quantifiable relationship between attendance and proximity to pollution would, in practice, be aggregated into the same annualized metric we used to estimate foregone funding.

If the magnitude of the pollution crisis increases, the effects of the pollution may become more evident in school attendance, and the separate epidemiological study may provide more granular data to support causal analysis relating health issues to school attendance.

Schools closest to the pollution are receiving less funding overall than other districts in San Diego County and are feeling the impacts of this and the pollution.

# 6. What the Findings Mean

How large is the sewage crisis's total economic burden, and who is left to carry it? This chapter answers both parts of that question by bringing together the findings from across this report. The analysis identifies a substantial economic burden associated with the Tijuana River sewage crisis, but no single dollar figure captures its full scale. Some effects can be translated into monetary terms with reasonable confidence, while others can be measured or observed without being conclusively attributed to the crisis or converted into dollars.

To reflect those differences, this chapter returns to the hierarchy of costs introduced in Chapter 2: **monetized costs**, supported by a defensible dollar estimate that informs the magnitude of the costs; **other quantified costs**, which can be measured but not confidently monetized or attributed to the crisis; and **non-quantified costs**, which are important to understanding the broader burden but cannot be reliably measured with the available information. This approach recognizes that a lack of monetization does not mean an effect is absent or unimportant; rather, it reflects differences in the available evidence and the strength of the connection that can be established between the crisis and each potential impact. The chapter then turns to distributional effects: which communities within the primary study area are most exposed to these costs, based on how their demographic and socioeconomic makeup compares to the county as a whole.

## Monetized Costs

The strongest monetized pathway identified in this study is the connection between worsening pollution conditions, reduced beach visitation, changes in visitor spending, and the regional economic activity supported by that spending. Based on the visitation scenarios evaluated in this report, reduced visitation to Imperial Beach and Coronado is estimated to correspond with between **$125.5 million and $503.5 million in reduced regional economic output annually**. If current pollution and visitation patterns persist, discounted cumulative impacts over the next 20 years are projected to range from approximately **$1.9 billion to $7.9 billion in economic output**. These effects fall most directly on tourism- and recreation-related businesses and workers, but also extend through the regional economy as affected businesses purchase fewer goods and services and households receive less income to spend elsewhere.

These estimates should be understood as indicators of the **magnitude of economic activity at risk** from doing nothing to address the crisis, rather than as a complete measure of the cost of the crisis. The prospective estimates similarly represent what could occur if the visitation patterns observed in recent years continue. Actual future impacts will depend on future water-quality conditions, infrastructure improvements, public perceptions, regional economic conditions, and the timing and effectiveness of actions taken to address the crisis.

## Other Quantified Costs

Several other analyses identify measurable changes that may represent additional costs of the crisis. Unlike the visitation pathway, however, the available information generally does not allow this study to isolate the effect of pollution from the many other factors influencing these outcomes. These findings are therefore presented as **quantified indicators of additional economic burden**, rather than costs that should be added to the monetized estimates above.

- **Business Formation and Retention.** Business formation and retention in the primary study area show a quantifiable divergence, even though this report does not convert that divergence into a dollar cost. Imperial Beach's average annual growth rate in business starts declined to roughly -33 percent by 2025, the only persistently negative trend among the geographies examined, and the city recorded a net loss of more than 200 businesses in that year alone (see Business Trends). These are real, countable changes in local business activity, but because business formation is also shaped by lease costs, ownership demographics, and broader retail and hospitality trends unrelated to pollution, this report presents them as a quantified pattern rather than as a monetized cost attributable to the sewage crisis.
- **Transient Occupancy Taxes.** Transient occupancy tax revenue provides another quantified indicator of changes in the visitor economy and a potential fiscal effect for local governments. After adjusting for inflation, hotel inventory, and Imperial Beach's 2023 tax-rate increase, TOT revenue per hotel room in Imperial Beach declined from about $9,300 in 2017 to $6,700 in 2024, a decrease of roughly 28 percent. By comparison, Coronado and San Diego had returned to approximately their 2017 levels by 2024, while several other coastal comparison communities experienced growth. Imperial Beach also showed a weaker post-pandemic recovery, with adjusted revenue per room falling again in 2023 before improving modestly in 2024. These trends do not isolate the effect of the sewage crisis from other factors that influence hotel performance, including room rates, hotel quality, travel patterns, financing conditions, and broader market trends. However, the comparatively weak trajectory in Imperial Beach is consistent with other evidence in this report showing reduced visitation and changes in visitor behavior. The findings also point to a potential fiscal consequence: weaker lodging activity can reduce local TOT revenue at the same time affected jurisdictions may face additional costs associated with responding to the crisis.
- **Property Values.** Property and investment data can provide another measurable indicator of conditions in the affected area but also present a substantial attribution challenge. Property values and sales are shaped by interest rates, regional housing supply, redevelopment opportunities, local land-use regulations, neighborhood amenities, and broader market conditions in addition to environmental quality. The analysis does not show broad evidence that the sewage crisis has reduced residential turnover or suppressed property-value growth across the primary study area. Residential turnover has generally tracked broader regional trends, while both sale prices and assessed values have continued to grow at rates comparable to or, in some

cases, faster than the County overall. There are localized differences within the study area, including slower assessed-value growth in some lower-value South Bay communities, but similar patterns appear elsewhere in the region and cannot be confidently attributed to pollution. The property-value pathway therefore provides weaker evidence of a measurable crisis-related economic loss than the visitation analysis. At the same time, continued appreciation does not mean residents are unaffected: high housing costs and limited availability may make it difficult for households concerned about environmental or public-health conditions to relocate, creating a potential burden through reduced residential mobility rather than declining property values.

- **Public Health (Water quality).** Water quality conditions at Imperial Beach and Coronado have resulted in levels of microbial contamination associated with a higher risk of gastrointestinal illness for water-contact recreators than the Federal Standard set by the US EPA. Based on the public-health literature reviewed for this study, the economic cost associated with an individual gastrointestinal illness can range from approximately $76 to $431, reflecting expenses such as medical treatment and lost productivity. The analysis provides evidence of an elevated health risk but does not estimate a total annual public-health cost attributable to the crisis. Doing so would require greater certainty about the number of people exposed, the frequency and type of recreation occurring under specific water-quality conditions, and the number of resulting illnesses. The per-illness estimate therefore helps illustrate the potential economic consequence of exposure without implying a total population-level health cost.
- **School and Education Funding.** School funding losses tied to declining average daily attendance are quantified as a dollar range—an estimated $15.7 million to $38.4 million in foregone Local Control Funding Formula revenue for the school districts closest to the pollution since 2016 but are not included among this report's monetized costs because the underlying statistical analysis did not find a significant, causal relationship between proximity to pollution and attendance after controlling for other demographic factors. The dollar range describes the scale of funding at stake if the observed divergence in attendance is connected to the crisis, rather than a confirmed cost of the crisis itself.

## Non-Quantified Costs

A third group of effects is important to the overall economic burden but cannot be reliably quantified with the available data. Some are visible in surveys, stakeholder interviews, administrative data, or broader economic trends but cannot be isolated or converted into dollars. Others are supported by established economic theory and prior research but lack locally specific data necessary to estimate their magnitude.

These effects matter because many of the ways residents, businesses, and public agencies respond to a prolonged environmental crisis occur gradually and outside conventional market transactions. They may appear as a business operating with fewer employees, a

household choosing a different recreation destination, a resident considering whether to leave the area, an organization redirecting staff toward crisis response, or a potential investor deciding to locate elsewhere. Individually, these effects are difficult to monetize. Collectively, they help describe how a prolonged crisis can alter the economic trajectory and quality of life of a community.

- **Costs to emerging industries.** Retail trade, food and beverage service, and coastal tourism and recreation together account for roughly three in five covered jobs in the primary study area, and each of these industries is present in the study area at a higher concentration than in San Diego County as a whole. Because these are also the industries most directly exposed to visitor spending, they are structurally more vulnerable to a sustained decline in beach visitation than the county's more diversified industry mix. This exposure is not limited to the near-term revenue losses estimated through IMPLAN: a local economy this concentrated in visitor-facing sectors has less capacity to absorb a demand shock by shifting workers or capital into unaffected industries, which raises the risk of longer-term restructuring—business consolidation, reduced hours, or a shift toward lower-margin operations—that this report has not attempted to monetize. The employment data reinforce this concern in one respect: job growth among workers commuting into the study area is concentrated in accommodation and food service jobs tied to the local visitor economy, while growth in retail trade and other recreation-related jobs tracks county-wide trends more closely than conditions specific to the primary study area. This suggests that the industries most identified with the local visitor economy are also the ones most exposed to conditions specific to the primary study area, rather than being cushioned by broader countywide growth.
- **Outmigration and reduction in business retention.** Beyond the decline in new business starts documented earlier in this report, Imperial Beach has also experienced net losses of existing businesses (more closures than openings) in three of the five years since 2021, including a net loss of more than 200 businesses in 2025 alone. This points to a retention problem as well as a formation problem: businesses that opened before the crisis intensified are closing or leaving at a rate that new business starts are not offsetting. Business survey respondents described this pressure directly, with several open-ended responses anticipating closure or relocation if conditions do not improve, echoing the sentiment captured in one response: “We will close or relocate.” Community survey respondents reported a parallel pattern on the residential side, with some respondents describing that they had considered relocating away from the affected area because of the pollution. Neither the business license data nor the survey responses can establish how many businesses or residents have actually left the primary study area because of the crisis, as opposed to the many other reasons a business might close or a household might move, but the consistency between the two data sources, declining net business counts and residents and business owners voicing an intention to relocate, is a pattern worth continued monitoring rather than a cost this report attempts to quantify.

- **Workers and business operations.** The business survey results describe how this pressure has been absorbed inside individual firms. Among businesses that reported reduced revenue, 45 percent said they had reduced staff, 36 percent had changed products or services, 18 percent had reduced wages, and 9 percent had reduced operating hours. None of these effects are separately quantified in this report, both because the survey sample is small and self-selected and because attributing a specific wage or job loss to the sewage crisis, rather than to the broader economic pressures facing small businesses generally, would overstate the precision of the underlying data.
- **Non-market recreation value.** Recreation provides economic value beyond the money a person spends during a trip. Someone who visits a beach may spend money on transportation, food, lodging, or retail purchases; those expenditures generate the market activity captured in the visitation and IMPLAN analysis. But the individual also receives value simply from being able to swim, surf, walk along the beach, visit the estuary, or otherwise enjoy the coast. Economists refer to the value received above what a person pays as consumer surplus. When pollution prevents a preferred activity, a person may lose some or all of that recreational value even if their spending does not change. Someone may still travel to the South Bay, for example, but have a lower-value experience because swimming or surfing is unavailable. Alternatively, they may substitute a different beach or recreational activity that is less preferred. Existing economic literature provides estimates of consumer surplus for different recreation activities, but those values are generally derived from studies conducted in other locations and often reflect full-day recreation experiences. Applying them directly to Imperial Beach or Coronado would therefore imply a level of precision that the available local information does not support. For this reason, we recognize lost recreation value as an additional economic effect but do not add a literature-based estimate to the monetized cost total.
- **Public Health (Air Quality).** Air-quality impacts associated with the Tijuana River represent an important but non-quantified cost of the crisis. Local monitoring confirms that elevated hydrogen sulfide conditions occur near the river: across the three monitoring stations and years examined, more than 2,000 monitored hours fell within SDAPCD's Yellow advisory category and more than 200 hours fell within the Orange category. At these concentrations, residents may experience noticeable odors and symptoms such as headaches, nausea, irritation, or respiratory discomfort, with sensitive individuals potentially affected at lower concentrations. Untreated sewage may also generate bioaerosols and other airborne contaminants associated in the broader literature with respiratory effects, although the available monitoring data do not allow community exposure to those contaminants to be measured directly. The economic consequences of these conditions are harder to quantify. Prior research shows that persistent odor and degraded air quality can create costs through health symptoms, reduced enjoyment of homes and outdoor spaces, behavioral changes, and potentially lower willingness to remain in an affected area. However, the available studies are highly context-specific, and the local data do not establish the number of

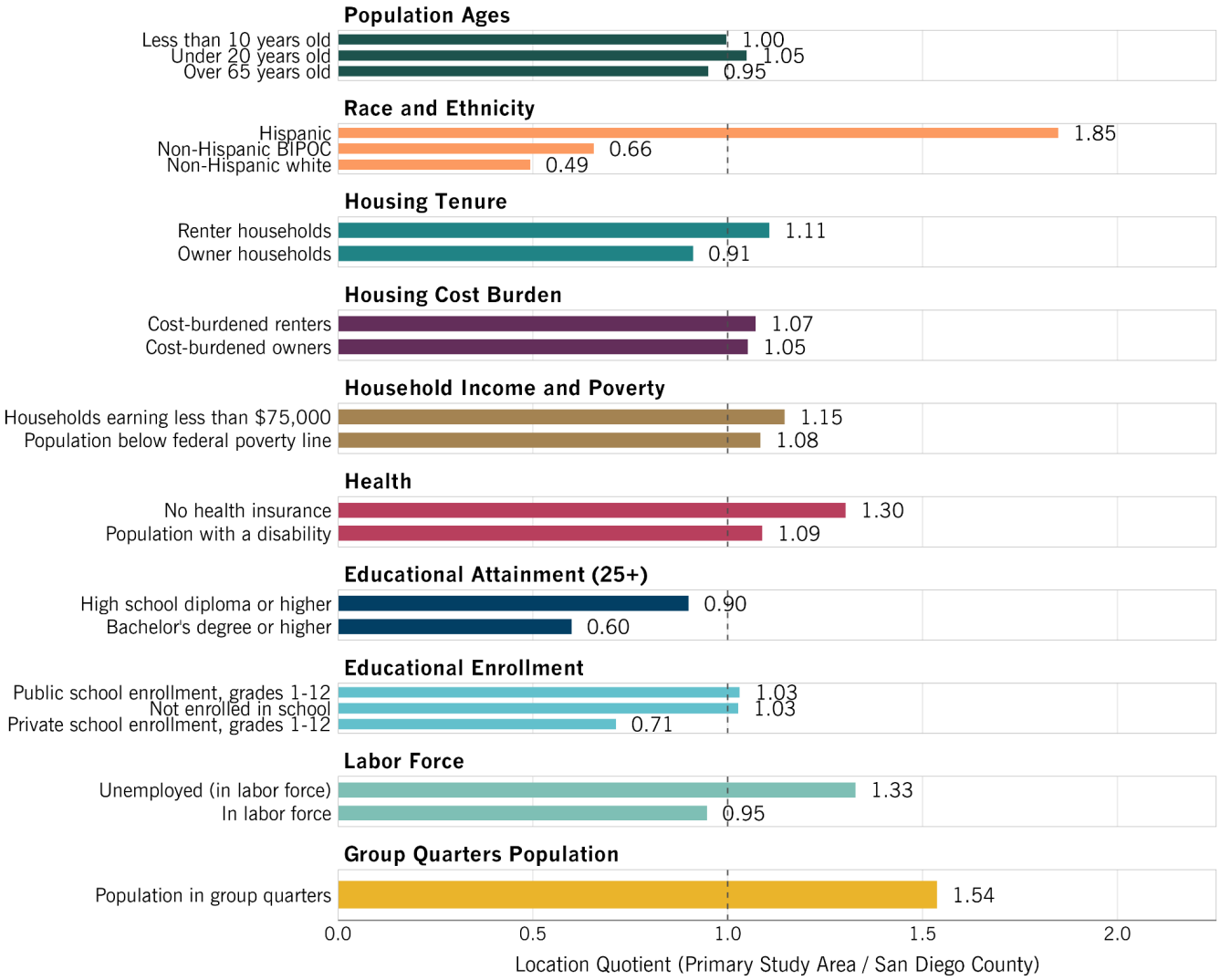
residents exposed, the duration or intensity of individual exposure, resulting health outcomes, or a causal effect on household behavior. Applying health-cost or willingness-to-pay estimates from other locations would therefore imply more precision than the evidence supports.

## Who Bears the Costs?

The economic effects described throughout this report are not distributed evenly across the primary study area's population. Comparing the demographic and socioeconomic composition of the primary study area to San Diego County as a whole, using location quotients (LQs), which express how over- or under-represented a group is in the study area relative to the county (an LQ of 1.0 indicates parity), shows that several populations with fewer resources to absorb an economic shock are concentrated in the communities most exposed to the crisis (Exhibit 39).

The clearest pattern is elevated concentration: the primary study area's Hispanic population share is 85 percent higher than the county's (LQ of 1.85), its population living in group quarters is 54 percent higher (LQ of 1.54), and its shares of residents without health insurance are 30 percent higher (LQ of 1.30). The primary study area also has a 33 percent higher concentration of residents who are unemployed than the county (LQ of 1.33). The clearest pattern of under-concentration is educational attainment: the study area's share of adults 25 and older with a bachelor's degree or higher is 40 percent lower than the county's (LQ of 0.60), and its non-Hispanic white population share is roughly half the county's (LQ of 0.49).

**Exhibit 39. Concentrations of demographics within the Primary Study Area compared to County of San Diego, 2024**




Source: American Community Survey 2024 5-Year Estimates, 2024; ECOnorthwest analysis.

These patterns do not mean that every resident of the primary study area experiences the crisis identically, or that every household in these categories is affected. They do mean that, in aggregate, the communities absorbing the effects described in this report have less financial cushion, less access to health coverage, and fewer alternative employment opportunities than the county overall. So, a given dollar of lost income, spending, or property value is likely to represent a proportionally larger burden for these communities than the same dollar loss would represent countywide.

These distributional patterns shape how the specific cost categories examined in this report are likely to be felt, across both businesses and residents:

- **Public health impacts.** Water-contact recreators at Imperial Beach and Coronado face a higher expected rate of gastrointestinal illness than the federal standard allows, and hydrogen sulfide exposure has been linked in the broader literature to headaches,

nausea, and respiratory discomfort (see Public Health Costs). Because these health effects occur in a community with an above-average rate of uninsurance (LQ of 1.30) and a disability slightly above the county's (LQ of 1.09), a comparable health burden is likely to translate into a larger uncompensated cost for the primary study area's residents than it would for county residents overall.

- **School and education.** School districts closest to the pollution have experienced average daily attendance and enrollment trends that diverge from the rest of San Diego County's school districts, corresponding to an estimated $15.7 million to $38.4 million in foregone funding since 2016 under the Local Control Funding Formula (see School and Education). This analysis could not establish a statistically significant, causal relationship between proximity to pollution and attendance after controlling for other demographic factors, so the divergence is best read as a cost that is plausibly, but not conclusively, connected to the crisis.
- **Property values.** Though the property data do not show broad evidence that the sewage crisis has suppressed aggregate growth across the study area, it does not measure whether people feel financially or practically able to relocate. In this context, strong market values can coexist with a different kind of economic burden—reduced mobility and fewer options for people seeking to avoid ongoing environmental and public-health concerns. The associated economic burden of reduced mobility would compound on renter households who typically experience less housing security in general. Renter households are already over-represented in the study area (LQ of 1.11) and slightly more likely to be cost-burdened (LQ of 1.07) than the county as a whole.
- **Employment and wages.** The employment effects documented in this report (including the decline in Imperial Beach's private covered employment beginning in 2017 and the divergence in business starts described above (see Local Businesses and Economic Development)) occur in a labor market where the study area's unemployed share of the labor force is already 33 percent above the county average. Job losses or forgone job growth in this context are more likely to translate into extended unemployment or a shift to lower-wage work than the same job losses would in a tighter, less-affected labor market.

# 7. Recommendations

## What the Findings Suggest

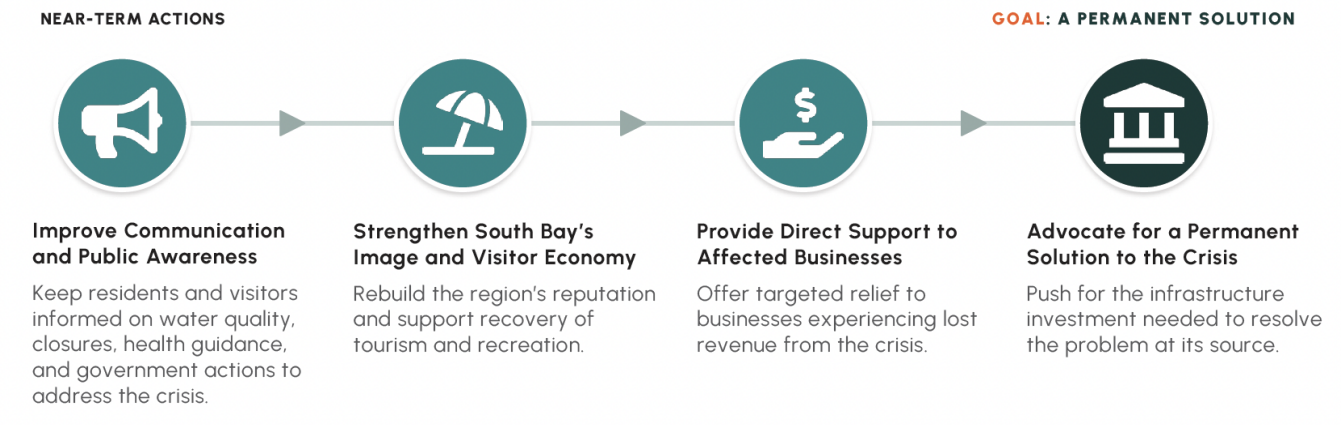
The economic effects documented in this study stem from an environmental and infrastructure problem that is substantially larger than the County can resolve on its own. Addressing the underlying sources of transboundary pollution requires major wastewater infrastructure investments, ongoing operations and maintenance, and sustained coordination among agencies and governments on both sides of the U.S.–Mexico border. The scale of those investments, as well as the authorities required to implement them, extend beyond the County's direct jurisdiction and financial capacity.

At the same time, the findings show that the economic consequences of the crisis are being experienced locally. Reduced beach access and concerns about pollution affect where residents and visitors recreate, whether and how often they travel to affected communities, and where they spend money. Businesses that depend on visitors and local foot traffic face resulting challenges, while residents lose access to recreation and other quality-of-life benefits. Public agencies, community organizations, schools, businesses, and households also devote time and resources to responding to a crisis that would otherwise be available for other priorities.

The recommended policy directions that follow respond to two distinct needs identified through the analysis. **First, the County can continue to take near-term actions to reduce some of the economic consequences experienced by residents, visitors, and businesses while the crisis continues.** These actions cannot eliminate the underlying pollution, but they can improve access to information, sustain visitation and spending where possible, and provide targeted assistance to businesses experiencing impacts.

**Second, the magnitude and persistence of the economic effects strengthen the case for sustained County advocacy and coordination toward a permanent infrastructure solution.** Continued pollution produces recurring costs. The County can use the evidence developed through this study to help communicate those costs, coordinate regional interests, and advocate for the state, federal, and binational investments necessary to resolve the crisis at its source.

**Exhibit 40. Summary of recommended policy directions**




# Near Term Actions

## Improve Communication and Public Awareness

**Goal:** Keep residents and visitors informed about environmental conditions, health guidance, beach access, and progress toward addressing the crisis.

### How this recommendation relates to the analysis

Public awareness of the Tijuana River sewage crisis has increased substantially, and the analysis indicates that pollution concerns influence where people recreate, visit, and spend money. Survey and stakeholder input also identified inconsistent, fragmented, or difficult-to-interpret information about environmental conditions and government response as an ongoing concern.

Uncertainty can itself affect economic behavior. Residents or visitors who do not know which beaches are closed, which recreational activities remain available, or whether conditions have changed may avoid a broader area than necessary. Likewise, businesses and organizations may have difficulty communicating accurate information to customers when updates are spread across multiple agencies or information sources.

Improved communication will not resolve the pollution problem, and public messaging should not minimize legitimate environmental or health concerns. However, a more coordinated approach can make it easier for residents and visitors to understand current conditions, distinguish between affected and unaffected locations or activities, and track progress toward longer-term solutions. It can also make existing government actions more visible and improve accountability.

**Exhibit 41. Potential implementation steps for Improving Communication and Public Awareness**

| Potential Steps | County Role | Approx. Timing | County Resources | Investment Type | Notes / Dependencies |
|---|---|---|---|---|---|
| Designate a County liaison or coordinating lead for the Tijuana River crisis and establish a clear work plan and accountability structure.<br><br>*(This step is highlighted separately as it could be critical for the remaining implementation steps in this table and for subsequent recommendation)* | Lead | 0–6 months | Moderate–High: dedicated staff capacity | Recurring | This person/function becomes the organizational home for communications and coordination rather than creating multiple separate initiatives.<br><br>Note that at the time of this impact study, the County was already considering a new position of Sewage Crisis Chief. |
| Through the liaison, establish a single, consistent public information channel covering environmental conditions, health guidance, government actions, infrastructure progress, and available resources. | Lead / Coordinate | 0–6 months | Low–Moderate: staff + communications capacity | Recurring | Should coordinate existing information rather than create another disconnected information source. Could include coordination with nearby jurisdictions, media/news outlets, and regular partner meetings. |
| Improve access to timely air- and water-quality information and forecasting tools. | Coordinate / Support | 3–12 months | Moderate: staff + technical/data coordination | Recurring | Work with the agencies and researchers that already produce monitoring, alerts, and forecasts rather than duplicating those functions. Consider specific improvements to |

| | | | | | |
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| | | | | | critical alerts (e.g., voluntary, real-time text alerts). |
| Periodically update key economic and community indicators developed through this study. | Lead / Coordinate | 6–12 months initially, then ongoing | Moderate: analytical staff or consultant support | Annual / Periodic | A limited indicator update would be less resource-intensive than repeating the full economic impact study. |
| Convene a State of the River forum or similar public update. | Lead / Convene | 6–12 months initially, then ongoing | Moderate: staff + event resources | Annual / Periodic | Could combine government updates, research findings, infrastructure progress, and community feedback in one recurring forum. |

Source: ECOnorthwest

## Strengthen South Bay and Coronado's Image and Visitor Economy

**Goal:** Support recovery of recreation, visitation, and spending while countering the broader perception that the entire South Bay and Coronado are inaccessible or unsafe.

**How this recommendation relates to the analysis**

Reduced visitation is the clearest measurable economic effect identified in this study. Changes in visitation affect more than direct recreation activity: visitors purchase food, retail goods, lodging, transportation, entertainment, and other services, meaning that reductions in visitor spending can ripple through the broader regional economy.

The findings also suggest that perceptions of the sewage crisis can influence behavior beyond the particular beach or activity directly affected by a closure. A visitor who associates the broader South Bay with pollution may decide not to make a trip at all, even when restaurants, businesses, parks, cultural destinations, or other recreational opportunities

remain available. Over time, those perceptions may also affect the area's broader image as a place to visit, invest, or do business.

Economic recovery therefore depends both on addressing the environmental conditions themselves and on maintaining reasons for residents and visitors to spend time in affected communities while the crisis continues. This does not mean encouraging people to recreate in locations that are unsafe or minimizing environmental conditions. Rather, it means clearly communicating what remains available and strengthening the range of attractions and activities that do not depend on ocean access.

**Exhibit 42. Potential implementation steps for Strengthening South Bay and Coronado's Image and Visitor Economy**

| Potential Steps | County Role | Approx. Timing | County Resources | Investment Type | Notes / Dependencies |
|---|---|---|---|---|---|
| Develop coordinated South Bay and Coronado destination messaging with local and regional visitor organizations. | Coordinate / Support | 3–9 months | Low–Moderate: staff + marketing resources | Recurring | Messaging should accurately distinguish between affected locations from the many destinations, activities, and businesses that remain available. |
| Use events, programming, and existing County/community assets to generate visitation and foot traffic in affected communities. | Coordinate / Support | 6–12 months | Moderate: staff + event/program resources | Recurring / Seasonal | Opportunities may exist to coordinate existing County, city, library, parks, arts, business, and community programming rather than creating entirely new events. |
| Work with partners to promote the area's broader economic assets, including its businesses, workforce, culture, location, and investment opportunities. | Coordinate / Support | 6–24 months | Moderate: cross-department staff + marketing resources | Recurring / Long-term | Expands the effort beyond tourism toward longer-term business attraction and investment. |

| | | | | | |
|---|---|---|---|---|---|
| Pair promotional efforts with coordination around visible investments in commercial areas and public spaces. | Coordinate / Fund | 12–36+ months | Moderate–High: cross-department staff + capital funding | Capital / Long-term | Could include streetscape, public-realm, transportation, right-of-way, or related improvements. Many actions would require coordination with incorporated cities. |
| Monitor visitation and perceptions over time. | Lead / Coordinate | 6–12 months initially | Low–Moderate: analytical capacity + potentially purchased data | Annual / Periodic | Can help determine whether visitation is recovering and whether promotional efforts should change. |

Source: ECOnorthwest

## Provide Direct Support to Affected Businesses

**Goal:** Help businesses experiencing reduced customers, revenue, or operating challenges remain viable while environmental conditions constrain normal economic activity.

**How this recommendation relates to the analysis**

Business feedback and the economic analysis indicate that the crisis creates particular challenges for businesses that depend on visitors, recreational activity, and local foot traffic. When fewer people visit affected communities, the impacts are experienced first by businesses serving those customers but can extend outward through reduced employment, household income, and purchases from suppliers and other regional businesses.

The effects may also vary substantially across individual businesses. Some firms may be able to adapt by changing their customer base, marketing, products, or services, while others have a location or business model closely tied to beach visitation. Smaller businesses may have less financial capacity to absorb sustained revenue losses or navigate multiple assistance programs.

Direct business support therefore provides a way for the County and its partners to mitigate some near-term economic effects even though such assistance cannot replace the need for a permanent environmental solution. Wherever possible, assistance should build on existing programs and institutions rather than creating duplicative systems.

**Exhibit 43. Potential implementation steps for Providing Direct Support to Affected Businesses**

| Potential Steps | County Role | Approx. Timing | County Resources | Investment Type | Notes / Dependencies |
|---|---|---|---|---|---|
| Evaluate how existing business-support programs are being used and whether affected businesses are accessing available resources.<br><br>*(This step is highlighted separately as it could be critical for the remaining implementation steps in this table)* | Lead | 0–6 months | Low–Moderate: staff + basic program/data review | One-time assessment with periodic follow-up | Review participation in existing grants, loans, technical assistance, marketing, and other support programs to determine whether the businesses most affected by the crisis are benefiting. Where gaps exist, identify barriers such as lack of awareness, eligibility requirements, administrative burden, language, or program design. |
| Increase awareness and use of existing programs among affected businesses. | Coordinate / Support | 0–12 months | Low–Moderate: staff + outreach/ communications | Recurring | Showcase and market existing grants, technical assistance, financing, and business-support programs. Tailor outreach and navigation support to businesses that appear most at risk or least likely to access existing systems.<br><br>Prioritize making existing programs easier to find and navigate before creating new ones. Could connect businesses with County, city, state, federal, nonprofit, |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | and private-sector programs without duplicating those programs. |
| Improve permitting navigation for businesses seeking to locate, expand, or reinvest in affected communities. | Coordinate / Support | 12–36 months | Moderate: staff + process coordination | Recurring | County authority varies by jurisdiction - as such, this is about navigation and interagency coordination with affected cities. |
| Where documented gaps remain, evaluate targeted financial or reinvestment tools. | Lead / Fund | 12–36 months | Moderate–High: program funding + administration | Pilot / One-time or recurring | Potential tools could include targeted relief, façade/storefront assistance, or other place-based economic-development investments. The appropriate intervention should follow demonstrated need rather than be predetermined. |
| Continue monitoring business conditions and needs. | Lead / Coordinate | 6–12 months initially | Low–Moderate: engagement + analytical capacity | Annual / Periodic | Helps ensure future support responds to demonstrated impacts rather than applying the same intervention to all businesses. |

Source: ECOnorthwest

# Longer Term: A More Permanent Solution

## Advocate for a Permanent Solution to the Crisis

**Goal:** Support the infrastructure investment, operations and maintenance, and binational coordination necessary to resolve the crisis at its source.

**How this recommendation relates to the analysis**

The near-term recommendations above can mitigate some of the consequences of the crisis, but they cannot eliminate its underlying economic effects. Those effects will continue for as long as sewage contamination, beach closures, environmental uncertainty, and negative perceptions persist.

The prospective analysis illustrates the importance of duration. If recent visitation impacts continue, the cumulative loss of regional economic output alone could reach billions of dollars over the next two decades. Those estimates also do not fully capture other losses documented or discussed in this study, including household burdens, public-health effects, institutional costs, and broader quality-of-life impacts.

The scale of those recurring losses changes the economic context for infrastructure investment. Funding improvements to wastewater treatment, conveyance, diversion, monitoring, and maintenance requires substantial resources, but continued inaction also carries a cost. The findings in this study provide additional evidence that investment in a durable solution should be evaluated not solely as an environmental or public-health expenditure, but also as a means of avoiding continued economic losses.

Permanent resolution nevertheless requires resources, authorities, and binational agreements that extend beyond the County. The County's principal role is therefore to maintain sustained advocacy, coordinate regional interests, provide credible evidence on local impacts, and help ensure that infrastructure investments are accompanied by reliable long-term operations and maintenance.

**Exhibit 44. Potential implementation steps for Advocating for a Permanent Solution to the Crisis**

| Potential Steps | County Role | Approx. Timing | County Resources | Investment Type | Notes / Dependencies |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Maintain resolution of the crisis as a sustained County state and federal legislative priority. | Lead / Advocate | Now / next legislative cycle | Moderate: County leadership + government-affairs staff | Recurring / Each respective legislative cycle | Focus advocacy on securing the infrastructure, operations, maintenance, and funding commitments necessary for a durable solution. |
| Use this study to strengthen the County's advocacy case by clearly communicating the economic costs of continued inaction. | Advocate | Now / ongoing | Low: staff + communications | Recurring | Translate the economic findings into concise materials for legislators, agencies, funding requests, and advocacy meetings. |
| Coordinate Sacramento and Washington, D.C. advocacy with the County's lobbyists and regional partners. | Advocate / Convene | Now / ongoing | Moderate: staff + existing/contracted advocacy resources | Recurring | Coordinate meetings, priorities, and messaging among County leadership, lobbyists, business organizations, and other regional partners rather than pursuing parallel efforts. |
| Participate in regional and binational technical and executive coordination structures. | Participate / Coordinate | Immediate–ongoing | Moderate: senior + technical staff | Recurring | Helps ensure local economic and community impacts remain represented in decisions primarily made outside County government. |

Source: ECOnorthwest

## Interpreting the Implementation Steps Framework

The timing and resource categories above are intended as **planning-level indicators rather than formal implementation or cost estimates**. Timing generally reflects how quickly an action could be initiated; some actions, particularly those involving infrastructure and binational coordination, would require sustained effort over many years.

The County's role also differs substantially across the recommendations. For communication and business-support actions, the County may be able to **lead or directly implement** many activities. Visitor-economy strategies are more likely to depend on **coordination and partnership** with cities, visitor organizations, and business groups. For a permanent infrastructure solution, the County's primary tools are **advocacy, convening, coordination, and evidence**, because the funding and authority required to resolve the underlying transboundary problem largely rest with state, federal, and binational partners.

# 8. Technical Appendices

The technical appendices presented below serve to provide additional information on relevant data, methods, supplemental analyses, and any respective limitations.

## Appendix A. Beach Visitation Trends Methodology

This appendix provides additional detail on the methods used to estimate historic visitation trends at Imperial Beach and Coronado Beach and to distinguish between local and non-local visitors.

The analysis is designed to characterize changes in visitation before and after key events associated with worsening sewage conditions. It is not a formal causal econometric analysis. Rather, it compares average visitation across pre- and post-event periods to illustrate the scale of observed changes in beach use.

### Historic Beach Visitation Data

Annual beach visitation data were obtained from the United States Lifesaving Association (USLA). The USLA data provide a relatively long time series of annual visitation, extending back to 1996 for Imperial Beach and 1979 for Coronado Beach.

Because the USLA data do not distinguish between local and non-local visitors, ECO supplemented the annual visitation series with data from Placer.ai.

Placer.ai classifies visitors based on the distance between their primary location and the destination. Consistent with common recreation and tourism analysis conventions, ECO classified visitors originating within 50 miles of a beach as **local visitors** and visitors originating more than 50 miles away as **non-local visitors**.

Placer.ai data are available beginning in 2017. ECO calculated the observed local and non-local visitation shares from the available Placer.ai data and used average shares to estimate the local and non-local distribution for earlier years in the USLA visitation series. This approach allowed the longer USLA visitation record to be separated into estimated local and non-local visitation while maintaining consistency with the more detailed recent visitation data.

The resulting series provides annual estimates of:

- total visitation;
- local visitation; and
- non-local visitation

for both Imperial Beach and Coronado Beach.

## Comparing Visitation Before and After Key Sewage Events

The analysis evaluates changes in beach visitation around two periods associated with worsening sewage conditions.

For the longer-term analysis, **2017** is used as the dividing point between the pre- and post-event periods. In 2017, the collapse of a sewage collector pipe contributed to a substantial increase in sewage pollution entering the Tijuana River system. ECO uses this event as a plausible point at which worsening conditions and increased public awareness of the sewage crisis could begin to affect visitation behavior.

For each beach, ECO calculated the geometric mean of annual visitation during the pre-event period from 2008 through 2016 and compared it with the geometric mean of annual visitation during the post-event period from 2017 through 2025. The geometric mean was used to reduce the influence of unusually high or low visitation years and to characterize the typical level of visitation across each multi-year period.

The difference between the pre- and post-event geometric means represents the estimated average annual change in visitation associated with the observed shift between the two periods.

A second, more recent comparison was developed to reflect worsening water-quality conditions affecting both Imperial Beach and Coronado Beach. For this analysis, ECO compared visitation during the period from 2020 through 2025, with the pre- and post-periods centered around **2023**. This scenario is intended to capture more recent visitation patterns during a period when intermittent water-quality closures increasingly affected Coronado Beach in addition to the persistent closures experienced at Imperial Beach.

These comparisons should not be interpreted as formal causal estimates. Other factors may also influence beach visitation, including weather, tourism trends, economic conditions, regional population growth, changes in beach amenities, and other external events. Rather, the analysis uses observed changes around relevant sewage-related events to characterize the potential magnitude of visitation changes associated with worsening conditions.

## Treatment of the COVID-19 Period

The 2020 and 2021 visitation observations were retained in the analysis.

While the COVID-19 pandemic substantially affected many tourism and recreation activities, the beach visitation data used in this analysis did not show a pronounced decline during those years. Beaches remained an accessible form of outdoor recreation, and excluding these observations would have required an additional set of assumptions regarding what visitation would otherwise have occurred.

Accordingly, observed visitation during 2020 and 2021 was retained in both the historic trend analysis and the more recent visitation scenario.

## Local and Non-Local Visitation

The distinction between local and non-local visitors is important because changes in these two visitor groups have different economic implications.

Local residents may substitute one beach for another while keeping their spending within San Diego County. The observed increase in local visitation to Coronado Beach following declines at Imperial Beach is consistent with some degree of substitution between the two locations. Imperial Beach experienced prolonged closures before similar intermittent closures became more common at Coronado Beach, making Coronado a plausible substitute destination for some local beach users.

The analysis treats this substitution as a plausible interpretation of the observed visitation patterns rather than as a directly measured behavioral relationship.

Changes in non-local visitation have a different implication because spending by visitors originating outside the region generally represents new dollars entering the San Diego County economy. Accordingly, changes in non-local visitation are particularly important for the subsequent visitor-spending and economic modeling analysis.

## Key Limitations

The visitation analysis is subject to several important limitations.

First, the pre- and post-event comparisons identify changes in visitation that coincide with worsening sewage conditions but do not establish that the sewage crisis caused all of the observed change. Beach visitation may also be influenced by weather, economic conditions, tourism trends, regional population changes, beach amenities, and other factors.

Second, local and non-local visitation shares for years prior to the availability of Placer.ai data are estimated using average shares observed during later years. Visitor composition may have differed during earlier periods.

Third, the analysis uses annual visitation data and therefore does not capture shorter-term behavioral responses to individual beach closures, pollution events, or changes in public perception.

For these reasons, the visitation estimates should be interpreted as a structured comparison of observed trends rather than a definitive causal estimate of visitation losses attributable solely to the Tijuana River Valley Sewage Crisis.

Lastly, one of the primary data sources, Placer.ai, is a location intelligence platform that estimates visitation patterns using aggregated and anonymized mobile device location data. The data are presented as estimates rather than direct counts and are intended to characterize relative visitation patterns over time. Because Placer.ai captures only mobile devices within its sample and applies statistical weighting to estimate total visitation, results may not represent all visitors equally. Certain populations, including children, individuals without smartphones, and visitors who opt out of location sharing, may be underrepresented

in the sample. Visitation estimates should therefore be interpreted alongside other foot traffic datasets and local knowledge.

# Appendix B. Visitor Spending and Economic Contributions Modeling Methodology

This appendix provides additional detail on the methods used to translate changes in beach visitation into estimates of visitor spending and the economic activity supported by that spending in San Diego County.

The analysis builds directly on the visitation trends developed in the preceding appendix. Changes in local and non-local visitation under the two visitation scenarios are combined with estimated per-visit spending patterns and modeled using IMPLAN to characterize differences in economic activity supported across the pre- and post-event periods.

## Estimating Day and Overnight Visitors

Non-local visitors may visit the beach as part of either a day trip or an overnight trip, with substantially different spending patterns between the two types of visits.

We used annual tourism data from the San Diego Tourism Marketing District to estimate the proportion of visitors to San Diego County who stay overnight. In years when available reports included both total visitation and overnight visitation, we calculated the implied share of visitors staying overnight.

For years in which overnight visitation was not separately reported, the overnight share was imputed using the relative shares observed in surrounding years. This assumption was considered reasonable because the observed overnight share remained relatively stable over time.

The resulting annual day-trip and overnight shares were applied to estimated non-local beach visitation.

Local beach visitors were assumed to be day visitors. Accordingly, local visitor spending does not include lodging or air transportation expenditures.

## Developing Per-Visit Spending Estimates

ECO used visitor spending data from Dean Runyan Associates to estimate spending per trip in San Diego County.

Dean Runyan Associates reports total visitor expenditures across major tourism-related spending categories. ECO combined these expenditure totals with annual visitation estimates from the San Diego Tourism Marketing District to calculate average spending per visitor trip.

Spending was allocated across categories including:

- accommodations;
- food services;
- retail;
- entertainment and recreation;
- local transportation; and
- air transportation.

Separate spending profiles were developed for day and overnight visitors to reflect the substantially higher spending associated with overnight travel, particularly for lodging and meals.

## Estimating Local Visitor Spending

Because the Dean Runyan visitor spending data primarily reflect tourism-related expenditures, they are more representative of non-local visitors than local recreation trips.

ECO therefore developed a separate local visitor spending pattern using recreation spending profiles published by the U.S. Forest Service. These data were used to estimate how local recreation-trip spending differs from spending by non-local visitors and to scale the relevant expenditure categories accordingly.

Local visitor spending was assumed to exclude:

- overnight accommodations; and
- air transportation

The resulting local spending profile reflects lower average spending per visit than the non-local visitor profile while maintaining a spending distribution consistent with recreational day trips.

## Translating Changes in Visitation into Visitor Spending

For each scenario, ECO applied the relevant per-visit spending pattern to the estimated average annual change in local and non-local visitation.

Conceptually, the calculation can be represented as:

**Change in visitor spending = Change in visits × Estimated spending per visit**

The calculation is performed separately by visitor type and spending category.

The resulting estimates represent the difference in **average annual visitor spending** between the pre- and post-event periods. They are not cumulative spending totals.

For the longer-term scenario, the comparison of visitation before and after 2017 results in lower average annual visitor spending associated with Imperial Beach and higher spending associated with Coronado Beach. For the more recent scenario, declining visitation at both beaches produces a larger combined reduction in estimated visitor spending.

## Interpreting Local and Non-Local Spending

The economic interpretation of local and non-local spending differs.

Spending by non-local visitors generally represents new dollars entering San Diego County. A reduction in non-local visitation therefore represents a potential reduction in externally generated spending within the regional economy.

Local visitor spending is different because residents who reduce spending associated with one beach may redirect those dollars elsewhere in the County. As a result, reduced local beach-related spending may represent a change in the distribution of economic activity rather than an equivalent net loss to the County economy as a whole.

The analysis therefore presents the economic activity supported by both local and non-local visitor spending while recognizing that changes in local spending should be interpreted more cautiously as regional economic losses.

## Estimating Economic Activity Supported by Visitor Spending

Visitor spending estimates were modeled using IMPLAN to estimate the amount of economic activity supported within San Diego County.

The analysis was conducted as a **contribution analysis**, rather than as a traditional economic impact analysis. This distinction reflects the limits of the available visitation data and the inability to attribute all observed changes in spending exclusively to the Tijuana River Valley Sewage Crisis.

For each scenario, ECO separately modeled the level of visitor spending associated with the pre-event and post-event periods. The difference between the resulting estimates of employment, labor income, value added, and economic output represents the change in economic activity supported by beach-related visitor spending between the two periods.

This approach captures both:

- **direct activity**, occurring in businesses where visitors make purchases; and
- **secondary activity**, including indirect effects through business-to-business purchases and induced effects associated with household spending supported by employee earnings.

Additional information regarding IMPLAN and the construction of the customized visitor spending pattern is provided elsewhere in this appendix.

## Retrospective Economic Effects

The retrospective analysis uses the average annual change estimated from the longer 2008–2025 visitation comparison.

The estimated average annual reduction in economic output was applied to each year from 2017 through 2025 to estimate cumulative retrospective economic activity associated with the observed post-2017 visitation pattern.

This approach assumes that the average annual difference between the pre- and post-event periods provides a reasonable representation of economic activity foregone during the retrospective period. It does not attempt to estimate a separate loss for each individual year.

## Prospective Economic Exposure Through 2045

The prospective analysis extends the estimated annual changes in economic activity through 2045 to illustrate the potential magnitude of future economic exposure if recent visitation patterns persist.

Two scenarios are presented:

- a **lower-bound scenario**, based on the longer-term comparison between pre- and post-2017 visitation; and
- an **upper-bound scenario**, based on the more recent visitation changes observed around 2023.

For each scenario, the estimated annual change in economic output is held constant in real terms. Future annual flows are discounted and summed to calculate the cumulative value of economic activity potentially foregone through 2045.

These estimates are intended to illustrate the scale of future economic exposure rather than predict a specific outcome. Actual future visitation and spending will depend on a range of factors, including sewage conditions, infrastructure improvements, public perceptions of water quality, broader tourism trends, and the speed at which visitation recovers.

## Key Limitations

Economic modeling is subject to several important limitations.

First, the spending analysis relies on average visitor spending patterns and therefore may not capture differences in spending behavior among visitors to Imperial Beach and Coronado Beach.

Second, the estimated day and overnight split for non-local visitors is based on County-level tourism patterns rather than beach-specific travel behavior.

Third, local visitor spending may be partially or fully redirected elsewhere within San Diego County if a beach trip does not occur. For this reason, changes in local visitor spending should not be interpreted as equivalent to a net loss of economic activity across the County.

Fourth, the contribution analysis estimates differences in the amount of economic activity supported under observed visitation scenarios but does not establish that all of those differences were caused by the sewage crisis.

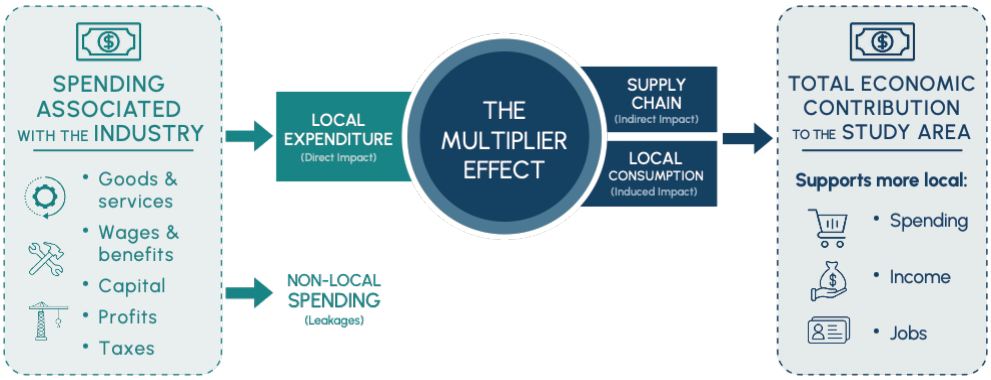
Finally, the prospective analysis assumes that modeled annual changes persist into the future. These estimates should therefore be interpreted as scenarios illustrating potential economic exposure rather than forecasts of future losses.

## IMPLAN Overview

IMPLAN is a regional input-output model widely used to assess the economic contributions of a business' or an organization's operations, capital developments, and many other types of projects or policies. The IMPLAN model divides the economy into 528 sectors and models the linkages between sectors, including government and household spending. Using national industry- and county-level economic data from the U.S. Bureau of Economic Analysis, U.S. Census, and other government sources, IMPLAN models how spending in one sector of the economy is spent and re-spent across other sectors. The linkages are modeled through input-output tables that account for all dollar flows between different sectors of the economy.

The economic relationships modeled by IMPLAN enable the user to estimate the overall change in the economy resulting from the specified economic activity (Figure 1). The dollars spent on operations and construction are analyzed to determine the total economic contribution within the selected geography. The direct investments from a project, policy, or organization's operations support successive rounds of spending that can be traced to employment, labor income, and value added in the local economy. IMPLAN reports employment, labor income, value added, and output as separate indicators rather than as items to be added together: labor income is a component of value added, and value added plus intermediate inputs equals output.

**Figure 1. Overview of Economic Contributions Analysis Framework**




Source: ECOnorthwest (2025)

## CONTRIBUTION TYPES

Economic multipliers derived from the model are used to estimate total economic contributions. Total economic contributions consist of three components: direct, indirect, and induced effects.

## CONTRIBUTION MEASURES

Contributions are assessed using the following measures that are reported by the IMPLAN model:

- **Jobs** are measured as the average number of employees engaged in full- or part-time work.
- **Labor income** is expressed as the sum of employee compensation and proprietor income.
    - Employee compensation (wages) includes workers' wages and salaries, as well as other benefits such as health, disability, and life insurance; retirement payments; and non-cash compensation; expressed as total cost to the employer.
    - Proprietor income (business income) represents the payments received by small-business owners or self-employed workers.
- **Value added** is output less the cost of intermediate inputs. It comprises employee compensation, proprietor income, other property income, and taxes on production and imports, and represents the value that the producer adds to purchased inputs through the production process. Value added can be conceptualized as the economic contribution to the study area's Gross Regional Product (GRP).
- **Output** is the total value of an industry's production and includes all components of the production function: labor income, taxes, profit, and intermediate inputs.

## LIMITATIONS OF INPUT-OUTPUT MODELS

Input-output models are static models used to measure an economy's inputs and outputs, based on data representing the relationships within the economy at a specific point in time. This analysis uses data from the 2024 model year, which is the most recent year for which data is available. The model then estimates how specific changes in an economy's inputs affect outcomes throughout the economy. This approach, known as a "partial equilibrium analysis", works well when the modeled changes do not radically reshape the relationships within an economy or affect the fundamental characteristics of labor markets, prices, or property values.

Economic contributions analyses, as opposed to economic impact analyses, do not consider how an investment or ongoing operations create new spending in a regional economy. As such, the estimates should be interpreted as gross contributions rather than net new impacts. With the exception of non-local visitor impacts, which we consider as new spending within the region.

## IMPLAN Industry Mapping

Travel and tourism-impacted industries were customized and aggregated within the economic impacts analysis. The following table details what industries were aggregated into their respective industry groupings. The table on the next page is based on similar approaches done by Dean Runyan Associates.

| Travel Impact Industry | IMPLAN Industry Code | IMPLAN Industry Description |
|---|---|---|
| Accomodations | 489 | Hotels and Motels, including Casino Hotels |
| Accomodations | 490 | Other Accomodations |
| Food Service | 101 | Breweries |
| Food Service | 102 | Wineries |
| Food Service | 103 | Distilleries |
| Food Service | 491 | Full-service restaurants |
| Food Service | 492 | Limited-service restaurants |
| Food Service | 493 | All other food and drinking places |
| Arts, Entertainment, & Recreation | 478 | Performing arts companies |
| Arts, Entertainment, & Recreation | 479 | Commercial Sports Except Racing |
| Arts, Entertainment, & Recreation | 480 | Racing and Track Operation |
| Arts, Entertainment, & Recreation | 481 | Independent artists, writers, and performers |
| Arts, Entertainment, & Recreation | 482 | Promoters of performing arts and sports and agents for public figures |
| Arts, Entertainment, & Recreation | 483 | Museums, historical sites, zoos, and parks |
| Arts, Entertainment, & Recreation | 484 | Amusement parks and arcades |
| Arts, Entertainment, & Recreation | 485 | Gambling industries (except casino hotels) |
| Arts, Entertainment, & Recreation | 486 | Other amusement and recreation industries |
| Arts, Entertainment, & Recreation | 487 | Fitness and recreational sports centers |
| Arts, Entertainment, & Recreation | 488 | Bowling centers |
| Arts, Entertainment, & Recreation | 402 | Scenic & Sightseeing Transportation |
| Arts, Entertainment, & Recreation | 411 | Motion picture and video industries |
| Arts, Entertainment, & Recreation | 433 | General and consumer goods rental except video tapes and discs |
| Retail Sales, Food Stores, & Gas Purhcases | 389 | Retail - Food & Beverage Stores |
| Retail Sales, Food Stores, & Gas Purhcases | 391 | Retail - Gasoline Stores |
| Retail Sales, Food Stores, & Gas Purhcases | 392 | Retail - Clothing and clothing accessories stores |
| Retail Sales, Food Stores, & Gas Purhcases | 393 | Retail - Sporting goods, hobby, musical instrument and book stores |
| Retail Sales, Food Stores, & Gas Purhcases | 394 | Retail - General merchandise stores |
| Retail Sales, Food Stores, & Gas Purhcases | 395 | Retail - Miscellaneous store retailers |
| Local Transportation (e.g., Public and Private) | 398 | Water transportation |
| Local Transportation (e.g., Public and Private) | 400 | Transit and ground passenger transportation |
| Local Transportation (e.g., Public and Private) | 432 | Automotive equipment rental and leasing |
| Local Transportation (e.g., Public and Private) | 502 | Other personal services |
| Local Transportation (e.g., Public and Private) | 397 | Rail transportation |
| Air Transportation | 396 | Air transportation services |

# Appendix C. Business and Employment Analysis

This appendix documents the methods, data sources, assumptions, limitations, equity considerations, and interpretive reasoning behind the business and employment findings presented in the Local Businesses and Economic Development section of this report. It covers six topics: business starts and closures, retail vacancies, taxable sales, employment trends over time, a shift-share analysis of visitor-serving employment, and commute patterns. The shift-share analysis and the trend in commutes within the primary study area are not presented in the body of the report; they are documented here because they informed how the other findings were interpreted.

## Overview of Approach

Research on other coastal water-quality crises shows that pollution events reach local economies through a relatively predictable sequence: fewer beach visits, lower sales at nearby restaurants, lodging, and retailers, and, if conditions persist, changes in employment and business activity. In Florida, red tide events (a harmful algal blooms) reduced beach attendance and were associated with lower revenues at coastal businesses.[56,57] A later analysis of four major blooms in Florida found monthly losses in taxable sales of about 15 percent in lodging and 1.75 percent in restaurants in affected counties, with no comparable losses in neighboring unaffected counties.[58] On the Mississippi Gulf Coast, months with above-average bacterial beach closures were associated with an estimated $152 million in reduced gross taxable tourism sales each year, roughly 8 percent of the regional total.[59] Studies of the 2010 Deepwater Horizon oil spill used QCEW employment, establishment counts, and sales tax data to show that the same event could reduce economic activity in one coastal region while response spending increased it in another.[60] These studies, paired with ECOnorthwest's expertise in experience with economic analysis, informed the selection of indicators in this appendix. Business formation, retail occupancy, taxable sales, industry employment, and commuting are the measures through which a sustained visitation decline would be expected to appear and are available for most jurisdictions over time.

None of these indicators was designed to measure pollution, and each is influenced by many other factors. The analyses therefore share a common design. First, trends are examined before and after the inflection points identified in the Background and Purpose chapter, with

[56] "What is a red tide?" National Oceanic and Atmospheric Administration (NOAA), September 2026, https://oceanservice.noaa.gov/facts/redtide.html

[57] Larkin, Sherry L., and Charles M. Adams. 2007. "Harmful Algal Blooms and Coastal Business: Economic Consequences in Florida." Society & Natural Resources 20 (9): 849–859. https://hillsborough.wateratlas.usf.edu/upload/documents/HABs%20Economic%20Consequences%20in%20Florida[1].pdf

[58] Bechard, Andrew. 2020. "Harmful Algal Blooms and Tourism: The Economic Impact to Counties in Southwest Florida." Review of Regional Studies 50 (2). https://rrs.scholasticahq.com/article/12705

[59] Browne, Jessica, Ayoung Kim, Seong Yun, and Benedict C. Posadas. 2023. Economic Impacts of Bacterial Beach Closures on the Mississippi Gulf Coast. Mississippi State University Extension, Publication P3949. https://extension.msstate.edu/publications/economic-impacts-bacterial-beach-closures-the-mississippi-gulf-coast

[60] Aldy, Joseph E. 2014. "The Labor Market Impacts of the 2010 Deepwater Horizon Oil Spill and Offshore Oil Drilling Moratorium." NBER Working Paper No. 20409. National Bureau of Economic Research. https://www.nber.org/papers/w20409

the COVID-19 pandemic treated as a confounding period rather than a pollution event. Second, the primary study area and its jurisdictions are compared with the broad study area geographies (Chula Vista and National City, San Diego City – North, and the Northern Coastal Cities) and, where data allow, with San Diego County and California; these areas share regional economic conditions but are farther from the river. Third, because the geographies differ greatly in size, comparisons rely on indexed series, growth rates, shares, and location quotients rather than raw counts.

The study treats a pattern as consistent with an effect of the crisis when the primary study area, and Imperial Beach in particular, diverges from comparison geographies; when that divergence begins at or after an inflection point rather than before it; and when its direction matches what reduced visitation and pollution exposure would predict. Even when all three conditions hold, these indicators cannot rule out other local causes. Business and employment findings are therefore reported as quantified or non-quantified patterns rather than as monetized costs (see How to Interpret the Impacts Presented in This Study). Figure 2 summarizes the indicators, data, and role of each analysis.

**Figure 2. Summary of Business and Employment Indicators, Data Sources, and Use in This Report**

| Topic | Primary data source | Years | Geographies | Primary metrics | Use in report |
|---|---|---|---|---|---|
| Business starts and closures | Municipal business license and business tax certificate records | 2015–2025 | Primary study area jurisdictions and subareas; Chula Vista, National City, San Diego City – North, Carlsbad, Del Mar | Annual starts; average annual growth rate (AAGR) of starts; net business change | Body of report; quantified pattern |
| Retail vacancies | CoStar | 2015–2025 | Imperial Beach, Coronado, primary study area | Annual retail vacancy rate | Body of report; context |
| Taxable sales | California Department of Tax and Fee Administration (CDTFA) | 2015–2025 | Imperial Beach, Coronado, Chula Vista, National City, San Diego County, California | Nominal taxable sales indexed to 2015 | Body of report; pattern to monitor |
| Employment trends | California EDD Quarterly Census of Employment and Wages (QCEW) | 2015–2025 | Primary study area; San Diego County | Private covered employment by industry group; location quotients | Body of report; structural exposure |
| Shift-share analysis | California EDD QCEW | 2015–2025 | Primary study area; San Diego County | County growth, industry mix, and local effects | Appendix only; attribution test |

| | | | | | |
|---|---|---|---|---|---|
| Commute patterns | U.S. Census Bureau LEHD Origin-Destination Employment Statistics (LODES) | 2014–2023 | Primary study area and broad study area geographies | Primary private jobs commuting in, out, and within; indexed to 2014 | Body of report (in and out); appendix (within) |

Source: ECOnorthwest.

## Business Starts and Closures

Business formation is one of the most direct measures of how entrepreneurs and investors view a community's prospects. A new business represents a decision to commit capital and sign a lease in a particular place, so a sustained decline in starts can signal reduced confidence well before it appears in employment totals. Business closures capture the other side of that decision, and small businesses are particularly sensitive to drops in revenue: in 2016 it was estimated that the median U.S. small business holds enough cash to cover only 27 days of typical outflows, and restaurants, which are heavily concentrated in the primary study area, hold the smallest buffer of any industry at 16 days.[61] Business starts and closures were also the concern raised most often by business owners in focus groups, where Imperial Beach participants described commercial vacancies and difficulty attracting investment.[62]

This section describes the data preparation and analytical methods used to estimate annual business starts, closures, and net change across the primary and broad study areas from 2015 through 2025. The analysis is based on a harmonized, geocoded business-record dataset that is filtered to represent unique businesses located in the defined study areas rather than a simple count of licenses issued.

### DATA SOURCES AND LIMITATIONS

The analysis combines business license records from seven jurisdictions (Figure 3). Six cities, Imperial Beach, Chula Vista, Coronado, Del Mar, National City, and Carlsbad, provided license or registration extracts through public records requests or public websites. The extracts differ in what they contain. The Imperial Beach extract covered licenses from 2015 through 2025, the Chula Vista extract covered 2015 through early 2026, and the National City and Del Mar extracts began in 2014. The Del Mar and Carlsbad data contained active licenses only, and the Carlsbad data was supplied as a spatial dataset with coordinates already attached. The Carlsbad data included only active non-residential licenses (879 records), records of the start of each business as the year it opened rather than a full date and included six-digit NAICS codes and descriptions. The National City and Del Mar extracts were the most limited: each contains only an account number, business name, start date, expiration date, and address, with no industry classification or closure date. Chula Vista and Coronado extracts included

[61] JPMorgan Chase Institute. 2016. Cash is King: Flows, Balances, and Buffer Days—Evidence from 600,000 Small Businesses. https://impact.jpmorganchase.com/content/dam/jpmc/jpmorgan-chase-and-co/documents/jpmc-institute-small-business-report.pdf

[62] See survey results in Chapter 3 and Appendix H.

NAICS codes and descriptions, and the Imperial Beach extract included a business-type field populated with NAICS industry titles but not the codes themselves.

City of San Diego records came from the San Diego Open Data Portal's business tax certificate collection, which is published as one file of active certificates and four files of inactive certificates grouped by the period in which they became inactive (1990–2000, 2000–2010, 2010–2015, and 2015 to the present). Combining all five files provided a complete history of certificates in the City of San Diego, including the San Diego neighborhoods in the primary study area and San Diego City – North. San Diego's certificates also included source coordinates and NAICS codes. Together, these sources supported the annual analysis of business starts for 2015 through 2025.

**Figure 3. Business License Data Sources and Coverage by Jurisdiction**

| Jurisdiction | Source and coverage | Start dates | Closure dates | Industry codes | Coordinates in source |
|---|---|---|---|---|---|
| Imperial Beach | City license extract, 2015–2025 | Yes | Yes (analyzed for 2021–2025) | No; business-type field uses NAICS titles, which were matched to codes | No |
| Chula Vista | City license extract, 2015–2026 | Yes | Yes | Yes | No |
| Coronado | City license extract | Yes | Yes | Yes | No |
| National City | City license download, 2014–present | Yes | No | No | No |
| Del Mar | Active licenses, 2014–present | Yes | No | No | No |
| Carlsbad | Active non-residential business licenses (spatial file); start recorded as year opened | Yes (year only) | No | Yes | Yes |
| City of San Diego (San Diego City – North, Otay Mesa, Otay Mesa-Nestor, San Ysidro, Tijuana River Valley) | Open-data business tax certificates: active file plus inactive files for 1990–2000, 2000–2010, 2010–2015, and 2015–present | Yes | No | Yes | Yes |

Source: Business license data collected from jurisdictions via public records requests or public websites; ECOnorthwest analysis.

Three reference inputs supported harmonization. A jurisdiction-specific field crosswalk mapped each source's column names to a common schema, since each city names and structures its fields differently. The official 2022 NAICS code and title table was used to assign industry codes to Imperial Beach records, matching each record's business-type title to its NAICS code. For Imperial Beach business-type descriptions that did not match a NAICS

title exactly, a supplemental crosswalk developed with AI assistance proposed a NAICS code for each unmatched description. Finally, a study-area boundary file, produced as part of this study's labor and employment analysis and used here as an input, defines the city and neighborhood geographies to which each business is assigned.

Because these records are an administrative byproduct rather than a statistical survey, several features of the data limit what they can show. Licensing requirements, exemptions, renewal cycles, and fees differ by jurisdiction, so the number of starts is not directly comparable from one city to another. Sources that contain only active licenses, such as the Del Mar and Carlsbad files, omit businesses that started during the study period and later closed, so starts in earlier years are likely undercounted in those cities relative to cities that provided full histories. Closure dates were available only for Imperial Beach, Chula Vista, and Coronado, and Imperial Beach closure records are usable only from 2021 onward, so net business change for Imperial Beach covers 2021 through 2025. Administrative changes can also create breaks in a series: the 2023 spike in the San Diego geographies reflects an administrative change and not an increase in business starts, per the City of San Diego. Closures are recorded when a license is closed or lapses, and jurisdictions may close lapsed accounts in batches, so the timing of recorded closures may not match the timing of actual closures. Records that could not be geocoded were excluded, and the Imperial Beach industry assignments, including those from the supplemental crosswalk, add uncertainty to any industry-level comparison. Finally, the analysis could not control for factors such as commercial leasing costs, business ownership demographics, and broader retail and hospitality trends, which shape business formation but lack comprehensive data at a fine enough geographic level to be analyzed with confidence.

### METHODS AND LIMITATIONS

The analysis is based on a harmonized, geocoded business-record dataset filtered to represent unique businesses located in each study geography, rather than a simple count of licenses issued. Each jurisdiction's records were mapped to a shared set of fields: business name, address, start date, close date, expiration date, NAICS code, and reported city, and row counts were checked against the source records. Businesses were classified using the 2022 NAICS lookup; for Imperial Beach, business-type descriptions were matched to NAICS titles and supplemented with a manual crosswalk. Existing coordinates in the Carlsbad and San Diego records were retained, and remaining addresses were geocoded through the Census Geocoder and then Google geocoding. A spatial join assigned each business to a study area geography, which made it possible to separate the San Diego neighborhoods in the primary study area from San Diego City – North.

Several screening steps reduced over-counting. Records falling in more than one study-area polygon were assigned to a single geography; out-of-city licenses and Imperial Beach property-rental licenses were excluded; and renewals were merged by matching business name, address, city, and NAICS classification, retaining the earliest start date and latest close date. A final location-consistency filter removed records whose reported city did not match their spatial location, eliminating approximately 20,535 records, or about 4.5 percent of the

cleaned dataset. A start is counted in the year of a business's earliest start date and a closure in the year of its latest close date; net change is starts minus closures. Growth in starts is summarized as an average annual growth rate (AAGR) over 2016–2017, 2017–2021, and 2021–2025, periods chosen to separate the 2017 inflection point from the pandemic:

*AAGR = (Starts in end year ÷ Starts in start year)^(1 ÷ number of years) − 1*

Note that in Exhibit 20, in the body of the report, the AAGR periods are uneven in length, so a growth rate calculated over a single year is more volatile than one calculated over three years, and growth rates in small geographies are sensitive to small changes (i.e. a difference of a few dozen starts produces large percentage swings in a city the size of Imperial Beach). AAGR is therefore best read as a measure of direction and relative pace rather than precise magnitude. Raw counts are useful for describing change within a single area, but they are not directly comparable across areas of very different sizes, which is why indexed series and percentage-change measures are used for cross-geography comparisons.

The final counts represent a filtered estimate of businesses in the study geographies, not a raw tally of licenses issued. The out-of-city, property-rental, spatial-overlap, renewal-deduplication, and location-consistency procedures all affect the resulting population, so results should be interpreted as measures of business activity after location and record-quality screening. In addition, screening reduces duplicates but may also remove some legitimate businesses, such as a business whose mailing city differs from its physical location, and assigning each overlapping point to a single polygon is a simplification. Finally, counts also measure license activity rather than actual openings and closings: a license may be issued before a business opens, and a license may lapse after a business closes.

### INTERPRETATION CONSIDERATIONS

The analysis assumes that each record represents one operating business at the recorded location and that the earliest start and latest close dates across renewals represent that business's lifespan. It assumes that records sharing a business name, address, city, and NAICS code are renewals of the same business, and that a mismatch between a record's reported city and its geocoded location indicates a duplicate or out-of-area listing. It also assumes that comparison geographies experienced the same regional and national conditions (i.e. the pandemic, inflation, interest rates, and minimum-wage increase) as the primary study area, so that a persistent divergence after 2017 is informative about local conditions. Counts are nominal and are not adjusted for population or for the size of the existing business stock.

License records describe businesses, not owners, so the analysis cannot show whether declines are concentrated among minority-owned, immigrant-owned, or very small businesses. Several factors suggest the burden falls disproportionately on owners with fewer resources. Imperial Beach and the South Bay neighborhoods have higher shares of Hispanic residents, renters, and lower-income households than the County; most establishments in the primary study area have fewer than 50 employees; and small businesses facing financial challenges commonly rely on owners' personal funds to stay open, which shifts business

losses directly onto owners' household finances.[63, 64] Informal and unlicensed businesses, such as street vendors and some home-based businesses, are important sources of income for lower-income and immigrant communities, so the analysis likely understates the effects on these entrepreneurs.[65]

## Retail Vacancy Trends

If fewer visitors and residents shop and dine in affected communities, the businesses that depend on them may close or decline to renew their leases, and landlords may have more difficulty finding replacement tenants. Retail vacancy rates are therefore a useful measure of the health of commercial districts, and they complement business license data by measuring the physical space that businesses occupy rather than the number of licenses issued. Vacancy was also raised directly in the focus groups, where Imperial Beach participants cited empty storefronts as a visible consequence of the crisis.

### DATA SOURCES AND LIMITATIONS

Annual retail vacancy rates for 2015 through 2025 were obtained from CoStar Group, a proprietary commercial real estate database compiled from property owner, broker, and field research, for Imperial Beach, Coronado, and the primary study area as a whole. CoStar's coverage is most complete for larger, professionally managed properties, while small storefronts, ground-floor retail in mixed-use buildings, and owner-occupied commercial properties (common along Imperial Beach's commercial corridors) are more likely to be missing or incompletely tracked. CoStar also revises historical inventory and vacancy data, so values reflect conditions as of the extraction date. The primary study area series includes retail in San Ysidro and Otay Mesa, where shopping centers also depend on cross-border shoppers rather than beach visitors, which can mask conditions in beach-oriented retail. Vacancy rates also do not capture asking rents or the condition of occupied space.

### METHODS AND LIMITATIONS

The vacancy rate is the share of total rentable retail building area that is vacant. The analysis compares the level and trajectory of vacancy across the three geographies, focusing on whether vacancy in Imperial Beach rose relative to the other geographies after the 2017 and 2020 inflection points. This is a descriptive comparison: it does not control for new construction, demolition, or conversion of retail space, or for regional trends such as e-commerce and the pandemic. In small markets, a single large vacancy, such as the loss of an anchor tenant, can move the vacancy rate by several percentage points, so year-to-year changes in Imperial Beach and Coronado are noisy. Vacancy is also a lagging indicator,

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[63] Federal Reserve Banks. 2025. 2025 Report on Employer Firms: Findings from the 2024 Small Business Credit Survey. March. https://doi.org/10.55350/sbcs-20250327

[64] See Appendix I.

[65] Wright C., "Sidewalk Vending Regulation and Enforcement,"May 2025, https://www.calcities.org/docs/default-source/city-attorneys-spring-conference/sidewalk-vending-regulation-and-enforcement.pdf?sfvrsn=99f546ae_3

because retail leases typically run several years and weaker sales may first appear as lower rents, shorter hours, or quick tenant turnover rather than as empty space.

The analysis assumes that a sustained reduction in visitor and resident spending would eventually appear as higher retail vacancy, and that CoStar's inventory definitions are consistent across years and across the three geographies.

### INTERPRETATION CONSIDERATIONS

Vacancy rates describe space, not people. A low vacancy rate can coexist with the displacement of small, long-standing tenants by new tenants able to pay higher rents, and with tenants operating at reduced hours or margins, outcomes that disproportionately affect small, locally owned businesses and their workers. Where vacancies persist, they reduce foot traffic and perceived safety for the remaining businesses and residents along a corridor. Because CoStar under-covers small storefronts, the indicator is least reliable for the businesses that survey respondents described as most affected.

The report characterizes retail vacancies as a mixed picture and not a reliable stand-alone indicator because the data do not show a sustained increase concentrated in Imperial Beach. Imperial Beach had the highest vacancy rate of the three geographies from 2018 through 2021, about 6 percent in 2018 and above 5 percent through 2021, which is consistent with post-2017 stress. Its rate then fell to about 1.3 percent in 2023 before rising to roughly 3 percent in 2025, below the primary study area average of about 4.1 percent. Coronado's increase to nearly 3.7 percent in 2025, its highest rate since 2015, coincides with more frequent water-quality closures at Coronado but represents a single year. Low vacancy in a supply-constrained coastal market can reflect limited new construction rather than strong demand, and vacancy moved in different directions in different years. The report therefore uses vacancy as context alongside taxable sales and business starts rather than as evidence of a crisis effect.

## Taxable Sales Trends

Taxable sales are the most widely used measure of local business revenue in studies of beach closures and coastal water-quality events because they are collected consistently by local jurisdictions and respond quickly to changes in spending. Studies of Florida red tide events and Mississippi bacterial beach closures both used state sales tax records to estimate losses in tourism-related sales during periods of poor water quality.[66, 67] Taxable sales are also a fiscal measure, because cities receive a share of the sales tax collected within their boundaries, so a decline in sales can reduce local public revenue at the same time that cities face additional costs from the crisis.

[66] Bechard, Andrew. 2020. "Harmful Algal Blooms and Tourism: The Economic Impact to Counties in Southwest Florida." Review of Regional Studies 50 (2). https://rrs.scholasticahq.com/article/12705

[67] Browne, Jessica, Ayoung Kim, Seong Yun, and Benedict C. Posadas. 2023. Economic Impacts of Bacterial Beach Closures on the Mississippi Gulf Coast. Mississippi State University Extension, Publication P3949. https://extension.msstate.edu/publications/economic-impacts-bacterial-beach-closures-the-mississippi-gulf-coast

## DATA SOURCES AND LIMITATIONS

Annual taxable sales for 2015 through 2025 were compiled from CDTFA's "Taxable Sales – Cities by Type of Business" (Table 4), "Taxable Sales – Counties by Type of Business" (Table 3), and "Taxable Sales, by Type of Business" (Table 1, statewide), accessed in June 2026, for Imperial Beach, Coronado, Chula Vista, National City, San Diego County, and California. Taxable sales capture spending at restaurants, retailers, and gas stations, but California exempts most food for home consumption and most services from sales tax, and lodging is taxed through the transient occupancy tax instead.[68] Several of the visitor spending categories most closely tied to beach trips are therefore better reflected in the TOT and visitation analyses. Sales are recorded where the seller is located, so the opening or closing of a single large retailer, auto dealer, or gas station can shift a small city's total. CDTFA reports sales only for incorporated cities and counties, so San Ysidro, Otay Mesa, Otay Mesa-Nestor, and the Tijuana River Valley cannot be separated from City of San Diego totals; Imperial Beach and Coronado are the only primary study area geographies represented. The most recent quarters are subject to revision.

## METHODS AND LIMITATIONS

Each geography's nominal taxable sales were indexed to 2015 by dividing each year's value by its 2015 value, so that geographies of very different sizes could be compared on growth rather than level. The analysis then compared each geography's peak, its trajectory after that peak, and whether Imperial Beach's path diverged from comparison geographies after an inflection point.

$$Index(year) = Taxable\ sales(year) \div Taxable\ sales(2015) \times 100\%$$

Values are nominal. Consumer prices rose by roughly one-third between 2015 and 2025, so part of the measured growth in every geography is price growth. Because all series are nominal and indexed, inflation does not change the relative ranking of geographies, but it does mean that Imperial Beach's 2022–2025 decline is larger in real terms than in nominal terms. Indexing also depends on the base year: a geography with unusually low sales in 2015 will show inflated index values later. The analysis uses annual totals and does not control for population change, new retail development, or changes in the taxable base. In addition, the analysis assumes that changes in visitor and resident spending at restaurants and retailers are reflected in the taxable sales of the jurisdictions where those businesses are located, and that comparison geographies faced the same regional price and economic conditions as Imperial Beach and Coronado, so that nominal indexed growth is an adequate basis for relative comparison.

## INTERPRETATION CONSIDERATIONS

A sustained decline in Imperial Beach's taxable sales would reduce general-fund revenue for a city whose residents have higher poverty rates and lower incomes than the County (Appendix J) and may rely more heavily on public services. Because sales in the South Bay

[68] California Department of Tax and Fee Administration. n.d. Publication 61, Sales and Use Taxes: Exemptions and Exclusions. https://www.cdtfa.ca.gov/formspubs/pub61.pdf

neighborhoods are reported within City of San Diego totals, the analysis cannot show whether majority-Hispanic, lower-income neighborhoods such as San Ysidro and Otay Mesa-Nestor experienced sales declines; their experience is effectively invisible in this indicator.

The report describes Imperial Beach's taxable sales as a pattern worth continued monitoring rather than as evidence of harm because the signal is ambiguous. In contrast to the Florida and Mississippi studies, which used monthly data to compare months with and without closures, annual data for Imperial Beach cannot isolate the effect of closure periods.

## Employment Trends and Shift-Share Analysis

Employment shows whether reduced spending has translated into fewer jobs, and which industries are most exposed. Following the Deepwater Horizon oil spill in 2010, industry-level QCEW employment data showed declines along the non-Panhandle Florida Gulf Coast, where tourism was affected, while coastal Louisiana parishes saw net gains driven by response activity.[69] That finding is relevant here because the study hypothesized that the Tijuana River crisis could similarly reduce employment in visitor-serving industries while increasing it in monitoring, construction, and remediation. The industry groups used in this analysis were designed to capture both effects, as well as the jobs whose workers face the most direct exposure to degraded air quality.

Employment in the primary study area's visitor-serving industries grew between 2015 and 2025, but growth alone does not show whether the area performed better or worse than it would have without the crisis. Shift-share analysis, formalized by Dunn in 1960, is a standard regional economics technique for separating the portion of an area's employment change that reflects broader economic and industry trends from the portion that reflects local conditions.[70] It has been used to study the employment effects of disasters on tourism economies, including the leisure and hospitality sector along the Gulf Coast after Hurricane Katrina, where proximity to the storm track shaped local employment change.[71] This study used it to test whether employment trends in visitor-serving industries could be more fully attributed to pollution or were explained by regional and industry trends. Because the results did not support attributing employment change to pollution, the analysis is not presented in the body of the report.

### DATA SOURCES AND LIMITATIONS

Employment data come from the Quarterly Census of Employment and Wages (QCEW), obtained through a public records request to the California Employment Development Department (EDD) Labor Market Information Division, for each primary study area subarea

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[69] Aldy, Joseph E. 2014. "The Labor Market Impacts of the 2010 Deepwater Horizon Oil Spill and Offshore Oil Drilling Moratorium." NBER Working Paper No. 20409. National Bureau of Economic Research. https://www.nber.org/papers/w20409

[70] Dunn, Edgar S. 1960. "A Statistical and Analytical Technique for Regional Analysis." Papers and Proceedings of the Regional Science Association 6: 97–112.

[71] Evans, Garen K. 2008. "Spatial Shift-Share Analysis of the Leisure and Hospitality Sector on the Gulf Coast following Hurricane Katrina." Paper presented at the Southern Agricultural Economics Association Annual Meeting, Dallas, TX. https://ageconsearch.umn.edu/record/6744



and San Diego County from 2015 through 2025. The QCEW counts jobs covered by unemployment insurance by place of work and is the most complete source of employment by industry for small geographies. It excludes proprietors, the unincorporated self-employed, unpaid family workers, and members of the armed forces.[72] The exclusion of military personnel is especially significant in Coronado, home to Naval Base Coronado, and the exclusion of the self-employed matters for recreation businesses such as surf instruction and guiding. Confidentiality suppression also limits detail in small geographies: total covered employment in the Tijuana River Valley (15 jobs in 2015 and 71 in 2025) was too small to disaggregate by industry, San Ysidro is excluded from the education services and health care groups, and coastal tourism and recreation was heavily suppressed in 2015. The industry groups shown in the body of the report represent roughly 95 percent of total covered employment. Multi-establishment employers sometimes report employment at a single address, which can misallocate jobs between geographies. Finally, QCEW adopted NAICS 2022 beginning with 2022 data, which reorganized several retail trade subsectors, so part of the decline in the retail trade location quotient after 2021 may reflect reclassification.

### METHODS AND LIMITATIONS

Three-digit NAICS subsectors were aggregated into custom industry groups (seen below in Figure 4) for two reasons. Aggregation reduces the number of small cells subject to confidentiality suppression, and standard industry classifications do not separate the distinctions most relevant to this study: which industries depend on visitor spending, which employ workers who spend substantial time outdoors, and which are tied to infrastructure, environmental monitoring, and remediation. The custom groupings involve judgment. Some subsectors serve both visitors and residents, such as food services, and some combine outdoor and indoor work, such as administrative and support services, which includes landscaping as well as office-based staffing. Group totals can therefore overstate or understate true exposure. The analysis assumes that the custom industry groups reasonably represent visitor dependence, outdoor work exposure, and remediation activity.

[72] U.S. Bureau of Labor Statistics. n.d. “Quarterly Census of Employment and Wages: Concepts.” Handbook of Methods. https://www.bls.gov/opub/hom/cew/concepts.htm

**Figure 4. Industry Groups by Sub-Industry Sectors (3-Digit NAICS)**

| Industry Group | Industry |
|---|---|
| Coastal Tourism | Amusement, Gambling, and Recreation Industries |
| Coastal Tourism | Accommodation |
| Coastal Tourism | Scenic and Sightseeing Transportation |
| Coastal Tourism & Recreation | Performing Arts, Spectator Sports, and Related Industries |
| Food Service | Food Services and Drinking Places |
| Outdoor Work Exposure | Fishing, Hunting and Trapping |
| Outdoor Work Exposure | Administrative and Support Services |
| Outdoor Work Exposure | Support Activities for Agriculture and Forestry |
| Real Estate | Rental and Leasing Services |
| Real Estate | Real Estate |
| Retail Trade | Motor Vehicle and Parts Dealers |
| Retail Trade | Furniture and Home Furnishings Stores |
| Retail Trade | Electronics and Appliance Stores |
| Retail Trade | Building Material and Garden Equipment and Supplies Dealers |
| Retail Trade | Food and Beverage Stores |
| Retail Trade | Health and Personal Care Stores |
| Retail Trade | Gasoline Stations |
| Retail Trade | Clothing and Clothing Accessories Stores |
| Retail Trade | Sporting Goods, Hobby, Book, and Music Stores |
| Retail Trade | General Merchandise Stores |
| Retail Trade | Miscellaneous Store Retailers |
| Retail Trade | Nonstore Retailers |
| Infrastructure & Remediation | Utilities |
| Infrastructure & Remediation | Heavy and Civil Engineering Construction |
| Infrastructure & Remediation | Waste Management and Remediation Services |
| Infrastructure & Remediation | Specialty Trade Contractors |
| Professional Services | Professional, Scientific, and Technical Services |
| Health Care | Ambulatory Health Care Services |
| Health Care | Hospitals |
| Education | Educational Services |

Source: ECOnorthwest

To understand areas of specialization, subarea employment was summed to the primary study area, and industry shares and location quotients (LQs) were computed for 2015 (before the 2017 inflection point), 2021 (after the inflection point and during pandemic recovery), and 2025 (the most recent year). LQs follow the standard Bureau of Labor Statistics definition, using San Diego County rather than the nation as the reference area:[73]

*LQ(industry group i) = (Private employment in i, primary study area ÷ Total private employment, primary study area) ÷ (Private employment in i, County ÷ Total private employment, County)*

In evaluating the LQs, the analysis assumes that San Diego County is the appropriate benchmark because the primary study area operates within the County labor market and accounts for a small share of County employment; and that private covered employment is a reasonable proxy for local labor demand. An LQ above 1.0 indicates that an industry group is more concentrated in the primary study area than in the County. Note, LQs are relative measures: a rising LQ can reflect growth in the primary study area or slower growth in the

[73] U.S. Bureau of Labor Statistics. n.d. "Location Quotients Explained." Quarterly Census of Employment and Wages. https://www.bls.gov/cew/about-data/location-quotients-explained.htm

County, and LQs describe economic structure rather than cause and effect. Comparing three years also hides declines and recoveries between them.

The shift-share analysis partially addresses the limitations by separating regional and industry trends from local change. The analysis decomposes the change in employment between 2015 and 2025 in Arts, Entertainment, and Recreation (NAICS 71) and Accommodation and Food Services (NAICS 72) into three components. A conventional shift-share uses national trends as the reference; this analysis uses San Diego County because the question is whether the primary study area diverged from its own region. The county growth effect is the change expected if the industry had grown at the same rate as all private employment in the County. The industry mix effect is the additional change explained by the industry growing faster or slower than the County economy overall. The local effect is the change remaining after both are accounted for, and reflects conditions specific to the primary study area, positive or negative:

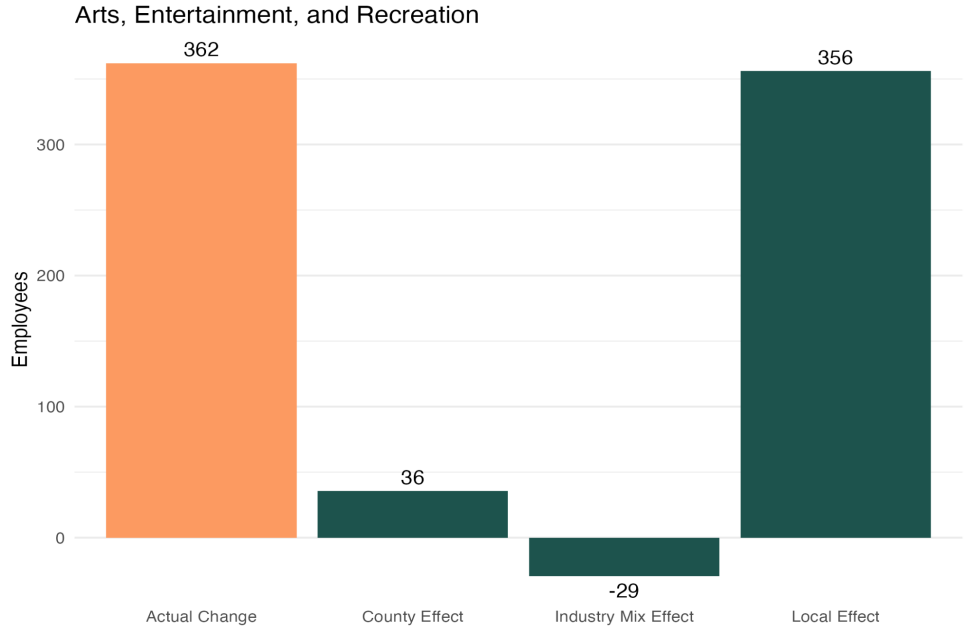
$$\textit{County growth effect} = E(i, 2015) \times g(\text{County, all industries})$$

$$\textit{Industry mix effect} = E(i, 2015) \times [g(\text{County, industry } i) - g(\text{County, all industries})]$$

$$\textit{Local effect} = E(i, 2015) \times [g(\text{primary study area, industry } i) - g(\text{County, industry } i)]$$

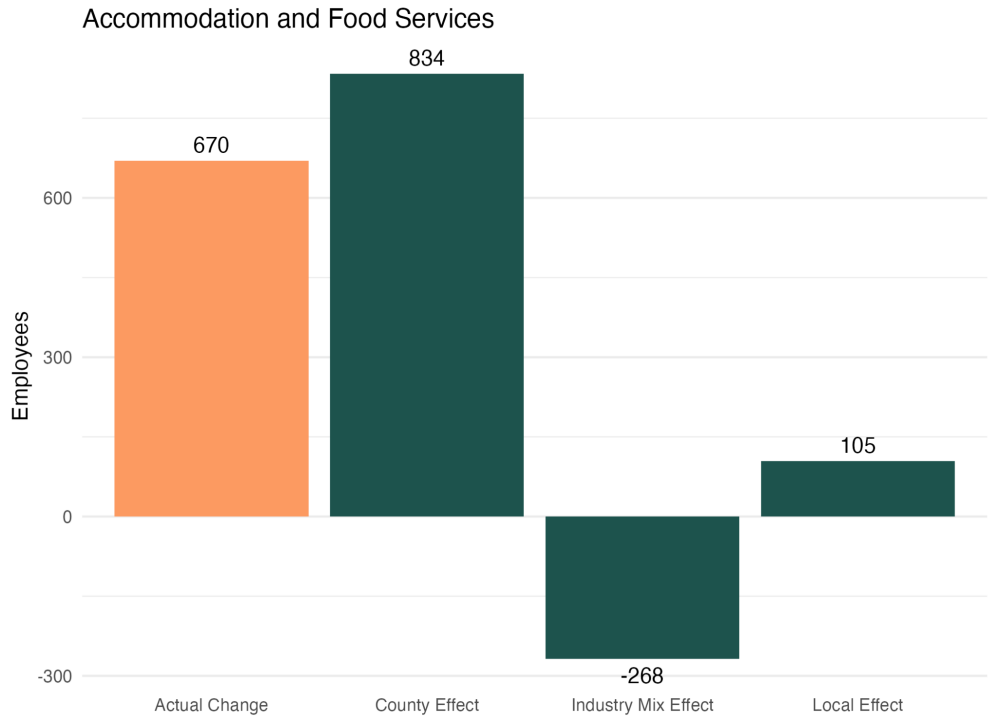
In these equations, E(i, 2015) is 2015 private covered employment in industry i in the primary study area and g is the growth rate in employment between 2015 and 2025. The three components sum to the actual change, subject to rounding. If pollution were measurably suppressing visitor-serving employment in the primary study area, it would be expected to appear as a negative local effect. Figure 5 and Figure 6 below, present the results.

**Figure 5. Decomposition of Change in Employment in Arts, Entertainment and Recreation Industry, Primary Study Area, 2015- 2025**



Source: California Employment Development Department (EDD) Labor Market Information Division (LMI) Quarterly Census of Employment and Wages (QCEW), 2015-2025.

**Figure 6. Decomposition of Change in Employment in Arts, Entertainment and Recreation Industry, Primary Study Area, 2015-2025**




Source: California Employment Development Department (EDD) Labor Market Information Division (LMI) Quarterly Census of Employment and Wages (QCEW), 2015-2025.

Shift-share is an accounting identity rather than a causal model. The local effect captures everything specific to the primary study area at once (e.g. new hotels or attractions, resort expansion in Coronado, border-oriented retail in San Ysidro, military-related demand, and pollution) so a positive local effect can coexist with localized losses in Imperial Beach that are offset by gains elsewhere. The decomposition also describes only net change between 2015 and 2025; a decline between 2017 and 2021 followed by recovery would not be visible. The analysis was limited to the two sectors most directly tied to visitor spending, and the small 2015 base in NAICS 71 makes its growth rate volatile.

## Commute Patterns

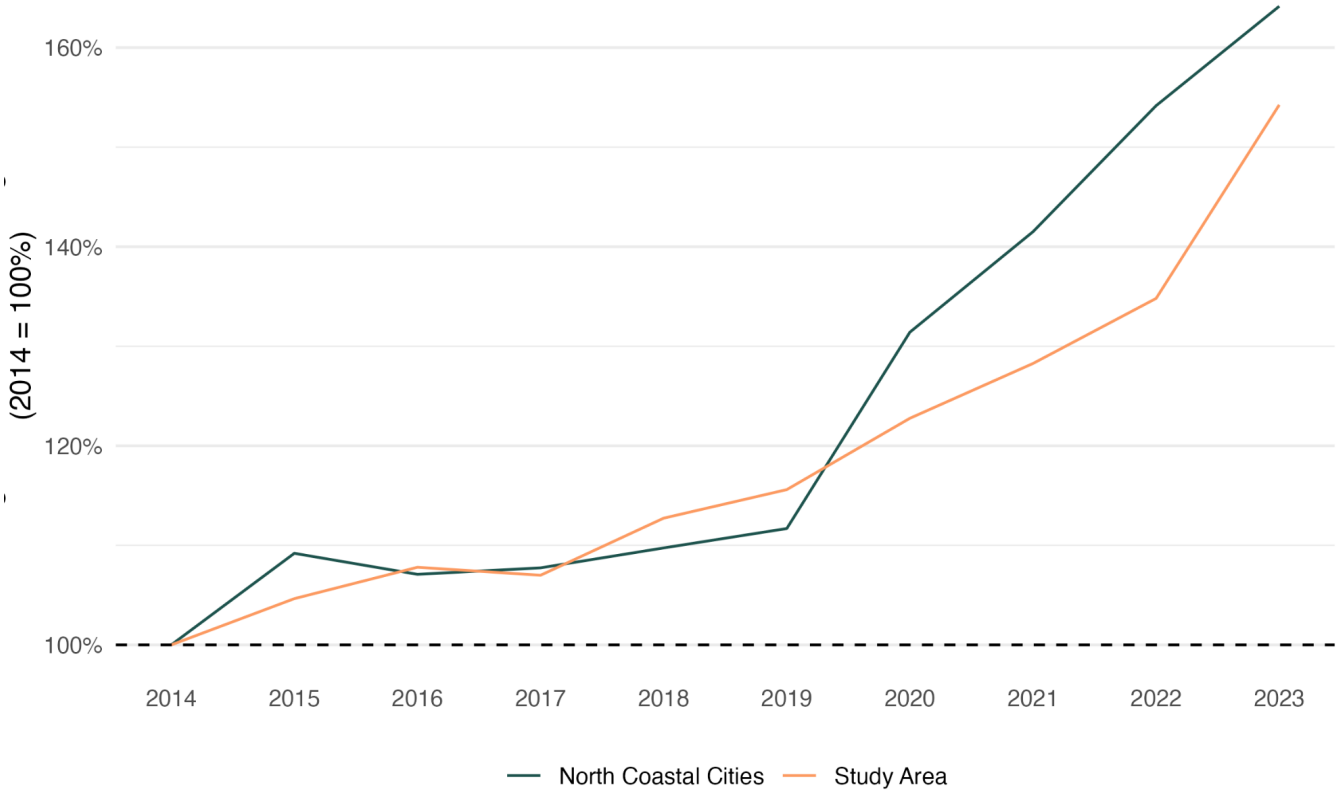
Industry employment data for the primary study area's smallest geographies are limited by suppression, so commute data were used to supplement them. Commuting flows show whether employers in the primary study area continue to attract workers from elsewhere in the region and whether residents increasingly leave the area for work. A crisis that weakened the local economy would be hypothesized to reduce the number of workers commuting in and to increase the share of residents commuting out. Commute data also show that the population exposed to pollution during the workday extends beyond the area's residents.

## DATA SOURCES AND LIMITATIONS

LODES data offer some advantages over survey-based commuting sources: because they are built from unemployment insurance wage records covering nearly all covered employment, they do not carry the sampling margins of error that accompany American Community Survey commuting estimates, and they cover small geographies that survey data cannot reliably support.[74] However, they also have limitations relevant to this analysis. Workplace counts are protected through noise infusion and residence locations through synthetic data methods, which reduces precision for small geographies, particularly on the residence side.[75]

Figure 7 below, summarizes the growth in jobs from individuals working and living within the primary study area compared to those in the northern coastal cities. Trends between the two are of similar growth patterns from 2014 through 2023.

**Figure 7. Primary Jobs from Individuals Commuting Within, Primary Study Area and Northern Coastal Cities, 2014-2023**




Source: Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES), Origin-Destination files, 2014-2023.

[74] U.S. Census Bureau, "Design Comparison of LODES and ACS Commuting Data Products," September 2014. https://www2.census.gov/ces/wp/2014/CES-WP-14-38.pdf

[75] U.S. Census Bureau, Center for Economic Studies. n.d. "OnTheMap Data Overview." Longitudinal Employer-Household Dynamics. https://lehd.ces.census.gov/doc/help/onthemap/OnTheMapDataOverview.pdf

# Appendix D. Transient Occupancy Tax

## Data Sources

The transient occupancy tax analysis combines city-level tax collections with hotel inventory data to create a comparable measure of lodging-tax revenue across jurisdictions.

**Transient occupancy tax data.** ECOnorthwest used the California State Controller's Office dataset *City Transient Occupancy Tax (TOT) for Fiscal Years 2017 to 2024*. The dataset reports annual city-level TOT collections, tax rates, and effective dates. The available series begins in 2017 and extends through 2024.

**Hotel inventory data.** ECOnorthwest used CoStar hotel-property data to estimate the number of hotel rooms in each jurisdiction and to review hotel development status. CoStar data also include market indicators such as average daily rate, revenue per available room, and occupancy where disclosure thresholds are met. The report's analytical framework identifies the State Controller's Office and CoStar as the primary data sources for the TOT analysis.

The jurisdictions evaluated include Coronado, Imperial Beach, San Diego, Del Mar, Oceanside, Carlsbad, Encinitas, Chula Vista, and National City. Solana Beach was reviewed for supplemental hotel-market information, although some CoStar measures were suppressed because of the small number of hotel properties.

## Normalization of TOT Revenue

Total TOT collections are not directly comparable across jurisdictions because hotel markets differ substantially in size. To account for these differences, ECOnorthwest calculated annual TOT revenue per hotel room:

**TOT revenue per room = annual TOT collections ÷ estimated hotel rooms**

We converted annual tax collections to **2025 dollars** before calculating the per-room measure. This adjustment removes the effect of general price inflation from the trend.

Hotel-room counts came from CoStar property records. Where the available data showed changes in hotel inventory over time, the analysis used the room inventory applicable to each period to the extent possible. Historical property-level inventory data were not consistently available, however, so the hotel-room denominator should be interpreted as an estimate rather than a complete historical inventory.

## Adjustment for Imperial Beach's Tax-Rate Change

Imperial Beach was the only jurisdiction evaluated where the TOT rate changed during the study period. Its tax rate increased from **10 percent to 14 percent in 2023**. Without adjustment, this policy change would mechanically increase reported TOT revenue even if taxable hotel activity remained unchanged.

For 2023 and 2024, ECOnorthwest therefore converted Imperial Beach's reported collections to the equivalent amount under its previous 10 percent tax rate:

**Adjusted TOT = reported TOT × (10 ÷ 14)**

We then converted the adjusted amount to 2025 dollars and divided it by the estimated number of hotel rooms. This approach keeps the tax rate constant across the series so that the resulting trend better reflects changes in the underlying taxable lodging base.

## Supplemental CoStar Hotel Data

CoStar data were also reviewed to provide additional context on hotel-market conditions and investment activity.

For most comparison jurisdictions, CoStar reports current:

- average daily rate (ADR),
- revenue per available room (RevPAR),
- occupancy rate,
- number of hotel properties, and
- hotel rooms by development status.

CoStar suppresses certain market-performance measures in small markets. Imperial Beach had six hotel properties in the dataset reviewed for this study, and CoStar suppressed ADR, RevPAR, and occupancy data for that market. Solana Beach was subject to similar suppression. As a result, these private-market data cannot be used to determine whether changes in Imperial Beach TOT revenue reflect changes in occupancy, room rates, or both.

CoStar also classifies hotel rooms by development status, including existing, proposed, abandoned, converted, and demolished properties. These data were used only as a supplemental indicator of hotel investment activity. One Imperial Beach project with a reported construction date of 2036 was excluded from the near-term development discussion.

## Data Limitations

Several limitations affect interpretation of the TOT analysis:

- **Historical coverage begins in 2017.** The State Controller's Office dataset does not provide a longer pre-2017 baseline comparable to the historical visitation series used elsewhere in the report.
- **TOT reflects both occupancy and room rates.** Changes in tax collections cannot be attributed to changes in visitation alone.

- **Historical hotel inventory is imperfect.** CoStar provides detailed current property information, but complete annual point-in-time room inventories were not consistently available for every jurisdiction.
- **Small markets are more volatile.** Imperial Beach has a relatively small hotel inventory, so changes at a small number of properties can materially affect citywide results.
- **Private-market data are partially suppressed.** CoStar suppresses ADR, RevPAR, and occupancy in markets with too few properties, including Imperial Beach.
- **TOT is not a causal measure.** Hotel revenue can change because of the sewage crisis, but also because of hotel quality, renovations, room-rate strategies, new supply, economic cycles, travel patterns, and other factors. As with other broad indicators in this report, the comparison-geography approach helps identify divergence but does not provide a perfect counterfactual.

# Appendix E. Property Values

## Data Sources and Limitations

The economic mechanism this analysis tests runs through Proposition 13: assessed value can grow at most 2 percent a year until a parcel changes hands or is newly built, at which point it resets to market value. If pollution lowers demand for homes, fewer homes sell, fewer assessments reset, and the aggregate assessed roll of the affected area drifts further below market and grows more slowly than the rest of the county.

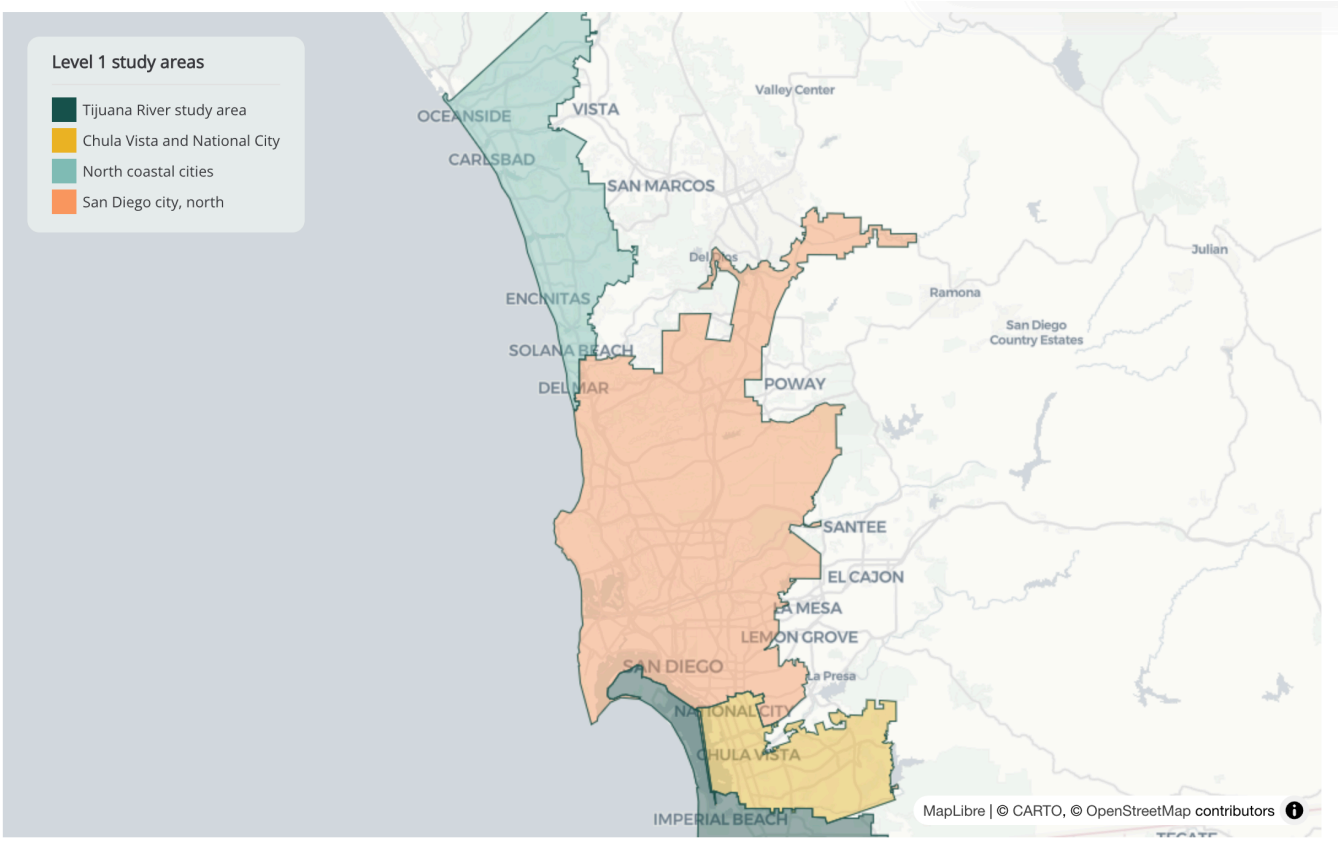
This version uses the same study area geographies from other analyses. The primary study area is one polygon: Tijuana River Valley, Imperial Beach, San Ysidro, Otay Mesa, Otay Mesa-Nestor, and Coronado. It is compared with the three other areas (Chula Vista and National City; the north coastal cities of Oceanside, Carlsbad, Encinitas, Solana Beach, and Del Mar; and San Diego city north of the study area), with the rest of the county, and with the county as a whole.

We used San Diego County Assessor Parcel data for this analysis, including historic sales and assessed value records.

- **Assessed values.** San Diego County Assessor Master Property Record roll extracts for assessment years 2016 through 2026, one file per year, 1.06 to 1.12 million parcels each.
- **Sales.** The Assessor's list of recorded sales with an indicated price, calendar years 2016 through 2025, 424,771 rows. About 91 percent of these documents appear on the following roll with the same document number, and 99.7 percent are grant deeds.
- **Parcels.** The county parcel geodatabase (current snapshot): centroids for geography assignment, living area for price per square foot.

Every figure is for residential parcels only. Single family homes, condominiums, multi-family buildings, and vacant residential lots that are taxable. Timeshares, possessory interests, mobile home coaches, and nontaxable parcels are excluded. Roll year t reflects sales recorded through calendar year t minus 1, so the 2026 roll is the endpoint that captures 2025 sales. Sale prices come from the Assessor's list of recorded sales with an indicated price. We focused on residential properties because they provide enough transactions to compare market activity over time. Commercial properties turn over much less frequently, and private ownership structures make market transactions harder to observe consistently.

**Figure 8. Property value analysis study areas**



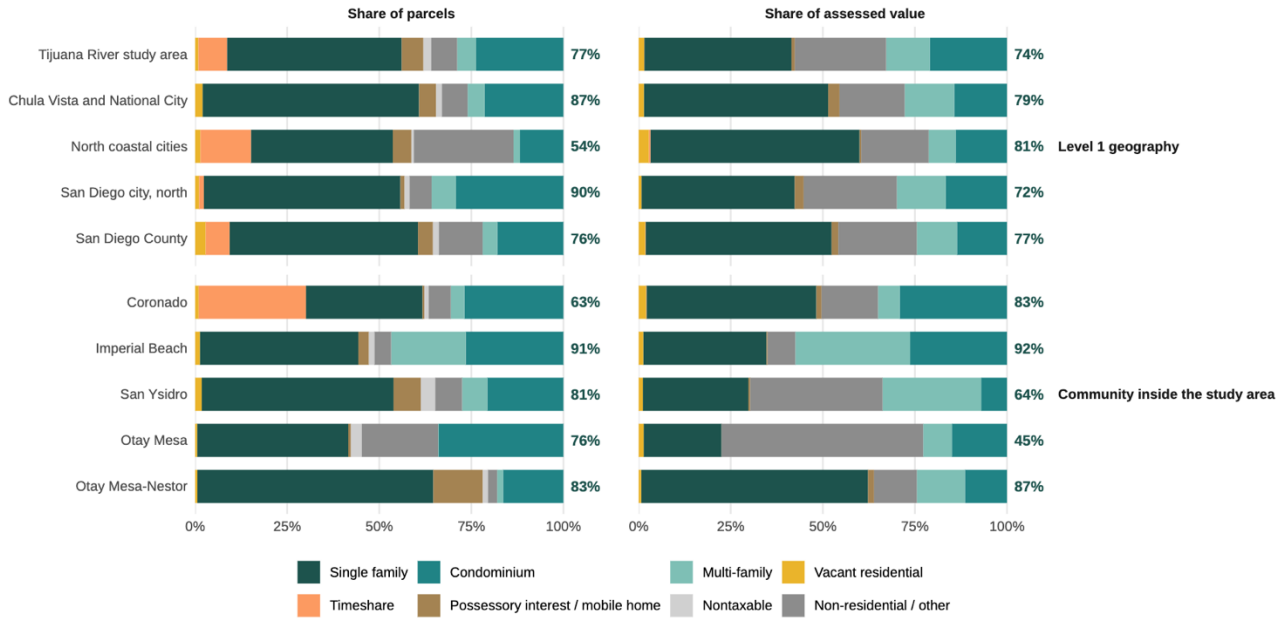

Source: San Diego County Assessor, ECOnorthwest Analysis

Note: Parcels are assigned by the assessor's parcel centroid. Parcels retired before the current parcel file was cut have no centroid and fall back to their tax rate area (Coronado and Imperial Beach are wholly inside the study area); retired San Diego city parcels that cannot be placed are dropped.

## Detailed Results

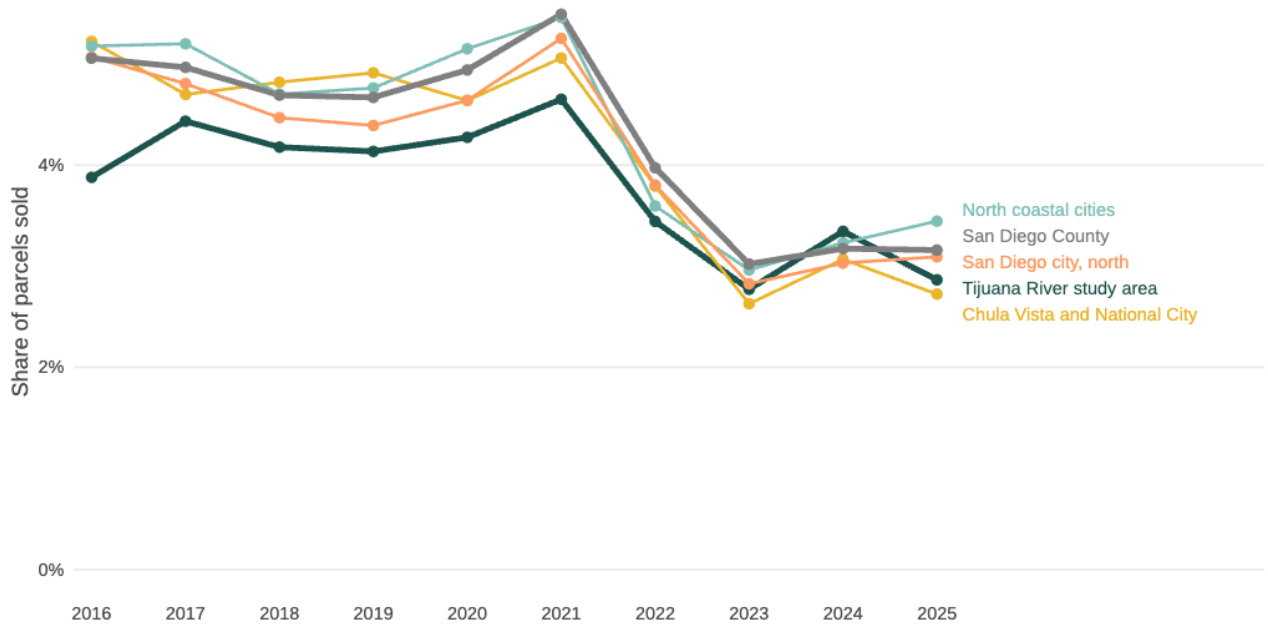
Every analysis in this appendix is limited to the residential universe: single family, condominium, multi-family, and vacant residential parcels. The chart below shows how much of each area's 2026 roll that universe covers, counting parcels and assessed value, with every parcel on the roll as the denominator. The roll does not carry reliable parcel acreage, so land area is not shown. Residential parcels are 77% of the study area's parcels and 74% of its assessed value, close to the county's 76% and 77%. Two gaps between the parcel and value shares are worth knowing. Coronado is only 63% residential by parcel count because 29% of its parcels are timeshare intervals, which carry little value; by value it is 83% residential. The same effect holds the north coastal cities to 54% of parcels. Otay Mesa runs the other way: 76% of its parcels are residential but only 45% of its value, because most of its value sits in non-residential parcels.

## Figure 9. Share of 2026 roll that is residential



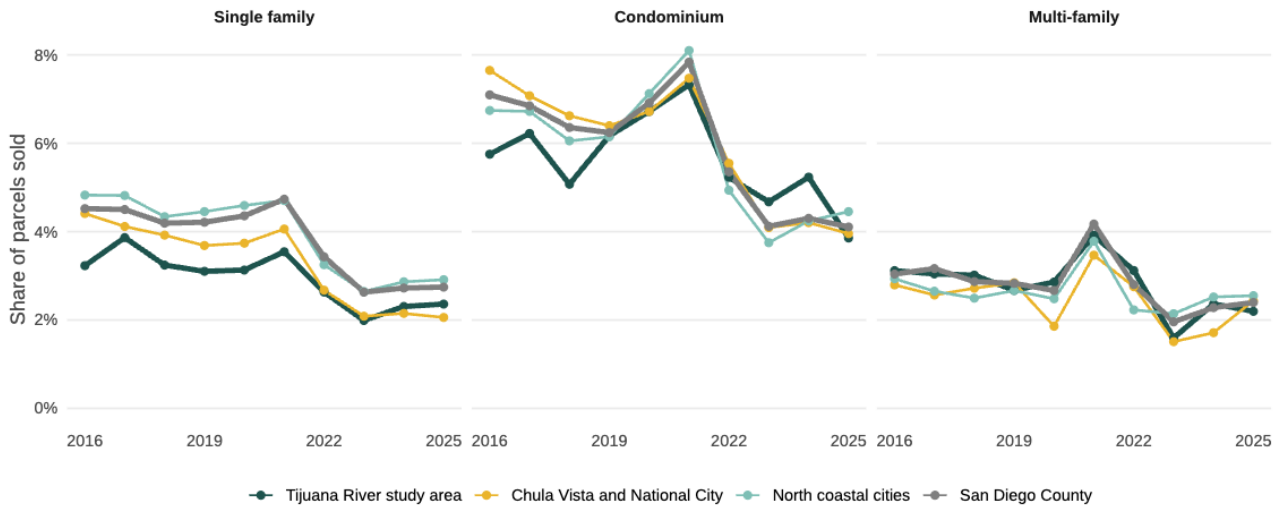

Source: San Diego County Assessor, ECOnorthwest Analysis

## Figure 10. Share of residential parcels sold in an arm's length sale, by year




Source: San Diego County Assessor, ECOnorthwest Analysis

**Figure 11. Share of parcels sold each year, by residential type**




Source: San Diego County Assessor, ECOnorthwest Analysis

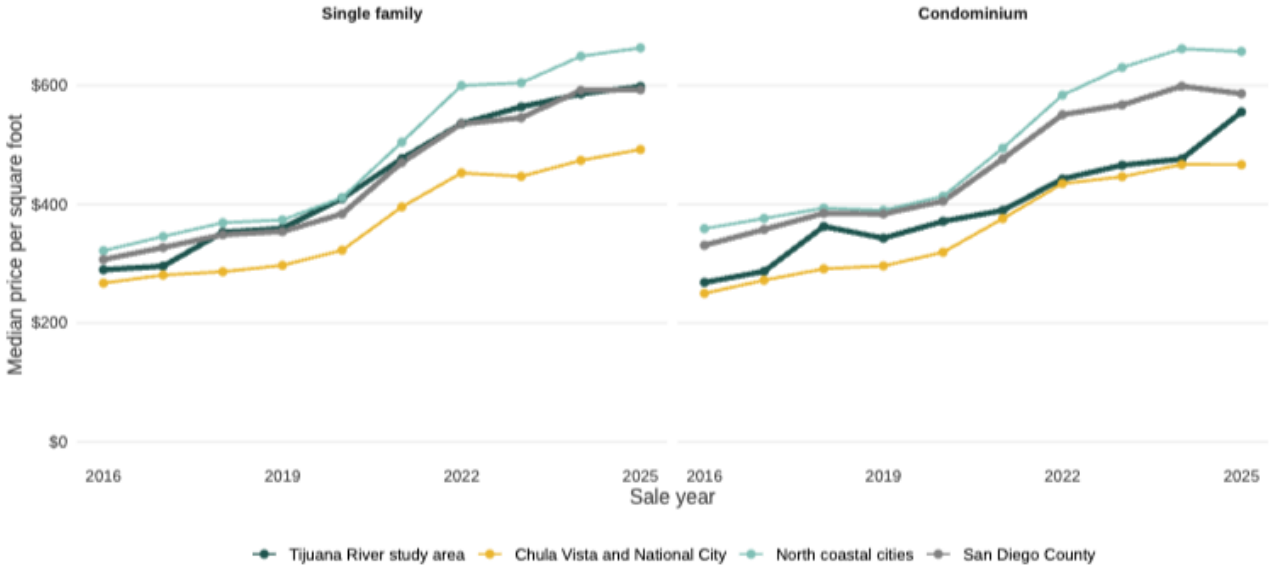
**Figure 12. Share of Parcels Sold by Type and Period**

| Period | Rest of county parcel years | Study area parcel years | Rest of county share sold | Study area share sold |
|---|---|---|---|---|
| Single family | | | | |
| 2016 to 2017 baseline | 1,085,975 | 40,437 | 4.5% | 3.5% |
| 2018 to 2019 first crisis | 1,095,870 | 40,632 | 4.2% | 3.2% |
| 2020 to 2021 pandemic | 1,103,081 | 40,595 | 4.6% | 3.3% |
| 2022 to 2025 second crisis | 2,210,964 | 80,897 | 2.9% | 2.3% |
| Condominium | | | | |
| 2016 to 2017 baseline | 350,957 | 16,228 | 7.0% | 6.0% |
| 2018 to 2019 first crisis | 355,360 | 17,206 | 6.3% | 5.6% |
| 2020 to 2021 pandemic | 362,583 | 18,124 | 7.4% | 7.0% |

| | | | | |
|---|---|---|---|---|
| 2022 to 2025 second crisis | 744,709 | 39,069 | 4.5% | 4.7% |
| Multi-family | | | | |
| 2016 to 2017 baseline | 82,560 | 4,479 | 3.1% | 3.1% |
| 2018 to 2019 first crisis | 82,740 | 4,431 | 2.8% | 2.8% |
| 2020 to 2021 pandemic | 83,332 | 4,425 | 3.4% | 3.4% |
| 2022 to 2025 second crisis | 168,400 | 8,789 | 2.4% | 2.3% |

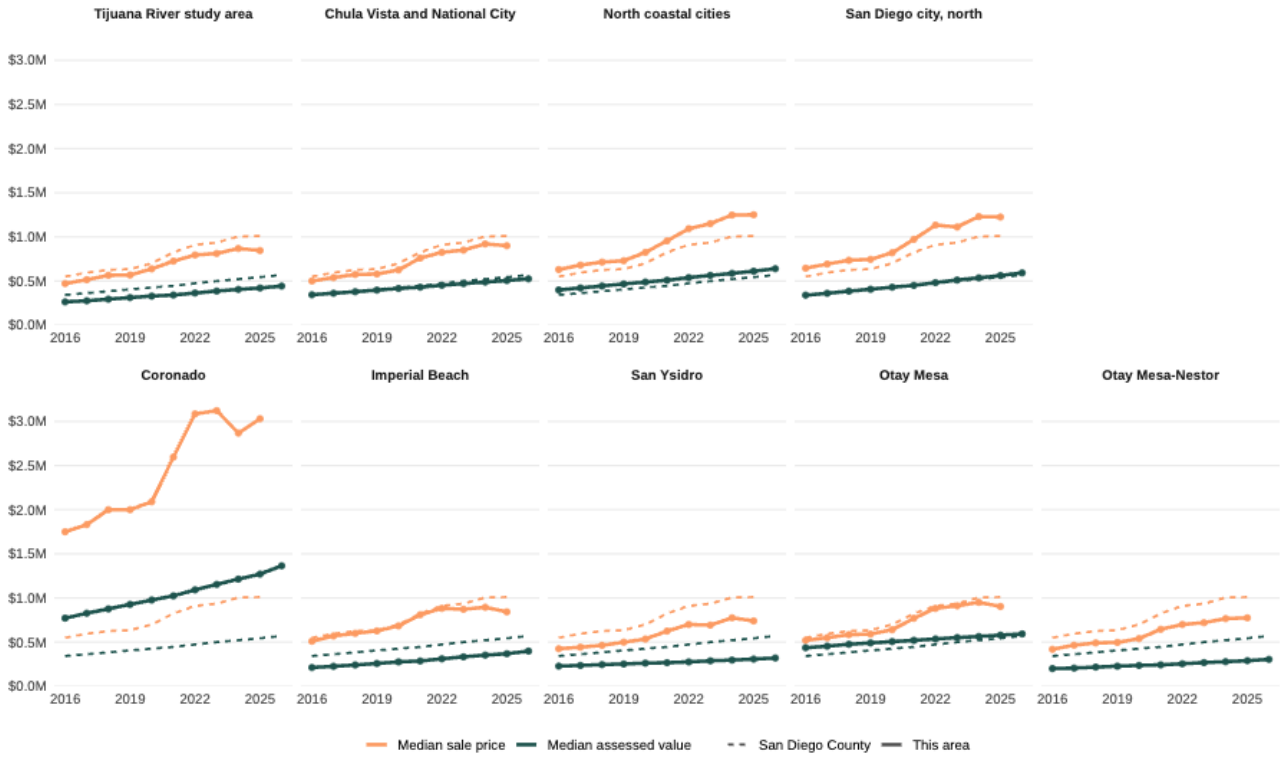
Source: San Diego County Assessor, ECOnorthwest Analysis

**Figure 13. Median sale price per square foot of living area, by residential type**




Source: San Diego County Assessor, ECOnorthwest Analysis

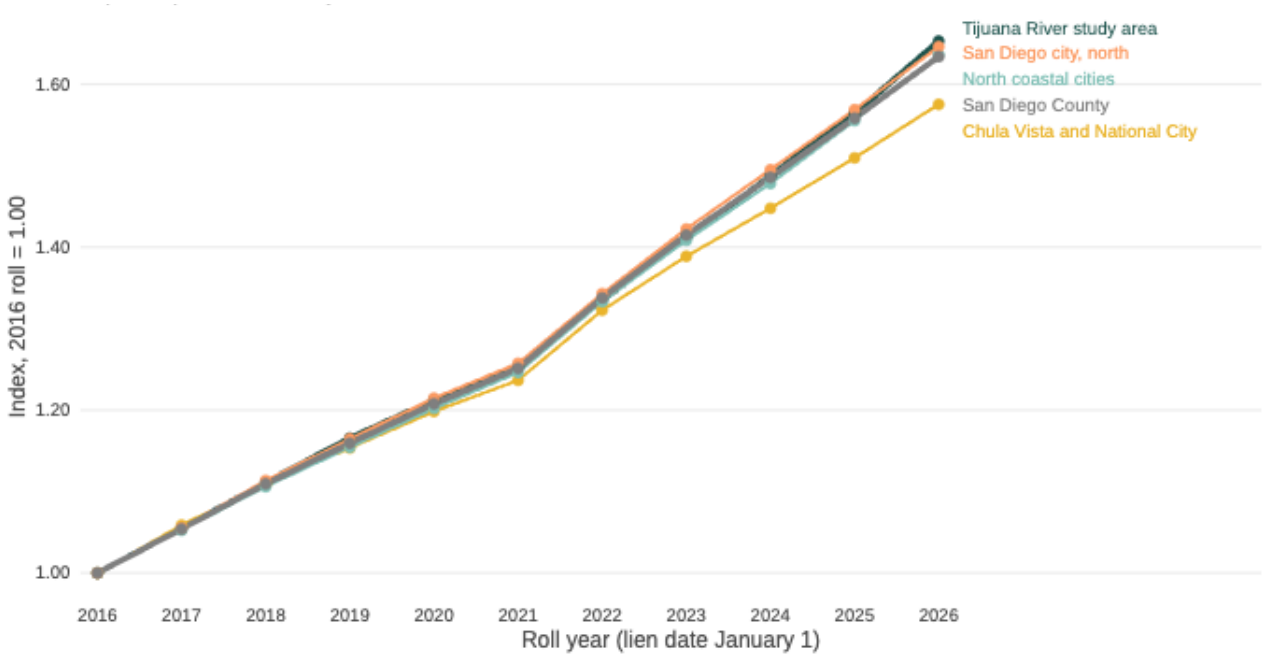
**Figure 14. Median sale price and median assessed value of single-family homes, by study area**




Source: San Diego County Assessor, ECOnorthwest Analysis

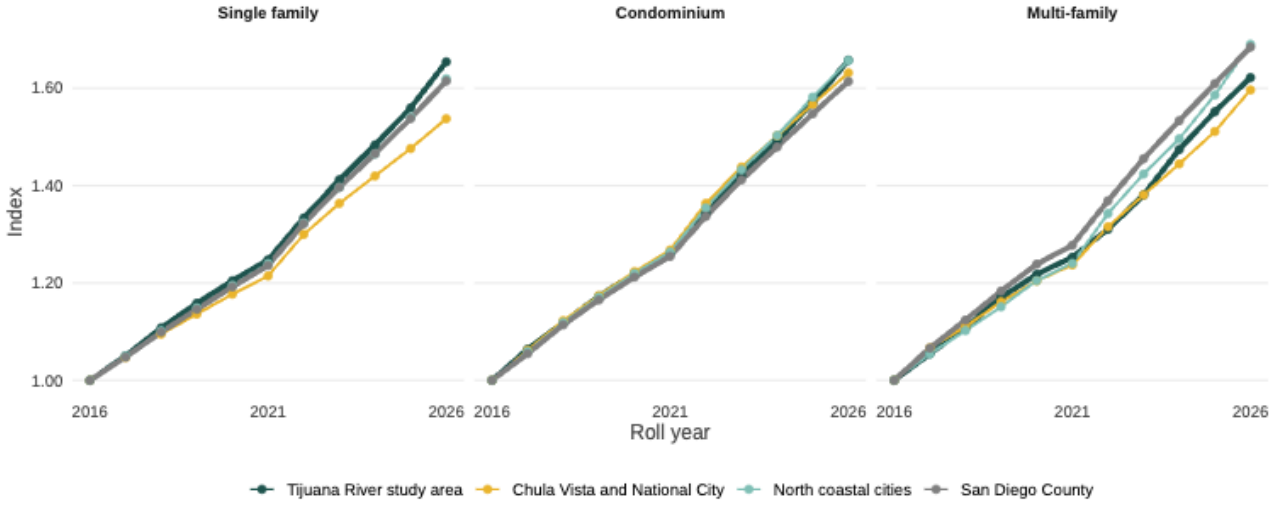
Note: sales price is arm's length sales in the calendar year; assessed value is every single family parcel on that year's roll.

**Figure 15. Gross assessed value of the same residential parcels, indexed to the 2016 roll**




Source: San Diego County Assessor, ECOnorthwest Analysis

**Figure 16. Constant panel assessed value index, by residential type**




Source: San Diego County Assessor, ECOnorthwest Analysis

**Figure 17. Constant panel value on the 2026 roll as a ratio of the 2016 roll, by type**

| Area | SF parcels | Condo parcels | MF parcels | SF index | Condo index | MF index |
|---|---|---|---|---|---|---|
| Tijuana River study area | 18,779 | 7,570 | 2,042 | 1.654 | 1.658 | 1.622 |
| Chula Vista and National City | 44,356 | 14,496 | 3,454 | 1.538 | 1.632 | 1.597 |
| North coastal cities | 76,715 | 23,031 | 3,527 | 1.620 | 1.657 | 1.690 |
| San Diego City - North | 181,989 | 100,822 | 22,394 | 1.641 | 1.578 | 1.715 |
| Rest of county | 198,004 | 32,910 | 9,499 | 1.597 | 1.702 | 1.657 |
| San Diego County | 519,843 | 178,829 | 40,916 | 1.615 | 1.614 | 1.685 |

Source: San Diego County Assessor, ECOnorthwest Analysis

# Appendix F. Public Health Costs

This appendix provides additional detail on the methods, assumptions, and supporting literature used to assess public-health costs associated with degraded water and air quality in the Tijuana River Valley. The analysis is intended to characterize the potential scale of health-related economic impacts using available environmental monitoring, visitation, epidemiological, and economic data.

The estimates presented in the report should not be interpreted as direct counts of illnesses or health conditions caused by the Tijuana River Valley Sewage Crisis. Rather, they represent modeled or expected outcomes based on observed environmental conditions, established exposure-response relationships, and assumptions regarding potential exposure.

## Water Quality and Gastrointestinal Illness Methodology

Enterococcus monitoring data from the California State Water Resources Control Board was used to characterize recreational water quality at Imperial Beach and Coronado Beach from 2022 through 2025. Enterococcus is commonly used as an indicator of fecal contamination and associated gastrointestinal illness risk in recreational waters.

The analysis compares observed enterococcus concentrations with the recreational water-quality criteria established by the U.S. Environmental Protection Agency (EPA). The EPA benchmark used in this analysis is a geometric mean of 301 copies per 100 milliliters,

corresponding to an estimated illness rate of approximately 32 NEEAR gastrointestinal illnesses (NGIs) per 1,000 recreational water users.76

Annual geometric means were estimated for Imperial Beach and Coronado Beach for two seasonal periods: summer and winter. Across the years and seasons examined, average enterococcus concentrations at both beaches exceeded the federal benchmark, with concentrations generally higher at Imperial Beach than at Coronado Beach.

## Translating Enterococcus Concentrations into Illness Risk

Observed enterococcus concentrations were translated into expected gastrointestinal illness rates using EPA methodology (see Equation 1) relating bacterial concentrations to NGI risk among recreational water users.[77]

**Swimming-associated NGI = -27.31 + 23.73 (mean log10 qPCR cce per 100 mL)**

This approach estimates the expected incidence of gastrointestinal illness among people exposed to recreational water under measured water-quality conditions. The resulting rates should be interpreted as modeled illness risks rather than observed or clinically confirmed illness cases.

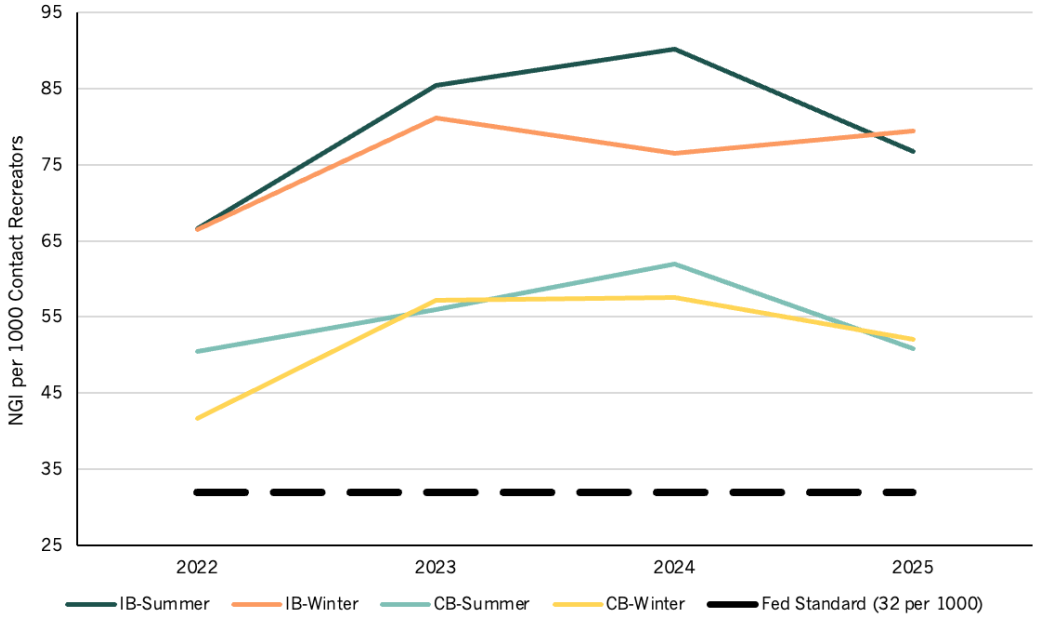
At their highest observed levels during the period examined, estimated illness risk reached approximately 90 NGIs per 1,000 recreational water users at Imperial Beach and 62 NGIs per 1,000 at Coronado Beach, compared with the federal benchmark of approximately 32 per 1,000.

[76] U.S. Environmental Protection Agency. 2012. Recreational Water Quality Criteria. EPA Office of Water Publication No. 820-F-12-058\. Washington, DC: U.S. Environmental Protection Agency.

[77] U.S. Environmental Protection Agency. 2012. Recreational Water Quality Criteria. EPA Office of Water Publication No. 820-F-12-058\. Washington, DC: U.S. Environmental Protection Agency.



**Figure 18. NEEAR Gastrointestinal Illnesses (NGI) per 1000 Contact Recreators**




Source: California SWRCB, US EPA[78], and ECOnorthwest Analysis

## Estimating Recreational Exposure

To estimate the number of illnesses potentially associated with observed water-quality conditions, ECO combined estimated illness rates with beach visitation and recreational-use assumptions.

Based on United States Lifesaving Association (USLA) visitation data, approximately 48 percent of annual visits to Imperial Beach occur during summer months and approximately 10 percent occur during winter months. The analysis assumes that approximately 15 percent of summer visitors and 10 percent of winter visitors enter the water through swimming, surfing, or similar activities.[79]

These assumptions were used to estimate the number of recreational water users potentially exposed to observed water-quality conditions during each period.

Expected illnesses were calculated by applying the estimated NGI rate to the estimated number of recreational water users. The number of illnesses that would be expected if water quality met the federal benchmark were also calculated. The difference between these estimates provides an indication of the additional expected illness burden associated with water quality above the federal benchmark.

The calculation can be summarized conceptually as:

[78] U.S. Environmental Protection Agency. 2012. Recreational Water Quality Criteria. EPA Office of Water Publication No. 820-F-12-058\. Washington, DC: U.S. Environmental Protection Agency.

[79] ECONorthwest. (2017). Cost-Benefit Analysis: San Diego Region Bacterial Total Maximum Daily Loads.

(1) **Expected illnesses = Beach visits (in thousands) × Share entering the water × Estimated illness rate**

The analysis is sensitive to several assumptions, including visitation levels, the proportion of visitors entering the water, measured bacterial concentrations, and the applicability of EPA exposure-response relationships to local conditions.

## Economic Cost per Gastrointestinal Illness

Gastrointestinal illnesses can impose costs through several channels, including:

- over-the-counter and prescription medications;
- physician and urgent-care visits;
- emergency-department treatment;
- missed work and lost wages;
- lost productivity to employers; and
- discomfort, inconvenience, and other non-market effects associated with illness.

Based on the economic literature reviewed for this analysis, **the estimated cost of a gastrointestinal illness ranges from approximately $76 to $431 per case in 2025 dollars**. The range reflects differences in illness severity, treatment requirements, and productivity losses.[80]

These estimates do not capture every potential consequence of illness, including all quality-of-life effects, effects on unpaid household production, or costs associated with secondary transmission.

## Hydrogen Sulfide Exposure and Public Health

Hydrogen sulfide ($H_2S$) is a gas produced during the decomposition of organic material under low-oxygen conditions and is commonly associated with sewage, wastewater systems, and other organic waste streams. $H_2S$ is also responsible for the characteristic “rotten egg” odor associated with sewage emissions.

A substantial body of public-health literature has examined the effects of exposure to $H_2S$ and other reduced sulfur compounds. Reported effects vary depending on concentration, exposure duration, frequency of exposure, and individual susceptibility.[81]

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[80] DeFlorio-Barker S, Wade TJ, Jones RM, Friedman LS, Wing C, Dorevitch S. 2017. Estimated costs of sporadic gastrointestinal illness associated with surface water recreation: a combined analysis of data from NEEAR and CHEERS Studies. Environ Health Perspect
125:215–222; http://dx.doi.org/10.1289/EHP130

[81] Batterman, Stuart, et al. 2023. "Health Effects of Chronic Exposure to Hydrogen Sulfide." Critical Reviews in Toxicology 53 (author manuscript PMC 2024).

At relatively low concentrations, exposure may result in odor nuisance and symptoms including headaches, nausea, eye and nasal irritation, sore throat, coughing, and respiratory discomfort. Sensitive individuals may experience symptoms at lower concentrations than the general population.[82]

Higher concentrations and more sustained exposures can result in more serious health effects. However, the monitoring analysis conducted for this report is focused primarily on the frequency of lower-level and moderately elevated $H_2S$ conditions documented near the Tijuana River rather than acute, high-concentration exposure events.[83]

## Other Airborne Contaminants Associated with Wastewater

Untreated sewage and wastewater systems may also generate airborne biological contaminants, including bacteria, fungi, endotoxins, and other bioaerosols. These contaminants can become airborne through turbulent water movement, wastewater handling, aerosolization, and related processes.[84]

The scientific literature has associated occupational and community exposure to elevated concentrations of bioaerosols with respiratory irritation and conditions including cough, airway inflammation, bronchitis, and asthma-related symptoms.[85]

The available monitoring data used in this analysis do not allow ECO to quantify community exposure to specific biological aerosols or attribute health outcomes directly to those contaminants. Accordingly, potential health effects from bioaerosols are discussed as part of the broader public-health context but are not monetized separately in the quantitative analysis.

## Economic Effects of Odor and Air-Quality Nuisance

Environmental economics literature provides several approaches for valuing the effects of degraded air quality and odor nuisance.[86,87,88]

Hedonic pricing models estimate how environmental conditions are reflected in housing prices or rents. Studies examining waste facilities, wastewater infrastructure, and other odor-

[82] Batterman, Stuart, et al. 2023. "Health Effects of Chronic Exposure to Hydrogen Sulfide." Critical Reviews in Toxicology 53 (author manuscript PMC 2024).
[83] Batterman, Stuart, et al. 2023. "Health Effects of Chronic Exposure to Hydrogen Sulfide." Critical Reviews in Toxicology 53 (author manuscript PMC 2024).
[84] Iqbal, Muhammad Anwar, Sadia Afrin Siddiqua, Mohammad Omar Faruk, Abu Reza Md. Towfiqul Islam, and Mohammed Abdus Salam. 2024. "Systematic Review and Meta-Analysis of the Potential Threats to Respiratory Health from Microbial Bioaerosol Exposures." Environmental Pollution 341: 122972.
[85] Iqbal, Muhammad Anwar, Sadia Afrin Siddiqua, Mohammad Omar Faruk, Abu Reza Md. Towfiqul Islam, and Mohammed Abdus Salam. 2024. "Systematic Review and Meta-Analysis of the Potential Threats to Respiratory Health from Microbial Bioaerosol Exposures." Environmental Pollution 341: 122972.
[86] Eyckmans, Johan, Simon De Jaeger, and Sandra Rousseau. 2011. "Hedonic Valuation of Odor Nuisance Using Field Measurements: A Case Study of an Animal Waste Processing Facility in Flanders." HUB Research Papers 2011/19.
[87] Ligus, Magdalena. 2018. "Measuring the Willingness to Pay for Improved Air Quality: A Contingent Valuation Survey." Polish Journal of Environmental Studies 27 (2): 763–771.
[88] Smith, V. Kerry, and Ju-Chin Huang. 1995. "Can Markets Value Air Quality? A Meta-Analysis of Hedonic Property Value Models." Journal of Political Economy 103 (1): 209–237.

generating land uses have found that persistent odors and perceived environmental disamenities may reduce nearby property values.[89,90]

Some studies reviewed for this analysis report property-value effects ranging from approximately 4.9 percent to 11.5 percent in areas exposed to substantial odor or environmental nuisance. These estimates are highly context-specific and depend on factors such as distance from the source, intensity and persistence of odor, local housing-market conditions, and public perceptions of health risk.[91]

Contingent valuation and other stated-preference methods provide a second approach to valuing environmental impacts. These methods estimate households' willingness to pay to avoid adverse conditions such as odors, respiratory symptoms, headaches, nausea, and other health or quality-of-life impacts.[92]

These studies demonstrate that households place economic value on avoiding both physical health symptoms and environmental nuisance. However, ECO does not directly apply property-value effects or willingness-to-pay estimates from this literature to the Tijuana River Valley. Differences in geography, exposure, housing markets, and study design make direct transfer of those estimates uncertain.[93,94,95]

The literature is therefore used to establish that persistent air-quality degradation and odor can create economic costs beyond direct medical expenses, rather than to generate a standalone dollar estimate for those effects.

## Local Hydrogen Sulfide Monitoring

The San Diego County Air Pollution Control District (SDAPCD) operates monitoring stations near the Tijuana River that record hourly $H_2S$ concentrations.[96]

SDAPCD categorizes measured concentrations using a color-coded advisory system:

- Green: concentrations below 4.9 parts per billion (ppb);
- Yellow: concentrations from 5.0 to 29.9 ppb;

[89] Eyckmans, Johan, Simon De Jaeger, and Sandra Rousseau. 2011. "Hedonic Valuation of Odor Nuisance Using Field Measurements: A Case Study of an Animal Waste Processing Facility in Flanders." HUB Research Papers 2011/19.
[90] Smith, V. Kerry, and Ju-Chin Huang. 1995. "Can Markets Value Air Quality? A Meta-Analysis of Hedonic Property Value Models." Journal of Political Economy 103 (1): 209–237.
[91] Eyckmans, Johan, Simon De Jaeger, and Sandra Rousseau. 2011. "Hedonic Valuation of Odor Nuisance Using Field Measurements: A Case Study of an Animal Waste Processing Facility in Flanders." HUB Research Papers 2011/19.
[92] Ligus, Magdalena. 2018. "Measuring the Willingness to Pay for Improved Air Quality: A Contingent Valuation Survey." Polish Journal of Environmental Studies 27 (2): 763–771.
[93] Eyckmans, Johan, Simon De Jaeger, and Sandra Rousseau. 2011. "Hedonic Valuation of Odor Nuisance Using Field Measurements: A Case Study of an Animal Waste Processing Facility in Flanders." HUB Research Papers 2011/19.
[94] Ligus, Magdalena. 2018. "Measuring the Willingness to Pay for Improved Air Quality: A Contingent Valuation Survey." Polish Journal of Environmental Studies 27 (2): 763–771.
[95] Smith, V. Kerry, and Ju-Chin Huang. 1995. "Can Markets Value Air Quality? A Meta-Analysis of Hedonic Property Value Models." Journal of Political Economy 103 (1): 209–237.
[96] San Diego County Air Pollution Control District. n.d., Hydrogen Sulfide Monitoring. https://www.sdapcd.org/content/sdapcd/about/tj-river-valley/tjrv-air-quality-monitoring.html.

- Orange: concentrations of 30 ppb or higher; and
- Purple: the County's highest advisory category, associated with substantially higher concentrations and more serious potential health concerns.[97]

ECO analyzed hourly monitoring data from three stations for the period from 2024 through 2026 and calculated the number of monitored hours falling within each advisory category.

Most monitored hours fell within the Green category. However, more than 2,000 monitored hours fell within the Yellow category across the stations and years examined. At these concentrations, SDAPCD indicates that sensitive individuals may experience odor, headaches, nausea, or respiratory discomfort and may consider limiting outdoor activity.

More than 200 monitored hours fell within the Orange category. At these concentrations, odors are expected to be noticeable to a broader portion of the population, and SDAP.

### Data Sources

- Enterococcus Data
  - California State Water Resources Control Board, n.d., Search Beach Monitoring Data. https://www.waterboards.ca.gov/water_issues/programs/beaches/search_beach_mon.html.
- Hydrogen Sulfide Monitoring Data
  - San Diego County Air Pollution Control District. n.d., Hydrogen Sulfide Monitoring. https://www.sdapcd.org/content/sdapcd/about/tj-river-valley/tjrv-air-quality-monitoring.html.
- Beach Visitation Data
  - United States Livesaving Association. n.d., American Lifeguard Rescue and Drowning Statistics for Beaches. https://www.usla.org/page/STATISTICS.

## Appendix H. School Funding Analysis

### School District Funding Overview

California's Local Control Funding Formula (LCFF) uses enrollment and student characteristics to calculate the level of funding needed to serve students in public school districts.[98] Two sources fill the funding level set by the LCFF: local property taxes and state funds. If local property taxes do not meet a district's LCFF entitlement level, the state supplements with additional funds.

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[97] San Diego County Air Pollution Control District. n.d., Hydrogen Sulfide Monitoring. https://www.sdapcd.org/content/sdapcd/about/tj-river-valley/tjrv-air-quality-monitoring.html.

[98] California Department of Education. 2026. "Local Control Funding Formula Overview." Accessed Aug 1, 2026. https://www.cde.ca.gov/fg/aa/lc/lcffoverview.asp

**Figure 19. California's Local Control Funding Formula Illustration**

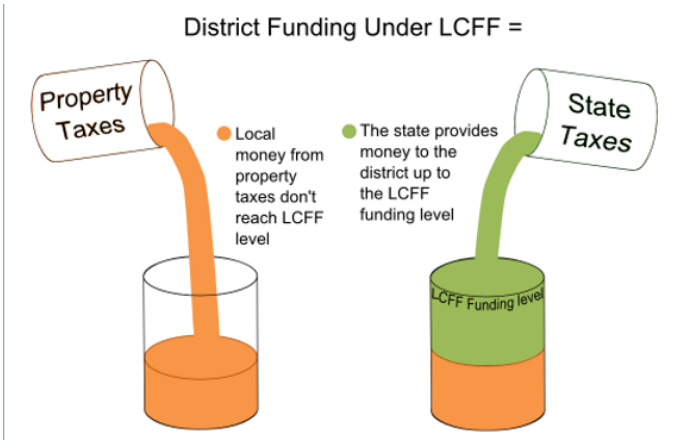



Figure source: Ed100, "LCFF: The Formula That Controls Most School Funding," October, 2025, https://ed100.org/lessons/lcff.

The LCFF is a per-student formula. Calculations are based on a district's average daily attendance (ADA), or the average number of students in class each day. ADA is calculated by dividing the total days of student attendance by the total days of instruction in the school year. ADA is multiplied by a base rate to determine the base grant of the LCFF and makes up approximately 80 percent of a district's funding.[99] For example, a high school district with 30,000 students attending each day (on average) in fiscal year 2025–26 would have a base grant of 30,000 multiplied by the per-student grant of $12,746, for a total of $382,380,000.

Other LCFF grant components provide additional funds to districts with a higher proportion of students who need more support (e.g. learning English, experiencing poverty, in foster care). These additional funds are also calculated primarily using ADA.

Any decrease in ADA could mean significant decreases in funding, likely from state funds. A high school district with an ADA of 29,500 students instead of 30,000 students would have a base grant that is 6 million dollars smaller. Average daily attendance is an estimate for enrollment, but may differ from enrollment for many reasons, including student mobility (i.e. transferring across districts), dropouts, and notably, absenteeism.[100]

## Pollution and funding

Research in states that use ADA as the basis of school funding has shown that low attendance has a negative impact on school funding.[101] While this is often intended to

[99]Legislative Analyst's Office, *The Local Control Funding Formula for School Districts and Charter Schools* (Sacramento: Legislative Analyst's Office, January 2023), https://abgt.assembly.ca.gov/system/files/2024-02/lao-lcff-overview.pdf.

[100]Ed-Data, "How Students Are Counted," Published May 11th, 2026, https://www.ed-data.org/article/How-Students-Are-Counted.

[101] David Knight & Mark Olofson, "How Large are District Effects on Student Attendance? Implications for School Funding based on Average Daily Attendance," EdWorking Paper: 26-1436 (March 2026), https://doi.org/10.26300/55r5-q644.

encourage schools to improve attendance, it also means districts facing circumstances outside their control, like a major public health event, are penalized fiscally.

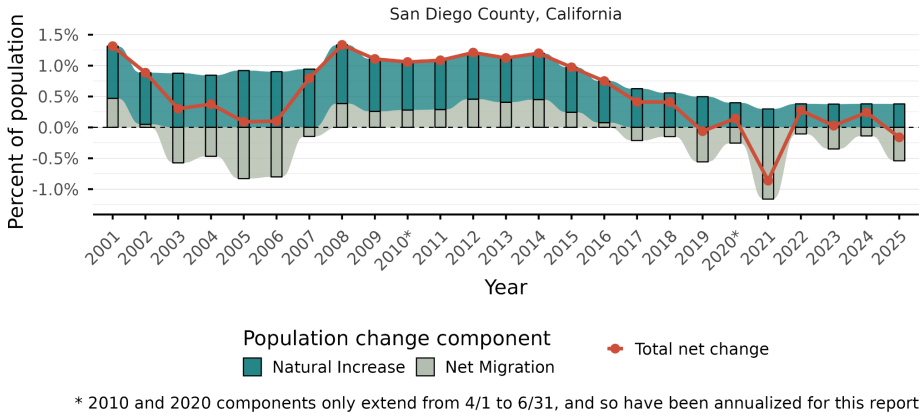
Air pollution like that seen in the Tijuana River Valley (TRJV) has been shown to increase rates of chronic absenteeism in schools.[102,103] Given the results of our survey, we know there is a link between the pollution in the Tijuana River Valley and health outcomes—if this pollution is affecting the health of residents, it may also be affecting students' school attendance. Even modest drops in attendance could translate into substantial funding losses. As a result, districts in the TJRV area may experience disproportionate decreases in school funding.

## ANALYSIS LIMITATIONS

Estimating the direct impact of the pollution's exposure on attendance and funding is a challenge due to outside factors influencing enrollment and attendance. Fluctuations in school enrollment have a direct impact on average daily attendance, as ADA is an estimate of school enrollment.

Enrollment is caught up in general migration patterns, both locally and nationally. From general migration to a decrease in birth rates nationally, the net population change in San Diego County has been decreasing over time.

**Figure 20.Components of population change, San Diego County, 2001-2025**




Source: US Census Population Estimates Program

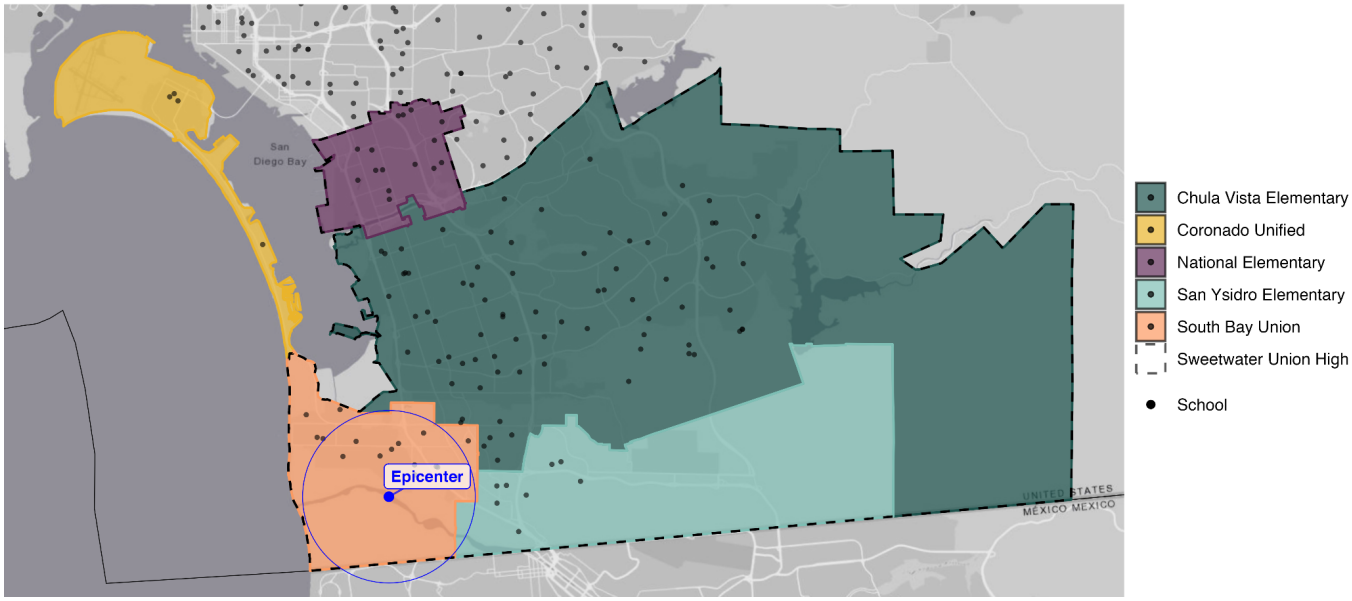
Changes in population may be associated with a decrease in school enrollment. Local migration patterns also involve changing racial and socioeconomic demographics, making it difficult to control for changes in public school enrollment and discern specific causes. Beyond enrollment, the gradual and longstanding nature of the pollution means there is no

[102] Mustahsin Aziz & Levan Elbakidze, "Invisible Barrier: The Impact of Air Quality on Chronic Absenteeism in the US," Environmental and Resource Economics 88, 655-680 (2025), https://doi.org/10.1007/s10640-024-00943-1.
[103] Frank D. Gillilan et. al, "The Effects of Ambient Air Pollution on School Absenteeism Due to Respiratory Illness," Epidemiology 12-1, 43-54 (January 2001), https://doi.org/10.1097/00001648-200101000-00009

single event date to use as a baseline for comparison to see if certain schools' attendance, enrollment, or performance have been disproportionately impacted.

The pollution also lacks distinct spatial boundaries. True pollution exposure for individual students and their families is unknown in any given year. ADA, the basis of funding, is calculated at a district level. Districts include multiple schools, whose proximity to the main pollution source varies.

**Figure 21. School District Boundaries Near Impacted Area (SY25)**



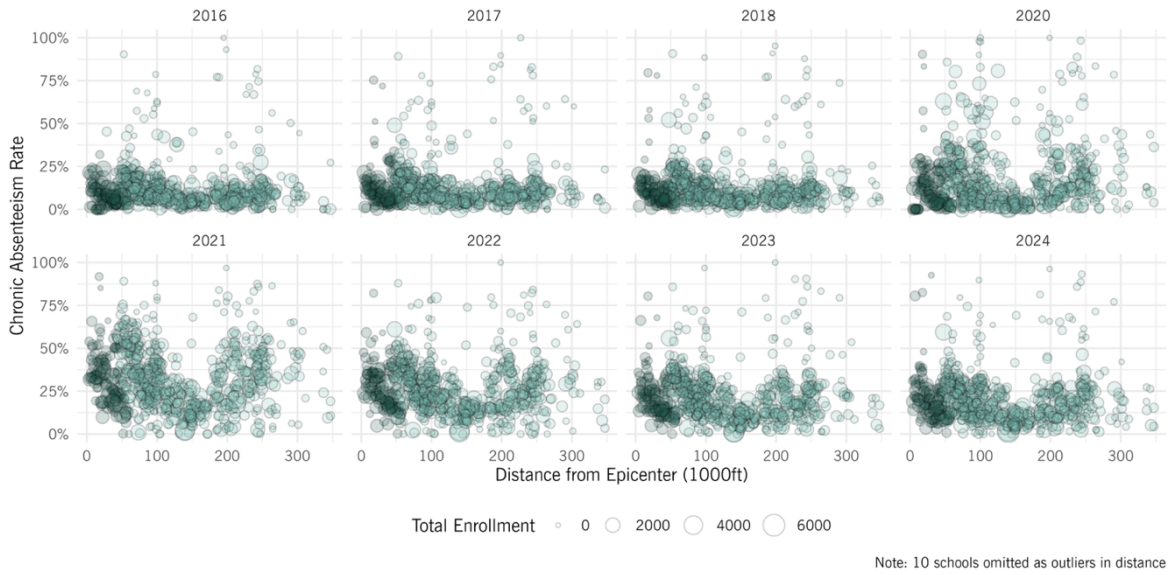

Source: ECOnorthwest

Note: Sweetwater Union High District has overlapping district boundaries.

Finally, worsening in pollution coincided with the COVID-19 pandemic. While we have more data availability in recent years, this is somewhat overshadowed by big drops in attendance, enrollment, and performance due to the pandemic that schools across the country are still recovering from.

Many of these issues are evident when plotting school-level chronic absenteeism against distance from pollution. While schools closer to the pollution appear to have slightly higher chronic absenteeism, there is a non-linear relationship that is exacerbated over time. This relationship is amplified post-pandemic, where schools furthest from the pollution epicenter are also seeing high rates of chronic absenteeism comparable to schools close to pollution. This suggests that other underlying factors may be playing a strong role in the relationship between attendance and pollution impacts; this may obscure a direct quantifiable statistical relationship between distance from pollution and average daily attendance.

**Figure 22. Chronic Absenteeism by School Distance from Pollution Epicenter Over Time**




Source: ECOnorthwest analysis of CDE data.

## Analysis

To identify the impact of pollution on school funding, our analysis was two-pronged. At a high level, we wanted to gauge the feasible range of impact in the school districts most proximate to the pollution. To do this, we compared the decreases in enrollment and average daily attendance (ADA) in the most impacted school districts to that of all other districts in San Diego County.

At a more granular level, we wanted to establish a statistically significant relationship between ADA and proximity to pollution, controlling for the major factors affecting attendance. This would determine the portion of the decrease in funding that could be attributable to pollution. While ADA is a limited metric, being district-level and annualized, it is the most directly tied to funding and has the most historic availability.

### METHODS

We used publicly available data on ADA, fall enrollment, and school/district demographics provided by the California Department of Education (CDE).[104,105,106,107,108]

[104] California Department of Education, "Chronic Absenteeism Data," Accessed May 18, 2026, https://www.cde.ca.gov/ds/ad/filesabd.asp.
[105] California Department of Education, "Enrollment by School (1981–2022)," Accessed May 4, 2026, https://www.cde.ca.gov/ds/ad/fileshistenr8122.asp.
California Department of Education, "Census Day Enrollment Data"; "Enrollment by School (1981–2022)," Accessed May 4, 2026, https://www.cde.ca.gov/ds/ad/filesenrcensus.asp.
[106] California Department of Education, "Current Expense of Education," Accessed May 5, 2026, https://www.cde.ca.gov/ds/fd/ec/currentexpense.asp.
[107] California Department of Education, "Public Schools and Districts Data Files," Accessed May 4, 2026, https://www.cde.ca.gov/ds/si/ds/pubschls.asp.
[108] California Department of Education, "Free and Reduced Price Meal Data," Accessed July 17, 2026, https://www.cde.ca.gov/ds/ad/filessp.asp.

### Overall Impact

To estimate the potential range of foregone funding in impacted school districts, we performed two calculations. First, we calculated an estimated ADA for impacted school districts in 2025, assuming that the trend in ADA in these districts was the same as all other districts in the county. We compared this to the actual ADA of impacted school districts in 2025 to get a potential difference of approximately 3,400. Multiplying this by the 2024-25 base grant amount of $11,300 (averaged across all grade spans),[109] we get an estimate of a maximum of $38,400,000 in funding lost.

**Figure 23. Counterfactual ADA Calculation**

| | |
|---|---|
| 2015-16 Actual ADA in Impacted School Districts | 79,000 |
| 2024-25 Projected ADA in Impacted School Districts | 69,400 |
| 2024-25 Actual ADA in Impacted School Districts | 66,000 |
| Difference between Projected and Actual ADA | 3,400 |
| Base Grant Amount | $11,300 |
| Difference in Base Grant Funding | $38,419,150 |

Source: ECOnorthwest analysis of CDE data

To calculate the minimum estimated impact (based primarily on enrollment), we used the actual enrollment in impacted school districts in 2016. We then calculated the estimated enrollment in 2025, assuming impacted school districts followed the same enrollment trend as all other school districts in the county. Then, we used the lower ADA-enrollment ratio in 2025 of impacted and other school districts to estimate a projected ADA for impacted school districts in 2025. Multiplying this by the smallest possible base grant of $10,400 per student, we get an estimated minimum of $15,700,000 in funding lost.

**Figure 24. ADA-to-Enrollment Ratio in Impacted vs. All Other SD School Districts**

| School Year | Impacted School Districts | All Other School Districts |
|---|---|---|
| 2015-16 | 85% | 83% |
| 2024-25 | 84% | 80% |

Source: ECOnorthwest analysis of CDE data

### Impact Attributable to Pollution

We ran a statistical regression model that measured the strength of the relationship between proximity to pollution and average daily attendance. The model allows us to control for influencing factors, such as differences in school districts' socioeconomic and racial composition.

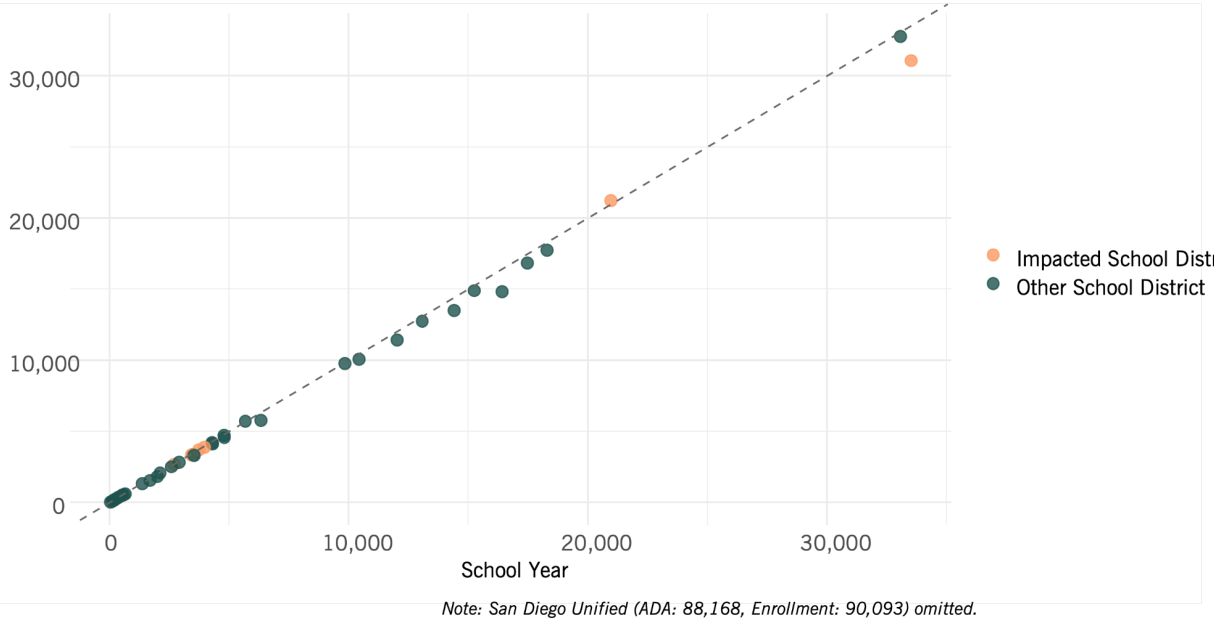
[109] California Department of Education, "Funding Rates and Information, Fiscal Year 2025–26," Accessed Aug 1, 2026, https://www.cde.ca.gov/fg/aa/pa/pa2526rates.asp.

To control for districts' varying sizes and changes in enrollment, we used the ADA to enrollment ratio, indexed to 2017, as our response variable (dividing a school's ADA by its enrollment). Other predictors in the model to account for variance included the share of students eligible for free or reduced-price meals, and the share of students who were BIPOC, Hispanic, or white. See the following section for the functional form of the model, a summary of the predictor variables, and the model output.

### School Districts Summary

In the historical data for San Diego County public schools, there were a total of 57 school districts, 42 of which had ADA, census day enrollment, and demographics values in 2025. One district was removed as an extreme outlier in the ADA-Enrollment ratio for modeling, leaving a total of 41 districts in the regression model.

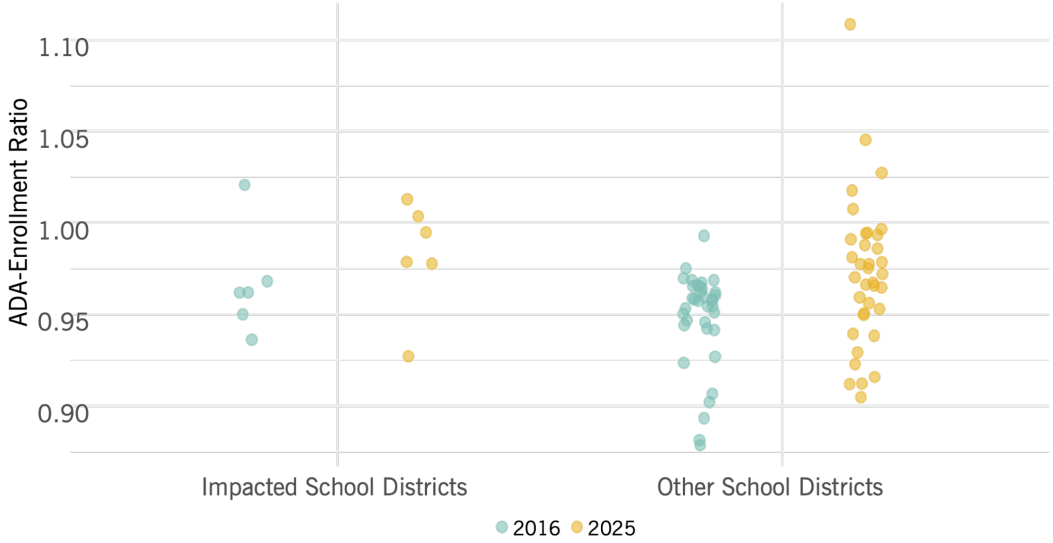
**Figure 25. ADA versus Enrollment, Most Recent School Year**




*Note: San Diego Unified (ADA: 88,168, Enrollment: 90,093) omitted.*

Source: CDE

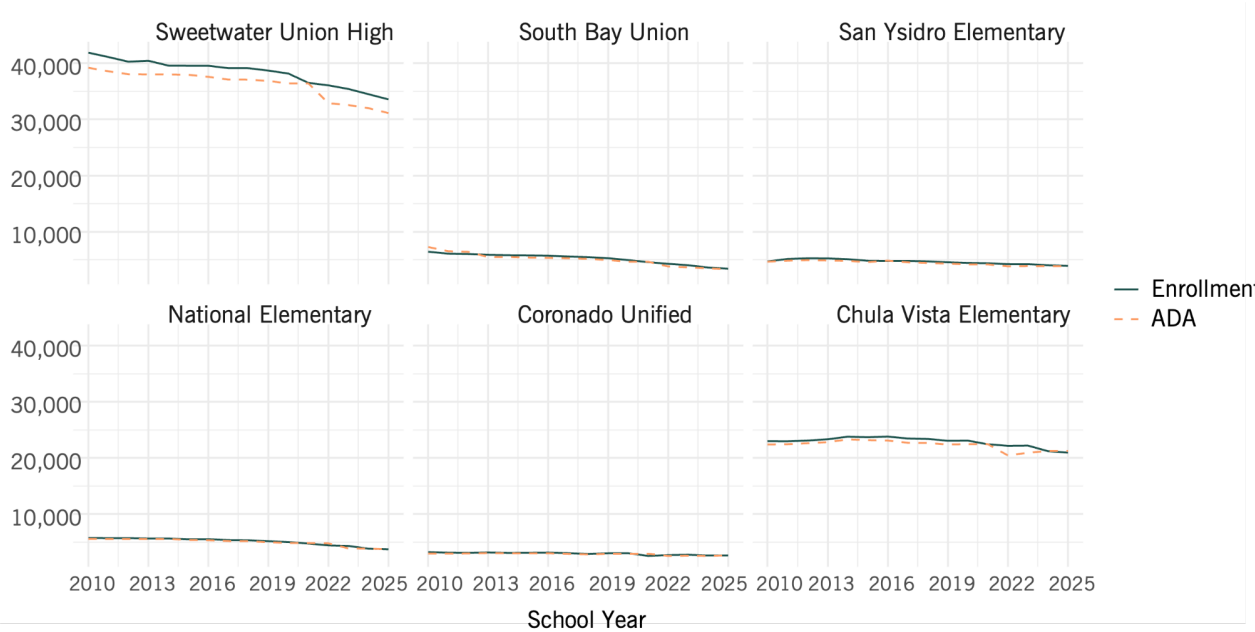
**Figure 26. ADA-Enrollment Ratio, 2015-16 vs. 2024-25**




Source: ECOnorthwest analysis of CDE data

Six of the 41 total districts were identified as the most impacted school districts based on their proximity to the pollution: Chula Vista Elementary, Coronado Unified, National Elementary, San Ysidro Elementary, South Bay Union, and Sweetwater Union High.

**Figure 27. ADA and Fall Enrollment Over Time for Impacted School Districts**



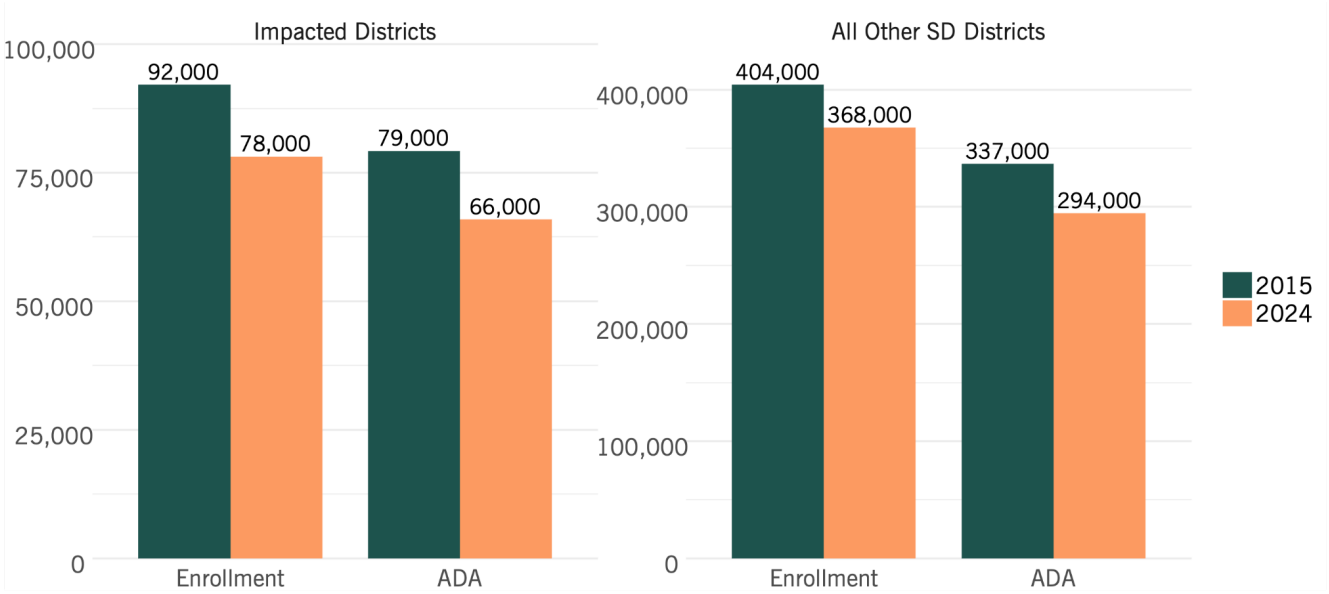

Source: CDE

## Findings

We estimate that at maximum, school districts closer to pollution had a potential foregone funding totaling approximately $16 - $38 million since 2016. Based on our property value analysis, which indicated overall lower assessed values, school districts in the impacted area

do not have a high property tax collection, so most of these funds would likely be sourced from the state.

**Figure 28. Difference in ADA and Fall Enrollment for Impacted Vs. All Other School Districts from 2015-16 to 2024-25**




Source: ECOnorthwest analysis of CDE data

It is not possible to distinguish with this granularity of data if this difference in ADA and enrollment in impacted school districts due to pollution impact, or other underlying factors. We did not find a large positive statistically significant relationship between the ADA-Enrollment ratio and the proximity to pollution in our regression.

Going forward, as the problem increases, this might change, and the epidemiological study could identify how this might change in the future, with more causal data relating health issues and school attendance. Additionally, while we did not find a strong relationship between ADA and distance from pollution, this does not mean that schools proximate to the river pollution are not feeling the impacts of the pollution on their population. From declining enrollments due to migration away from the pollution to a lack of funding to deal with pollution-related air quality issues (e.g. AC unit filters not equipped to deal with the level of filtration now needed), schools close to the river pollution are being affected.

## Limitations

### DATA LIMITATIONS

Schools report enrollment data directly to the department of education for legal and funding purposes, as such our data, while generally reliable, has several limitations. Firstly, while ADA is the metric most directly related to funding, it is an annual metric provided at the district level. This affected our ability to measure the impact of pollution both spatially and

temporally. Also, while absenteeism is one of the main reasons that ADA may differ from fall enrollment, student mobility, dropouts, and independently reporting charter schools also impact ADA. These effects are not easily separable from the impacts of pollution.

### METHODOLOGICAL LIMITATIONS

In determining the LCFF funding entitlement level, districts may use the current or prior years' ADA, or the average of the three most recent prior years' ADA.[110] Thus, the actual impact on ADA as it relates to funding in a short time period is relatively limited.

We faced several challenges in trying to estimate a statistically significant relationship between ADA and proximity to TRJV pollution. Beyond data limitations, the estimated effects of our linear regression were small, and while slightly statistically significant, the model lacked explanatory power and suggested that increasing distance from pollution was associated with a decreasing ADA-Enrollment ratio. This persisted even if charter schools, a potential reason for low ADA, were removed from the sample. This is potentially related to the U-shaped nature of chronic absenteeism and school demographics in San Diego County.

We also tried alternative approaches that did not substantially improve our results. We fit a multi-level time series model to increase our sample size and evaluate the relationship between ADA, proximity to pollution, and time, but it did not meaningfully improve the model's explanatory power. This suggests that limitations in the underlying data make these effects difficult to estimate. We also regressed chronic absenteeism on proximity to pollution, also with race and FRPM as control variables, and it also did not show a notable statistically significant relationship with proximity to pollution.

With more time and resources, more granular data could be used to further explore and improve upon our model. If we were able to obtain attendance data in shorter time periods, such as months or quarters, changes in attendance could be compared directly to spikes in pollution. Additionally, school-level data would allow us to measure a more direct relationship between proximity to pollution and schools. Finally, a longitudinal analysis could be done with student-level historical attendance data, to estimate if there was a more causal connection between the pollution and the attendance of students living close to the pollution or attending schools close to the pollution.

## Regression Model Summary

While several regression specifications were tested (as mentioned above), we include regression outputs of a single regression that illustrates general model performance. The functional form of the linear regression was:

$$\text{ADA-Enrollment}_i = \beta_0 + \beta_1 \log(\text{distance}_i) + \beta_2 \text{BIPOC}_i + \beta_3 \text{Hispanic}_i + \beta_4 \text{RaceMissing}_i + \beta_5 \text{FRPM}_i + \varepsilon_i$$

[110] "Local Control Funding Formula Overview."

Where ADA-Enrollment$_i$ is the ADA-to-Enrollment ratio, indexed to 2017, log(distance$_i$) is the log-transformed distance from the assumed epicenter of the pollution, BIPOC, Hispanic, and RaceMissing are components of a categorical race variable (with shares of BIPOC, Hispanic, white, and students missing race in each district), and FRPM is the share of students eligible for free or reduced price meals (a proxy for poverty).

The summary statistics of each variable are below, alongside the model regression outputs. To check the robustness and explanatory power of the model, we calculated the R2 value and plotted residuals, neither of which supported strong explanatory power for the model.

**Figure 29. Summary Statistics of Model Variables**

| Variable | Min | Q1 | Median | Q3 | Max | Mean | SD | N |
|---|---|---|---|---|---|---|---|---|
| ADA-Enrollment (indexed to 2017) | 0.461 | 0.950 | 1.000 | 1.027 | 1.059 | 0.962 | 0.122 | 41 |
| Distance from Epicenter (ft) | 9,424.8 | 98,097.7 | 182,277.7 | 242,838.8 | 812,811.3 | 184,375.4 | 133,772.1 | 41 |
| Race BIPOC | 0.027 | 0.123 | 0.153 | 0.205 | 0.468 | 0.179 | 0.098 | 41 |
| Race Hispanic | 0.103 | 0.351 | 0.495 | 0.690 | 0.914 | 0.501 | 0.233 | 41 |
| Race Missing | 0.000 | 0.000 | 0.007 | 0.019 | 0.078 | 0.013 | 0.018 | 41 |
| Race White | 0.016 | 0.205 | 0.369 | 0.497 | 0.687 | 0.339 | 0.184 | 41 |
| FRPM | 0.057 | 0.363 | 0.551 | 0.682 | 0.853 | 0.507 | 0.228 | 41 |

Source: ECOnorthwest analysis of CDE data.

**Figure 30. Linear Regression Model Output**

*ADA-Enrollment (indexed to 2017)*

| Predictors | Estimates | CI | p |
|---|---|---|---|
| (Intercept) | 1.81 | 1.10 – 2.52 | <0.001 |
| distance from epicenter [log] | -0.06 | -0.11 – -0.00 | 0.03 |
| race bipoc | -0.35 | -0.83 – 0.14 | 0.16 |
| race hispanic | -0.06 | -0.45 – 0.32 | 0.75 |
| race missing | -1.11 | -3.64 – 1.41 | 0.39 |
| p frpm eligible ages 5 17 | -0.16 | -0.48 – 0.16 | 0.32 |
| Observations | 41 | | |
| $R^2$ | 0.22 | | |

Source: ECOnorthwest analysis of CDE data.

Constrained to district level data, the model has limited observations for any period. Additionally, the explanatory power of the model is modest, explaining about 22 percent of the variance in the change in ADA-Enrollment ratio.

The key takeaway from the regression model is the unintuitive direction of the coefficient for "distance to epicenter [log]" paired with a lack of statistical robustness. Our effect hypothesis is that there should be a positive relation between the ADA-Enrollment (indexed to 2017) and the distance to pollution. As distance from the "epicenter" increases, we expect lower absenteeism and therefore a higher ADA-Enrollment ratio. Furthermore, by indexing to 2017, we expect the change in this ratio since 2017 to be more significant and negative in districts closer to the pollution than farther away. The magnitude of the coefficient is low and

demonstrates poor robustness across specification, showing a high variance in effect magnitude and even direction in some specifications.

# Appendix H. Community and Stakeholder Engagement

## Stakeholder Engagement Plan

The stakeholder engagement approach was designed to do two things at once: **include and inform affected communities, while also generating practical information to strengthen the economic analysis**. The engagement was intentionally staged so that early qualitative input could help identify the most important economic pathways, data gaps, and survey priorities, followed by broader survey outreach to collect more structured evidence.

The engagement plan identified three primary objectives. First, it sought to inform affected communities about the study, why it was being conducted, how findings would be used, and what the study could and could not address. Second, it aimed to improve the economic analysis by documenting mechanisms that may be difficult to observe in administrative data, including business interruptions, visitor avoidance, household coping costs, and mitigation actions by businesses and public agencies. Third, it sought to capture differences in impacts across geographies, sectors, and populations, particularly where the burden of the crisis may be disproportionate.

The plan also emphasized inclusive engagement. This included bilingual and culturally responsive outreach in English- and Spanish-speaking communities, tailoring engagement methods to different stakeholder groups, and limiting redundant requests in recognition of existing community engagement fatigue. The first stage relied on interviews and small-group discussions organized by geography and sector; the second stage used surveys to broaden participation and test themes emerging from those discussions.

## Survey Distribution Plan

The survey distribution plan built directly on the earlier discussion groups. The surveys were designed around a two-stage question: **whether respondents had been affected by the pollution crisis and, if so, how they had changed their behavior as a result**. The surveys also sought to distinguish among effects associated with water quality, air quality, odor, public-health concerns, and beach closures, while identifying where people, activity, and spending may have shifted.

Four surveys were developed for different audiences: businesses, visitors, community members, and organizations. Distribution relied primarily on intermediary organizations with established relationships in the affected communities. Business-support organizations and chambers were asked to reach local businesses; tourism, lodging, recreation, beach, and destination-marketing organizations were used to reach visitors; and community-based organizations, schools, libraries, neighborhood groups, and other trusted messengers were identified as potential channels for community outreach. The distribution list began with

stakeholders identified during the focus group phase and expanded to include organizations such as healthcare providers, hotel and restaurant operators, recreation providers, real estate and workforce organizations, renter and homeowner groups, youth-serving organizations, and relevant public agencies.

The outreach strategy included direct stakeholder emails and a simple outreach toolkit with English- and Spanish-language email text, newsletter copy, social media language, and website links so partner organizations could easily share the surveys through their existing networks. High-priority partners, including chambers, business improvement districts, tourism organizations, and community-based organizations, were slated for targeted follow-up. The plan also anticipated using flyers with QR codes in high-traffic community and visitor locations if additional participation was needed.

The original distribution plan anticipated a four- to six-week field period with staged outreach, amplification through partner networks, review of response patterns, targeted gap-filling, and final reminders. It also called for tracking outreach activities and participation by geography, stakeholder type, language, and sector. In practice, the surveys remained open longer: they launched in May 2026, received additional outreach in July—including follow-up emails and direct flyering to local businesses—and the results used in this report reflect responses downloaded from SurveyMonkey on September 11, 2026.

The plan explicitly treated the surveys as **targeted engagement tools rather than statistically representative samples**. Results were intended to complement the study's quantitative data by documenting economic behaviors, perceived impacts, and lived experiences, while maintaining respondent anonymity and avoiding claims that the responses represent the broader population.

## Focus Group Summary

Kearns & West facilitated four virtual stakeholder discussion groups in 2026 to gather qualitative information about how the Tijuana River sewage crisis is affecting communities, businesses, recreation, tourism, public services, and quality of life. The first three groups were organized geographically around **Imperial Beach, Coronado, and San Ysidro/Nestor and the Tijuana River Valley**. A fourth regional discussion group convened additional economic-development and business stakeholders representing the broader South Bay. The geographic structure was intended to capture differences in how the crisis is experienced across affected communities and to identify impacts and data gaps that could inform the quantitative analysis.

Participants represented local governments, tourism and business organizations, environmental and community organizations, economic-development groups, agriculture and land-based users, and other organizations with direct experience of the crisis. Organizations represented across the four groups included the City of Imperial Beach, City of Coronado, Coronado Chamber of Commerce, Discover Coronado, Coronado Museum, Wildcoast, Olivewood Gardens/Tijuana River Valley Garden, 4 Walls International, Civic Communities, Friendship Park, Resource Conservation District, S&S Ranch, San Diego Coastkeeper, Tijuana

River Valley Equestrian Association, San Diego Chamber of Commerce, and South County Economic Development Center.

### IMPERIAL BEACH

Participants described the crisis as affecting both the local economy and the community's identity. Themes included reduced tourism and visitation, commercial vacancies, missed development and investment opportunities, workforce challenges, public-sector costs, and disruption to recreation and community life. Participants described families leaving or considering leaving the area, younger generations growing up without access to the ocean, and activities such as surfing and junior lifeguard programs shifting to other communities. They also emphasized that lower-income and resource-dependent populations may face disproportionate burdens, including people who rely on fishing, community gardens, or small-scale agriculture.

Participants also raised impacts on agriculture and community organizations. Repeated flooding and contamination were described as damaging crops, infrastructure, and operations, while organizations reported relocating activities or diverting staff and funding toward crisis response. City representatives described the opportunity cost of staff time devoted to the sewage crisis and concerns about attracting businesses, workers, and investment while neighboring communities do not face the same environmental conditions

### CORONADO

The Coronado discussion focused heavily on the visitor economy and community reputation. Participants described reduced foot traffic during beach closures, canceled or shortened hotel stays, refund requests, negative reviews, and questions from visitors and meeting planners about whether the water is safe. Tourism and business stakeholders expressed concern that ongoing closures are weakening Coronado's reputation as a clean, high-quality coastal destination and reducing its competitive advantage relative to other beach communities.

Participants also described effects on beach-dependent businesses, including surf schools, camps, wedding and picnic companies, as well as spillover effects on hotels, restaurants, retailers, and other visitor-serving businesses. Local government and community organizations reported additional operational burdens, including staff time spent explaining closures, changing signage, adjusting programs, and responding to public concerns. Participants also noted that the economic effect can extend beyond the beach itself when visitors perceive the broader destination as closed or unsafe.

### SAN YSIDRO/NESTOR AND THE TIJUANA RIVER VALLEY

Participants in the San Ysidro/Nestor and Tijuana River Valley discussion described a somewhat different mix of effects. Key themes included disruption to agriculture and land-based businesses, reduced access to recreational and cultural destinations, health-related expenses, and constraints on household mobility. Participants described repeated flooding

affecting farms and community gardens, with costs associated with crop losses, soil testing, cleanup, and repairs to roads, irrigation systems, fencing, and other infrastructure.

Participants also described reduced or inconsistent access to Border Field State Park, Friendship Park, trails, and other destinations, which can reduce visitation, programming, and cross-border activities. Community organizations noted that fewer programs and events can also affect their ability to demonstrate impact and compete for grant funding. Participants raised concerns that high regional housing costs make it difficult for some residents to move away from poor environmental conditions, potentially increasing the burden on households with fewer alternatives.

### REGIONAL AND ECONOMIC-DEVELOPMENT PERSPECTIVES

The fourth discussion group broadened the conversation from localized effects to regional economic development. Participants described the crisis as increasingly affecting business and investment perceptions of the South Bay, not just waterfront recreation and tourism. They raised concerns that businesses may hesitate to locate or invest in the area because of environmental and public-health risks, creating a broader deterrent to investment and workforce recruitment.

Participants also emphasized the vulnerability of small businesses that depend on beach activity and have limited resources to absorb prolonged declines in customer traffic. At the same time, they described a role for coordinated economic-development responses, including emergency loans and grants, technical assistance, business promotion, access to capital, and efforts to bring visitors and activity back to affected communities. Participants consistently linked economic recovery to both near-term business support and long-term infrastructure and binational coordination.

### CROSS-CUTTING THEMES

Across the four discussions, several themes appeared repeatedly:

- **Changes in visitation and recreation:** Participants described residents and visitors avoiding affected beaches and communities, relocating activities, or choosing other destinations.
- **Business and investment effects:** Stakeholders reported lower foot traffic, reduced sales, closures or relocation, and concerns about missed investment and development opportunities.
- **Community reputation and perception:** Participants repeatedly emphasized that public awareness and perceptions of pollution can affect behavior even when a specific beach or activity remains available.
- **Operational and public-sector costs:** Local governments and organizations reported diverting staff time and resources toward communication, closures, programming changes, and crisis response.

- **Health and quality-of-life burdens:** Participants described concerns about air and water exposure, reduced outdoor activity, medical costs, and households feeling unable to relocate.
- **Distributional effects:** Several groups emphasized that lower-income households, small businesses, resource-dependent users, and organizations with limited financial capacity may have fewer options to adapt.
- **Need for coordinated action:** Participants consistently called for long-term infrastructure solutions alongside near-term support for affected businesses, residents, and organizations.

## Complete Survey Results

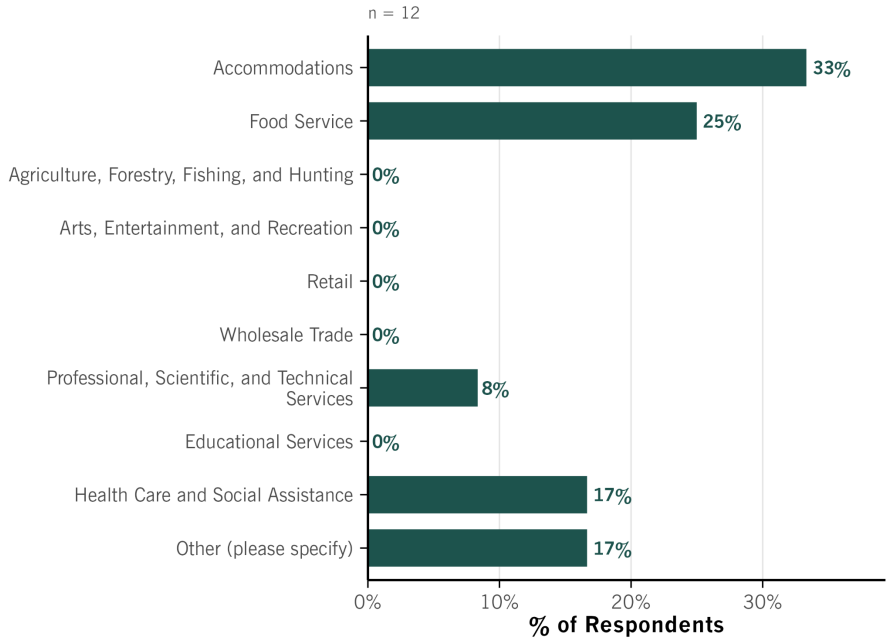
**Figure 31. Survey Response Summary**

| Survey | Total Responses |
|---|---|
| Business Impacts | 12 (12 English, 0 Spanish) |
| Community Impacts | 175 (175 English, 0 Spanish) |
| Organization Impacts | 6 (6 English, 0 Spanish) |
| Visitor Impacts | 53 (52 English, 1 Spanish) |
| **Total** | **246** |

Source: ECOnorthwest

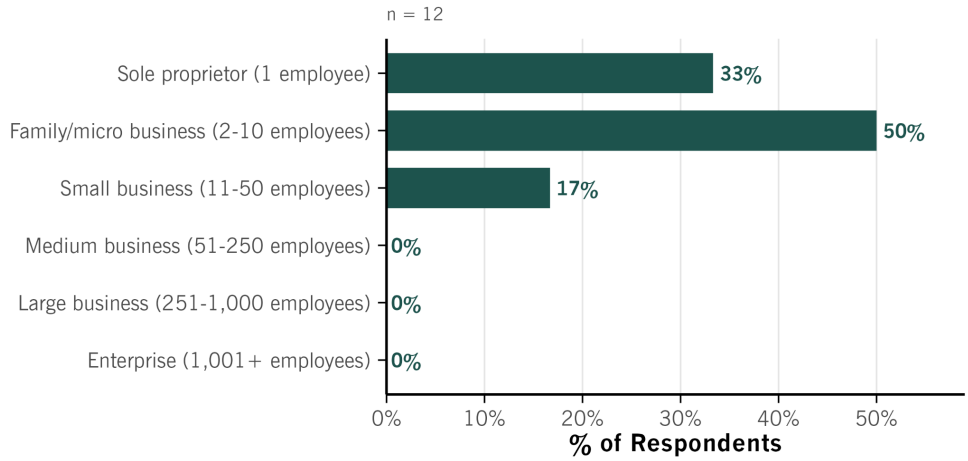
## BUSINESS IMPACTS

**Figure 32. Which of the following industries best describes your business?**



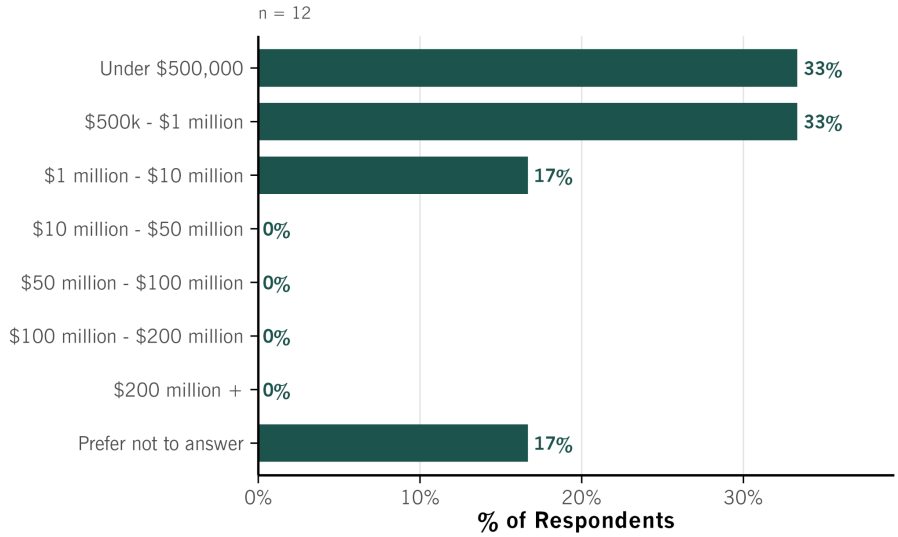

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 33. Which of the following best describes your business employment structure?**



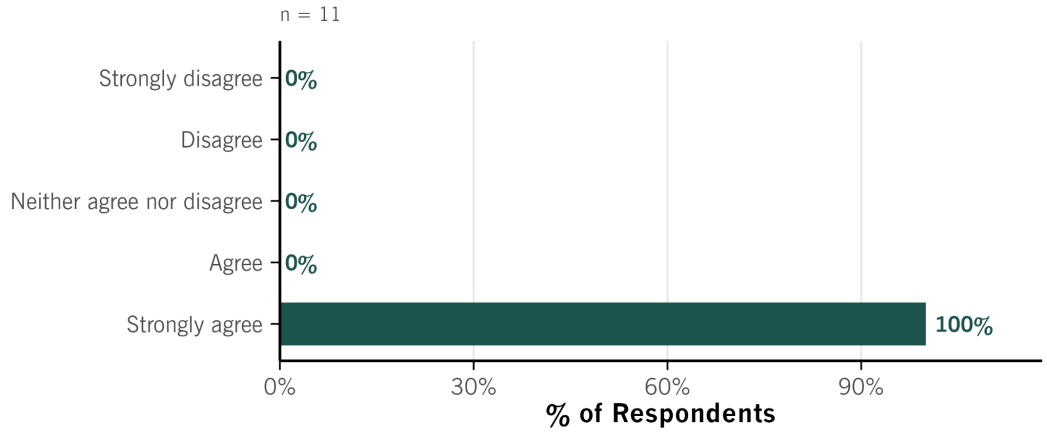

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 34. What is your company's estimated average annual revenue?**



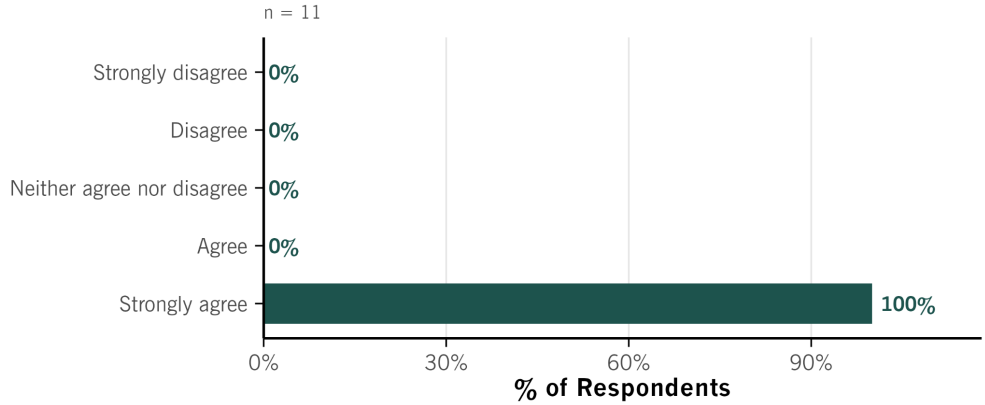

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 35. I believe that pollution in the Tijuana River is a serious concern for businesses and the local economy.**



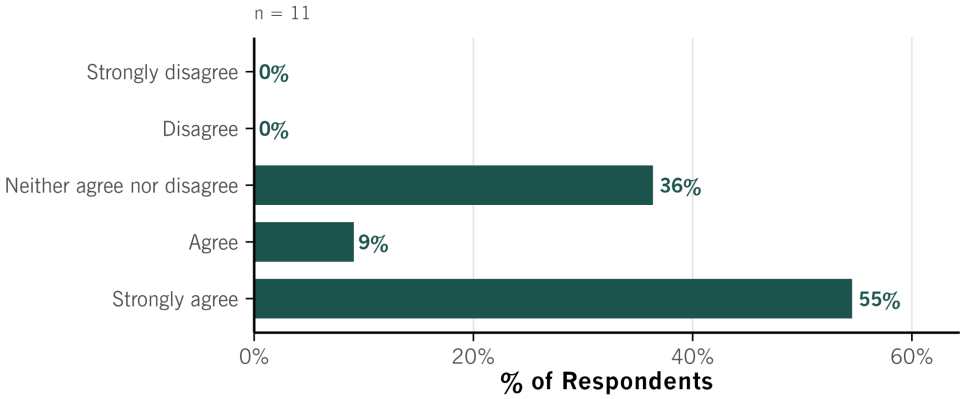

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 36. The Tijuana River pollution crisis has directly impacted my business.**



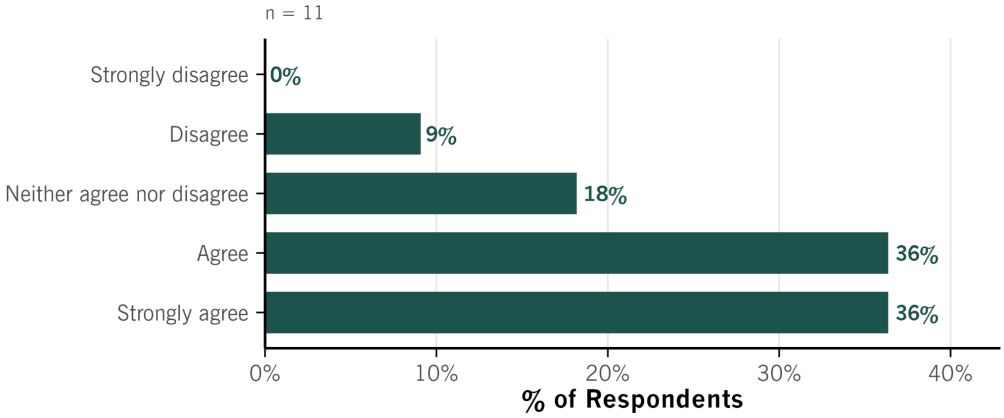
Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 37. I believe that my employees are experiencing negative health impacts from pollution which has caused them to miss work.**



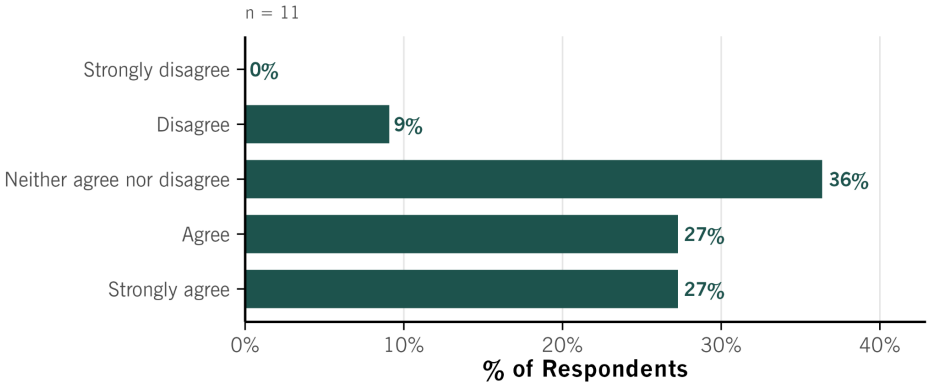

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 38. I have struggled to attract new employees because of pollution and related impacts.**



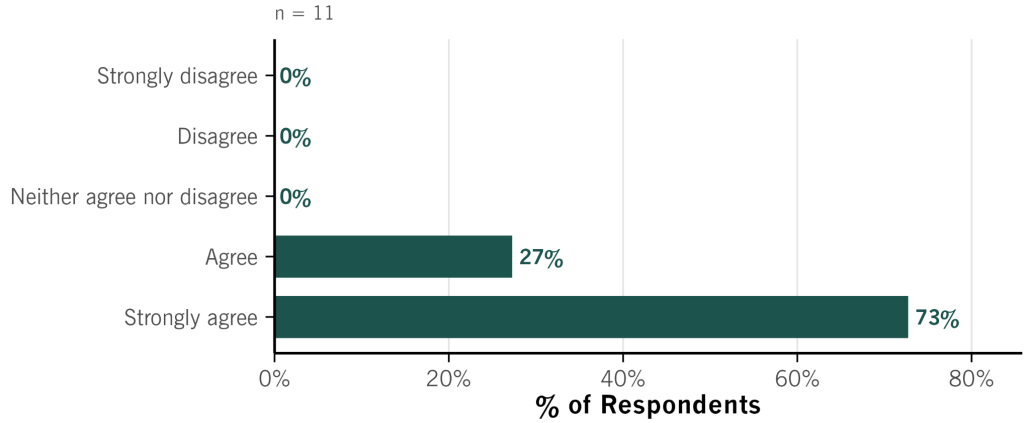

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 39. I have struggled to retain existing employees because of pollution and related impacts.**



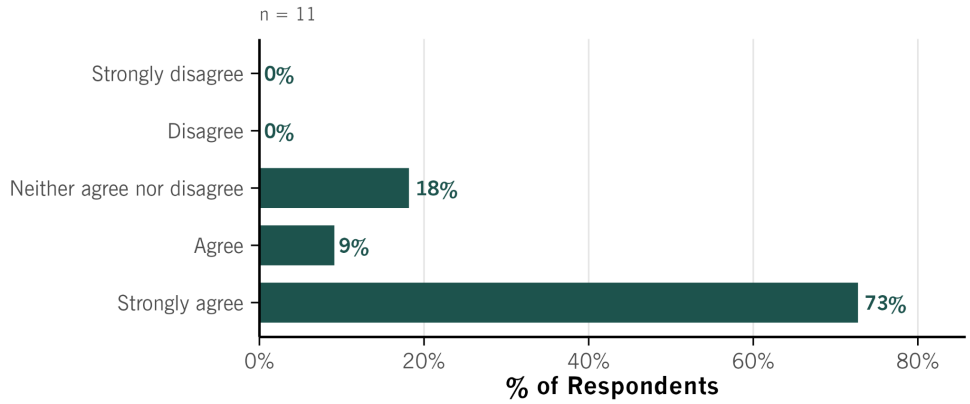

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 40. I have struggled to attract new customers because of pollution and related impacts.**



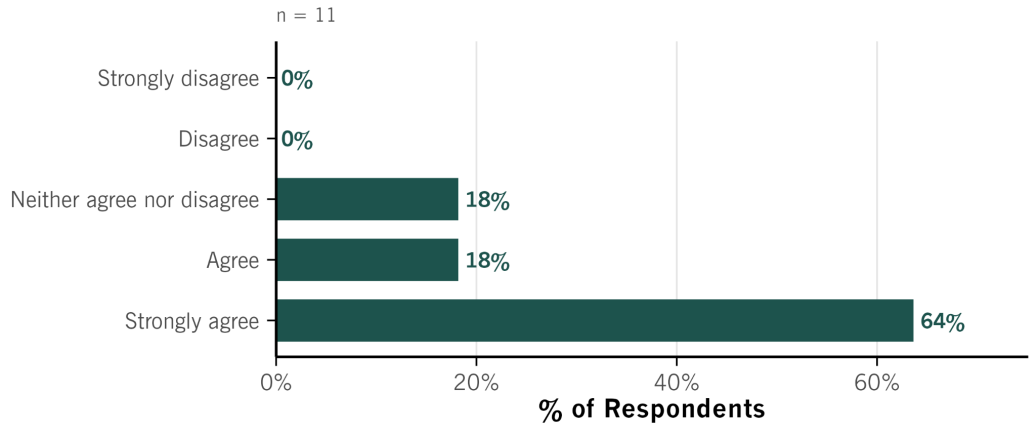

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 41. I have struggled to retain existing customers because of pollution and related impacts.**



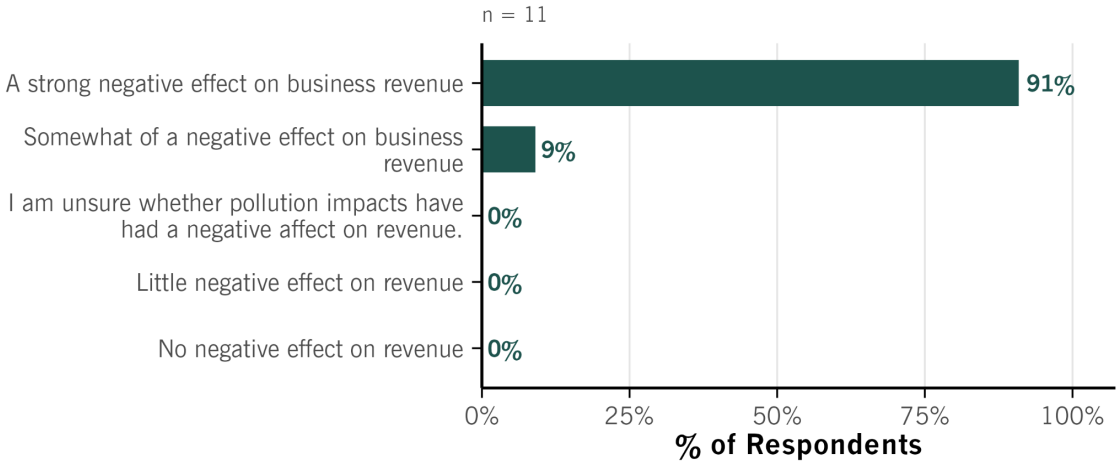

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 42. I believe that customers are choosing to visit or work with businesses in other areas of the County due to pollution and related impacts.**



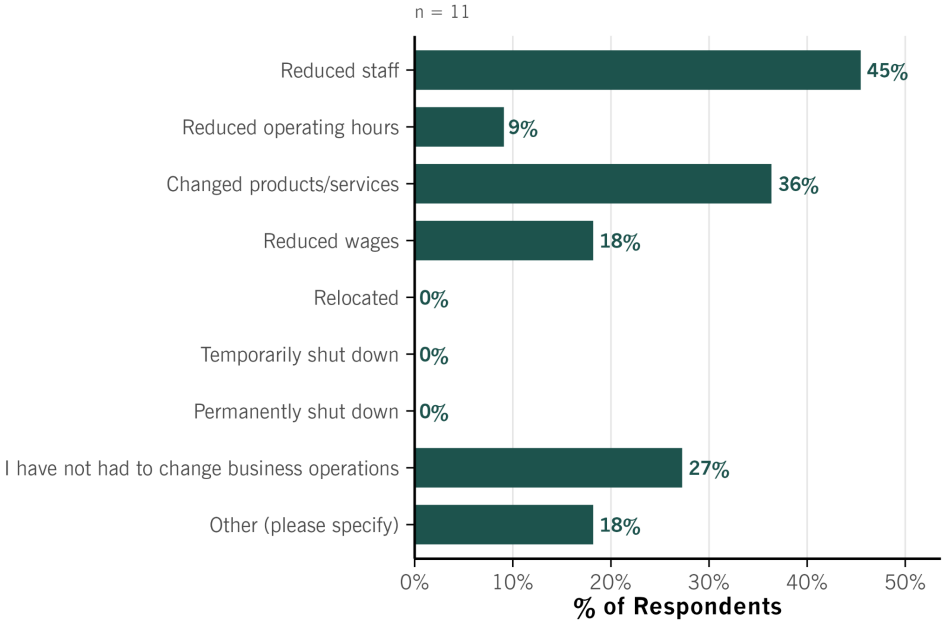

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 43. In your view, pollution in the Tijuana River has had:**



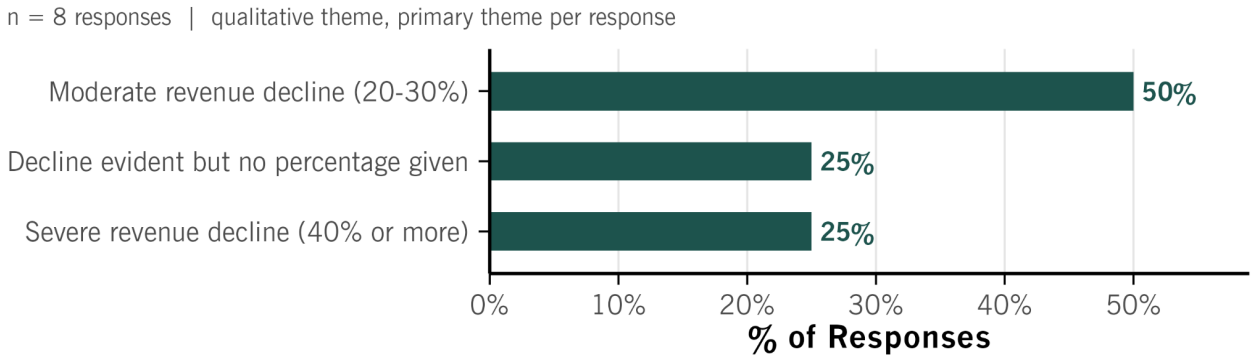

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 44. How has reduced revenue impacted your business operations?**



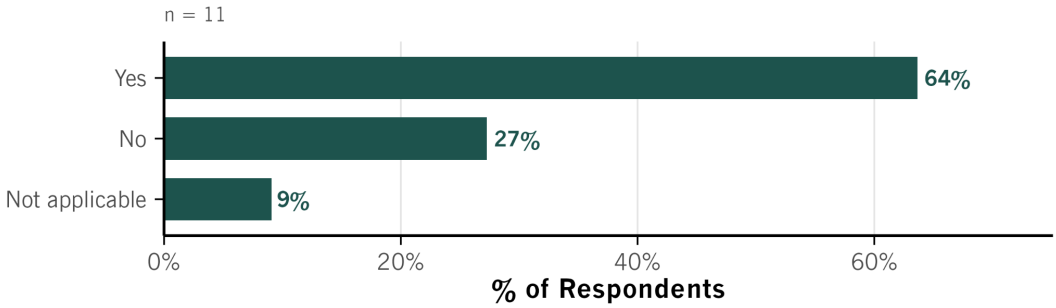

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 45. If you're willing to share, if revenue has changed, can you provide an estimate (in percentage) of annual revenue changes (i.e., 15 percent reduction per year)?**



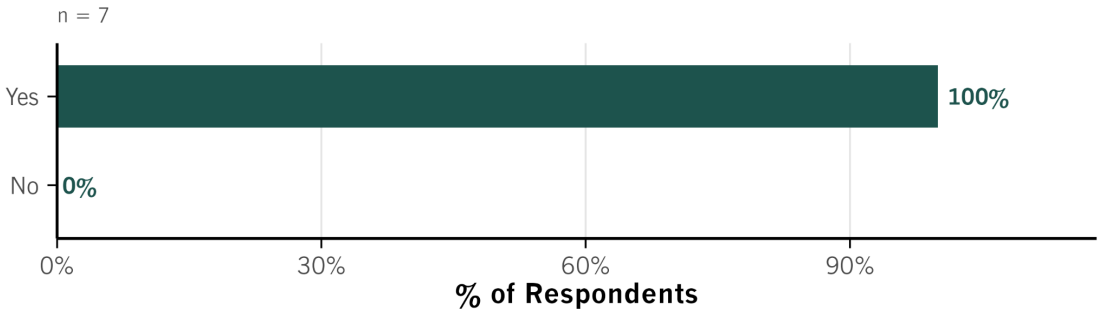

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 46. In the past 2 years, have you considered relocating or expanding business operations outside of your current location?**



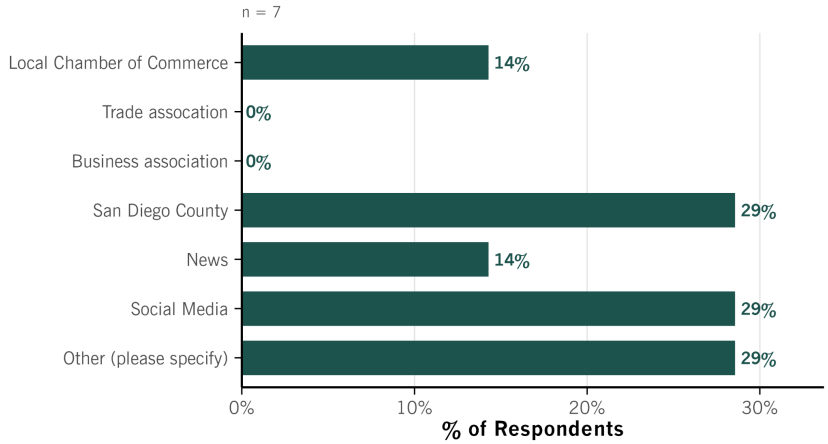

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 47. Has pollution in the Tijuana River and related impacts influenced your decision to expand or relocate?**



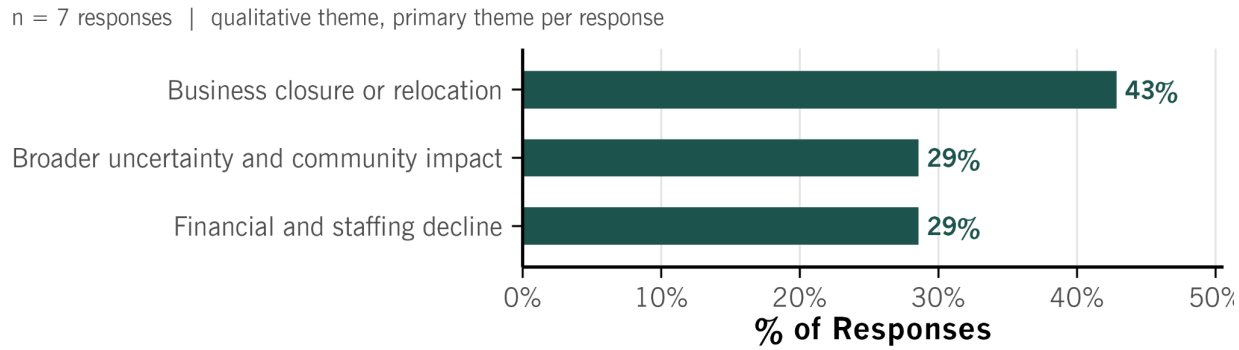

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 48. How did you hear about this survey?**



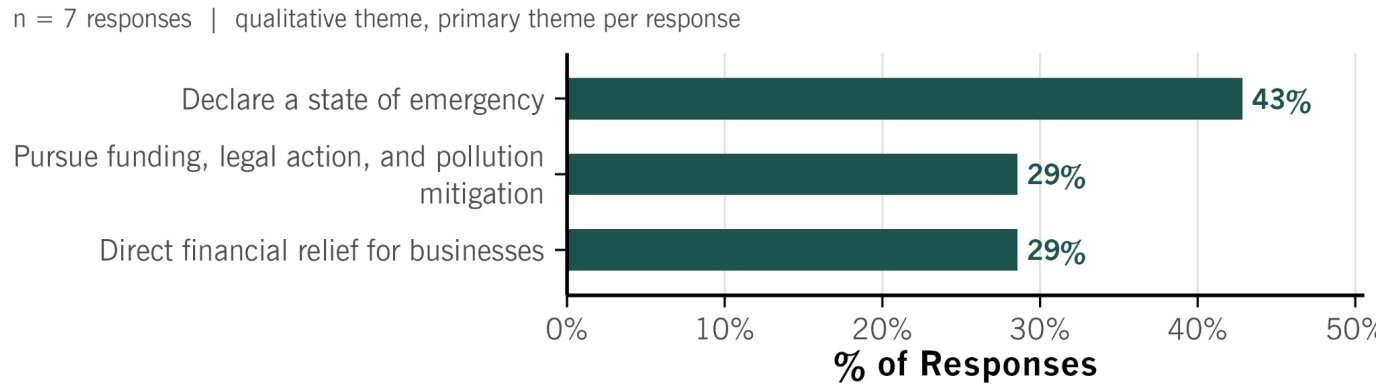

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 49. If conditions remain the same, how would your business operations be affected over the next 2-5 years?**



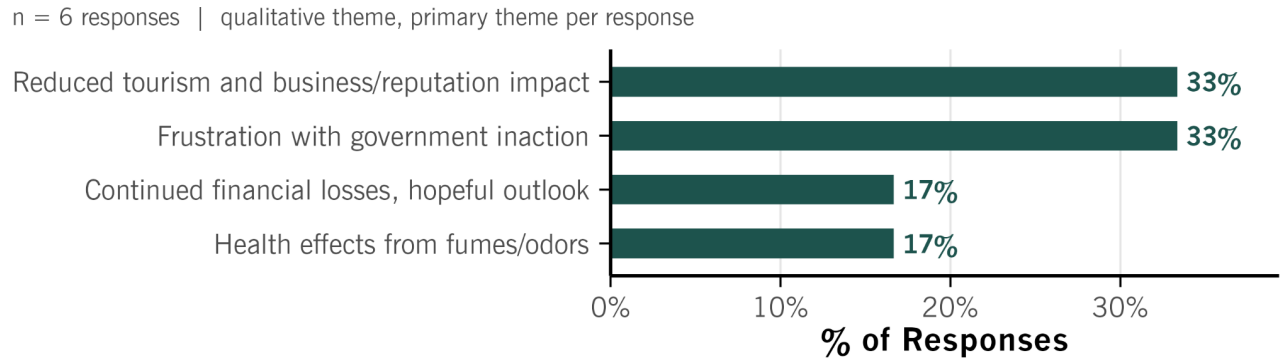

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 50. What could the County do to mitigate the economic impacts of the Tijuana River Valley crisis?**




Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

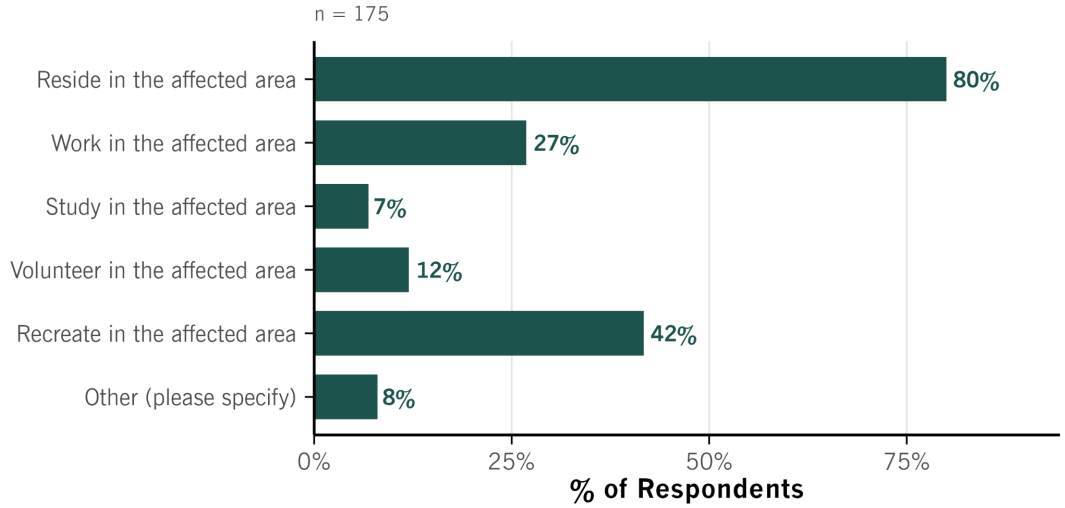
**Figure 51. Is there anything else you would like to share about how pollution in the Tijuana River has impacted your business?**




Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

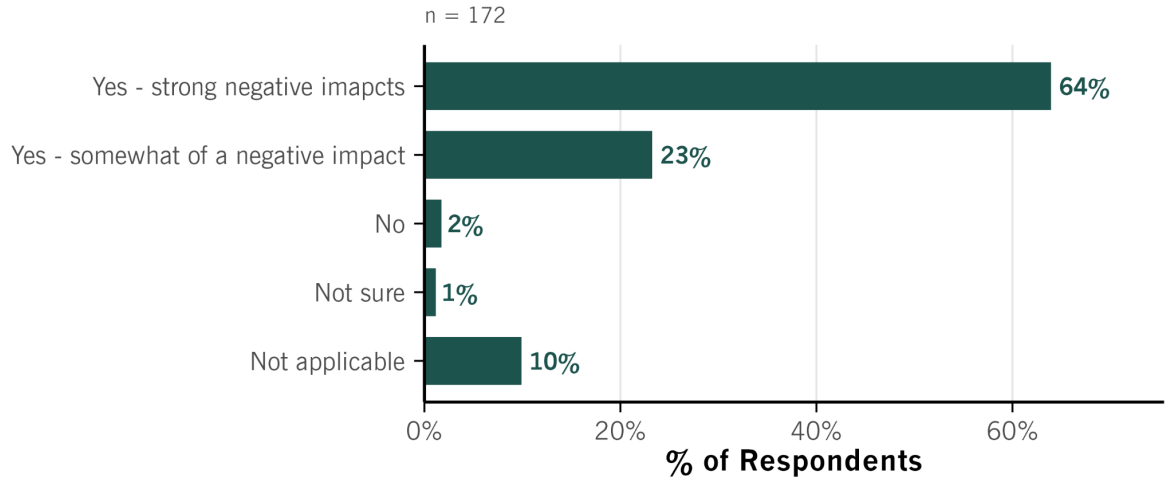
## COMMUNITY IMPACTS

**Figure 52. What is your reason for completing this survey? (select all that apply)**



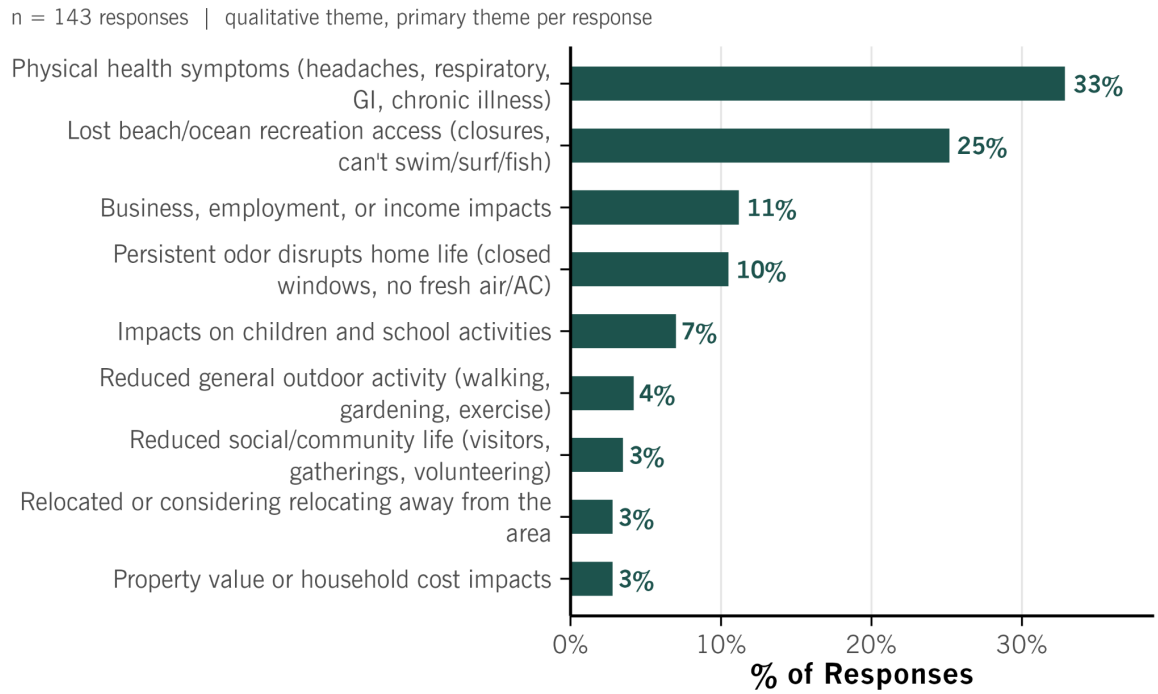

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 53. Have you experienced negative impacts to your work, school, or volunteer activities in the affected area because of pollution?**



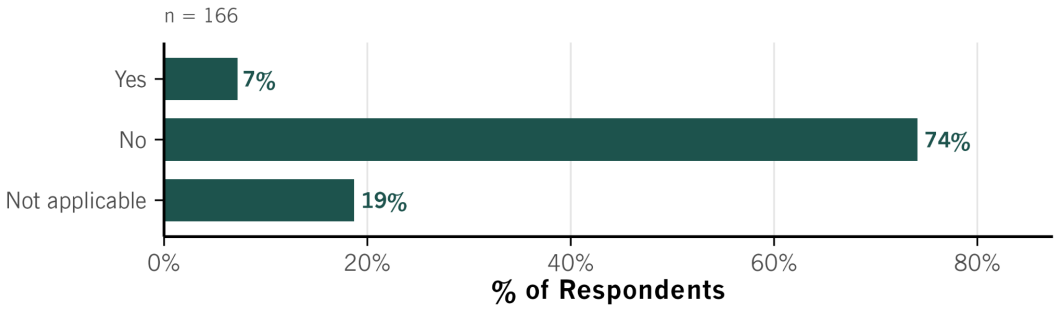

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 54. If yes, can you describe the impacts?**



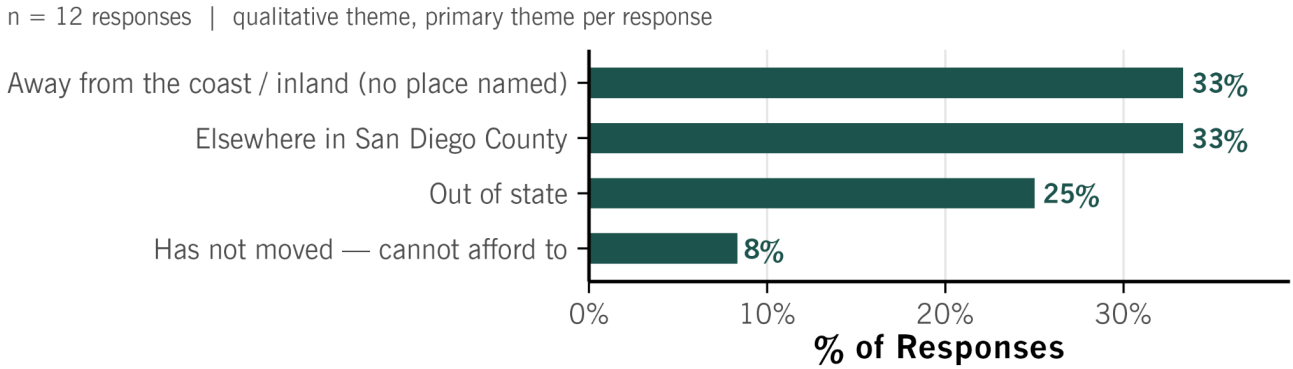

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 55. Have you previously moved residences due to the impacts of pollution in the Tijuana River?**



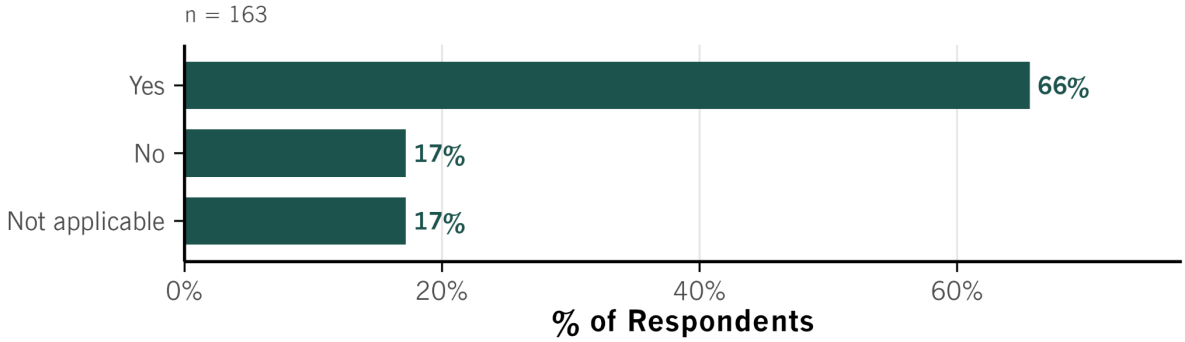

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 56. If yes, where did you move to?**



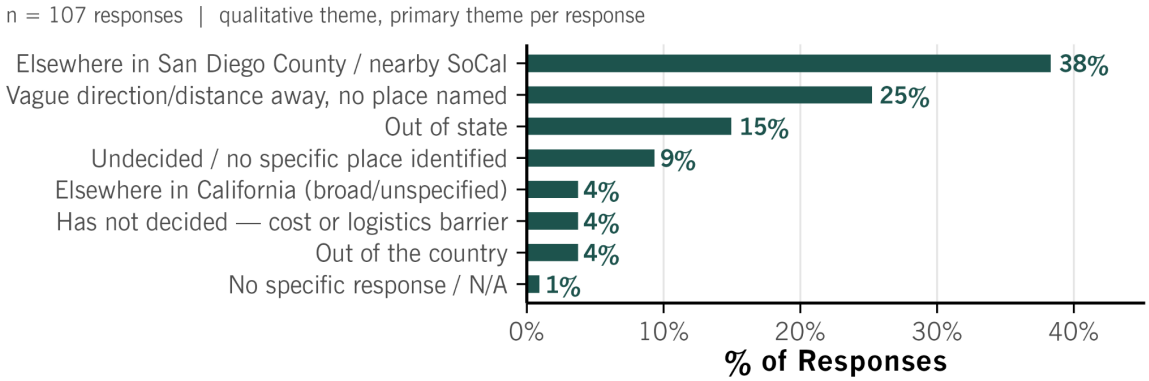

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 57. Have you considered moving because of pollution in the Tijuana River?**



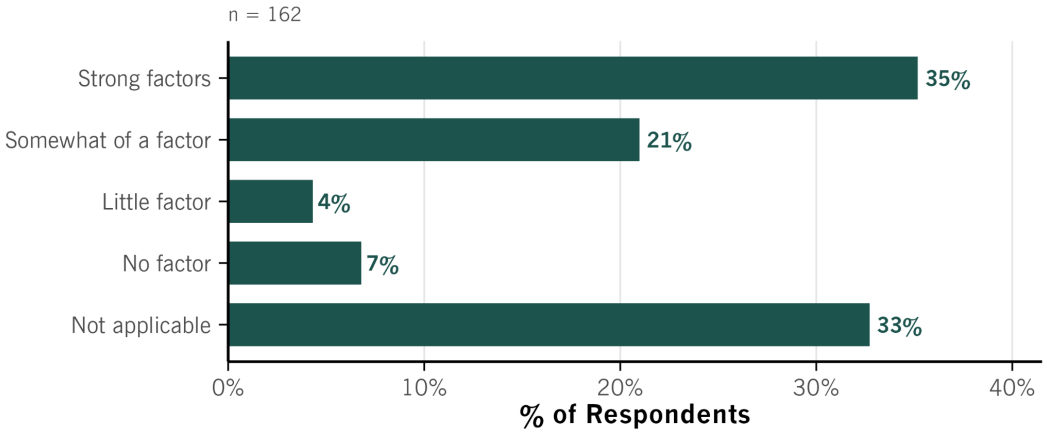

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 58. If yes, where have you considered moving to?**



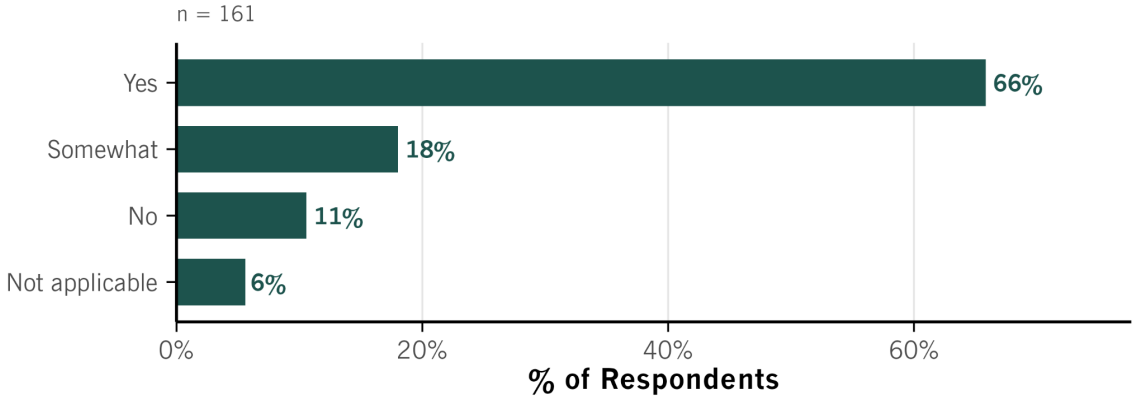

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 59. To what extent have pollution impacts factored into your decision of whether to delay or abandon renovations or improvements to your property?**



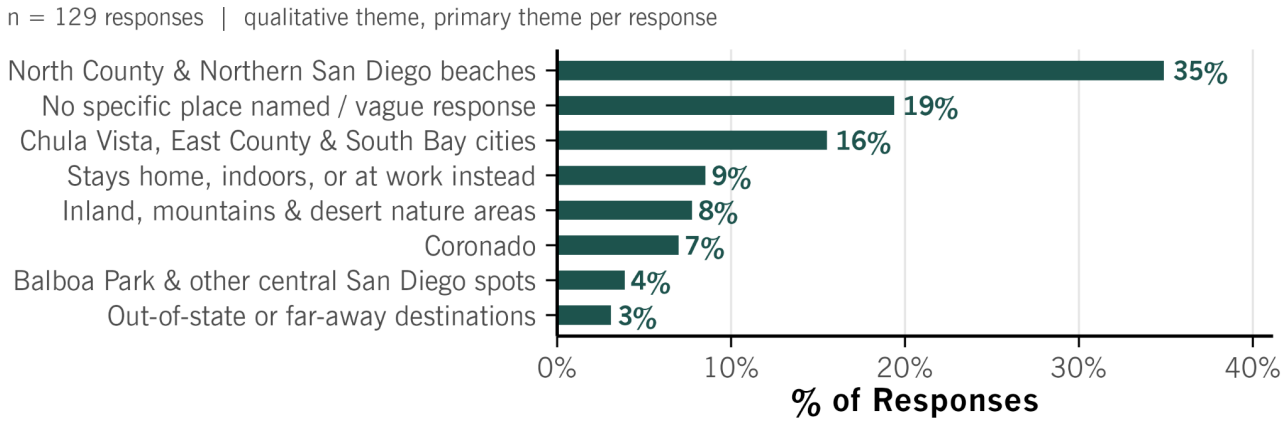

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 60. Are you choosing to spend less time in your neighborhood or surrounding areas because of the pollution?**



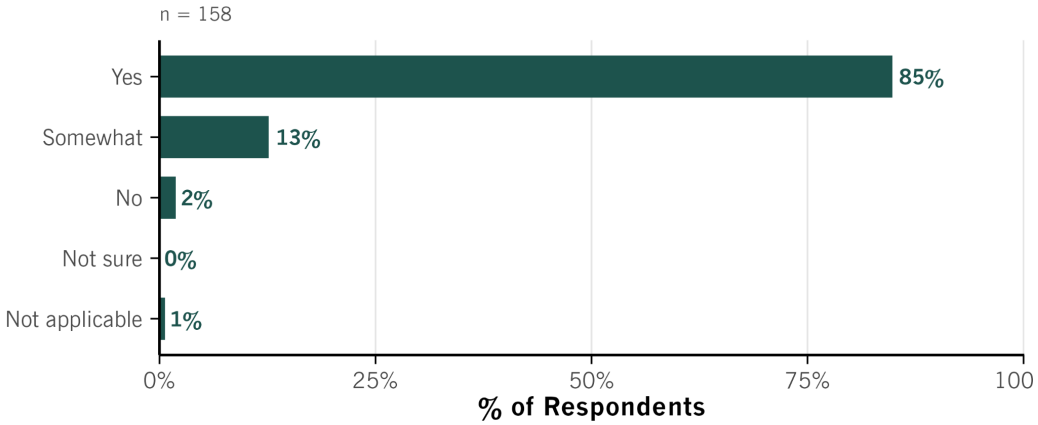

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 61. If yes, where are you choosing to go instead?**



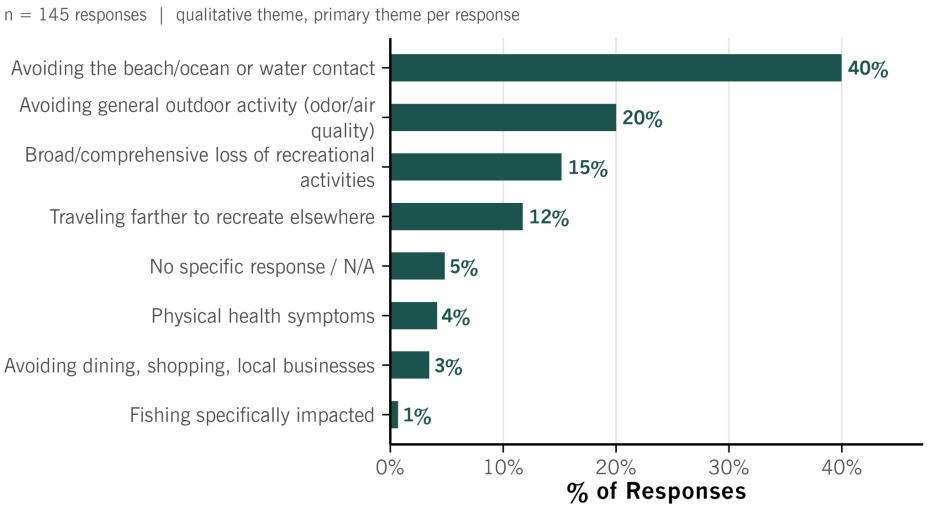

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 62. Are you limiting your recreational activities in the affected area (i.e. walking, swimming, shopping, dining) due to pollution?**



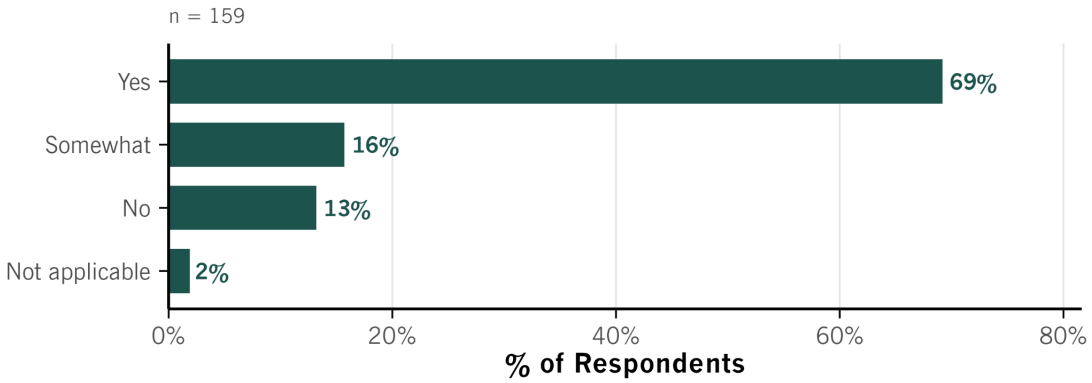

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 63. If yes, can you describe the impacts pollution has had on your recreational activities?**



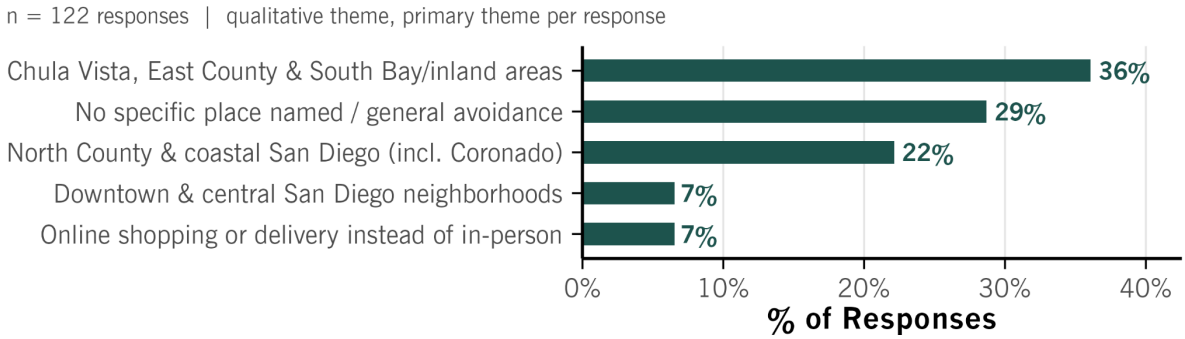
Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 64. Has pollution influenced your decision to shop at, visit, or use businesses outside of the affected area instead of businesses within it?**



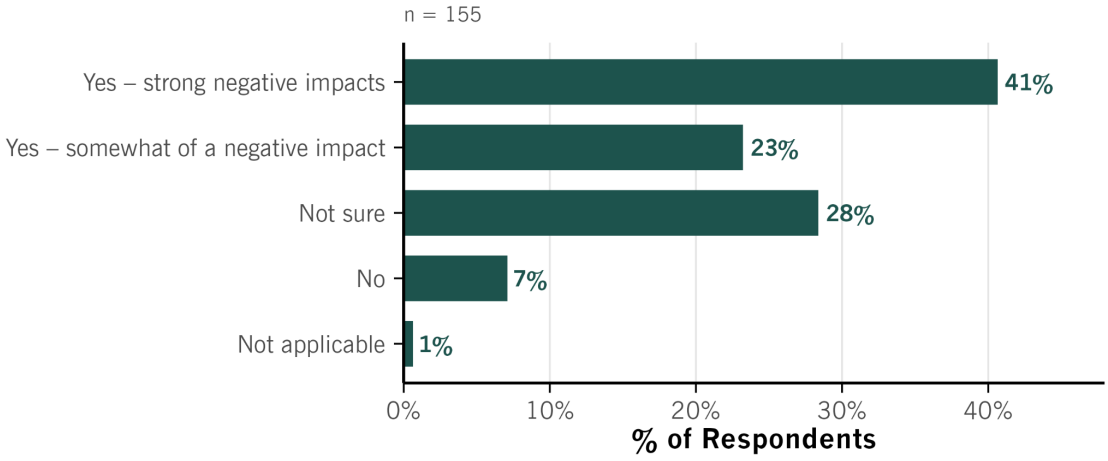

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 65. If yes or somewhat, where are you choosing to shop instead?**



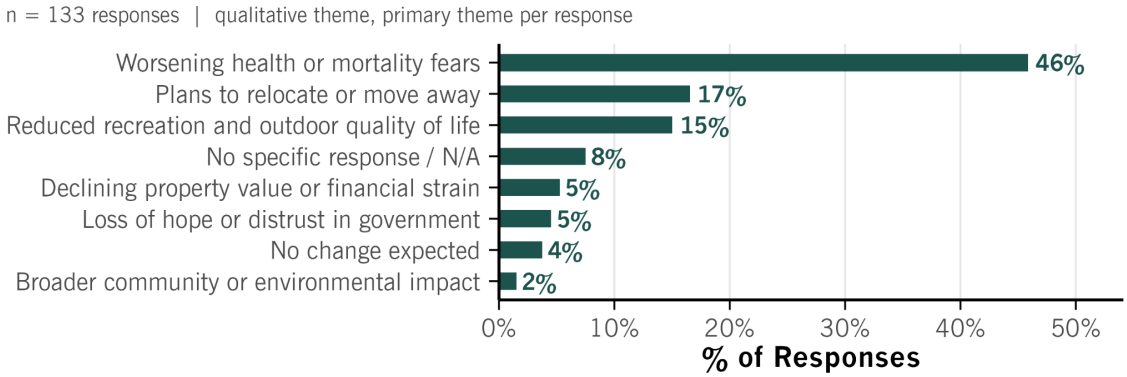

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 66. Have you experienced negative health impacts because of the pollution?**



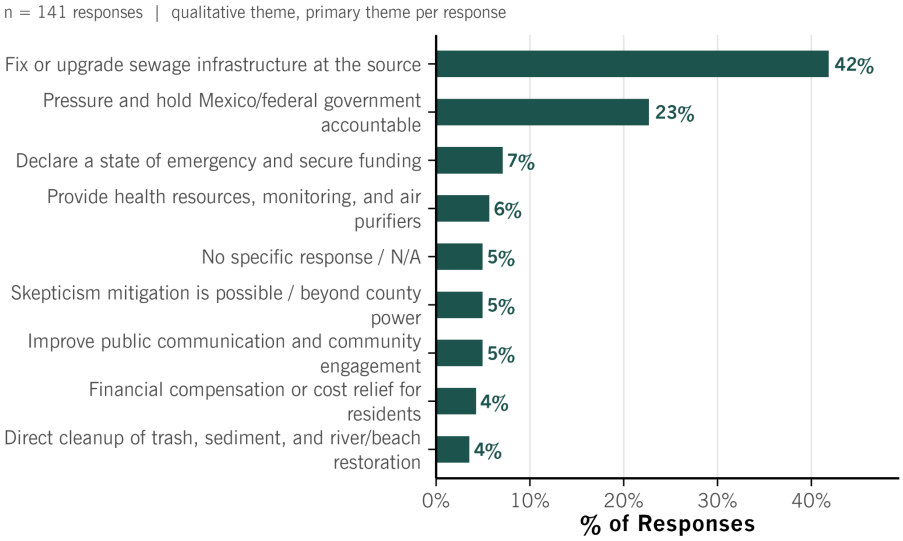

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 67. If conditions remain the same, how would you be affected over the next 2-5 years?**



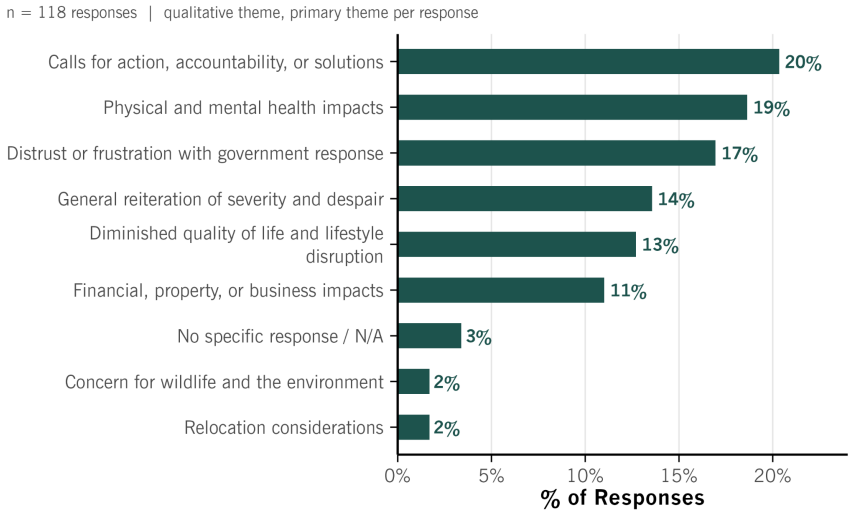

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 68. What could the County do to mitigate the community impacts of the Tijuana River Valley crisis?**




Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

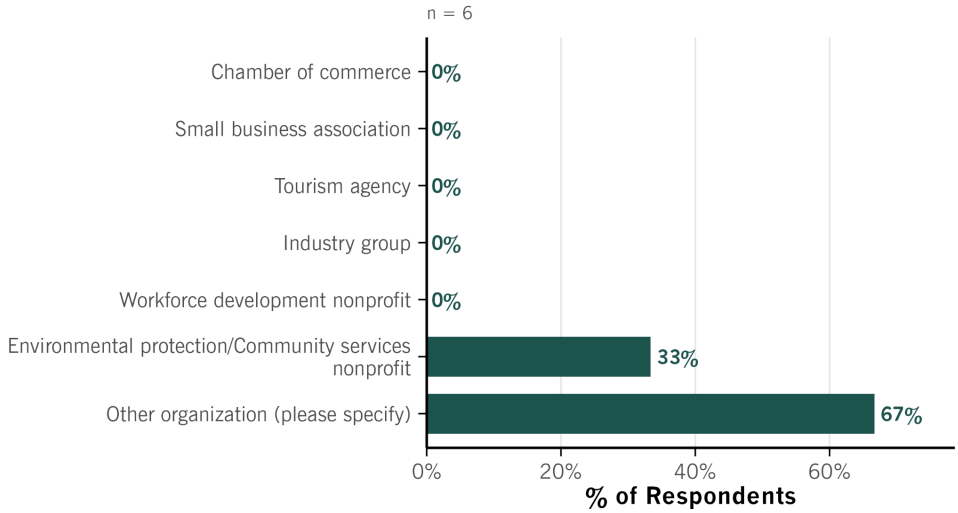
**Figure 69. Is there anything else you'd like to share about how pollution in the Tijuana River has impacted you?**




Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

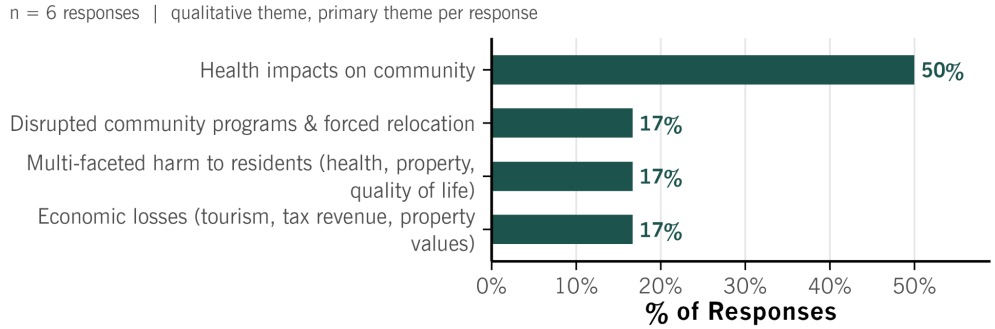
## ORGANIZATION IMPACTS

**Figure 70. What type of organization do you operate or manage?**



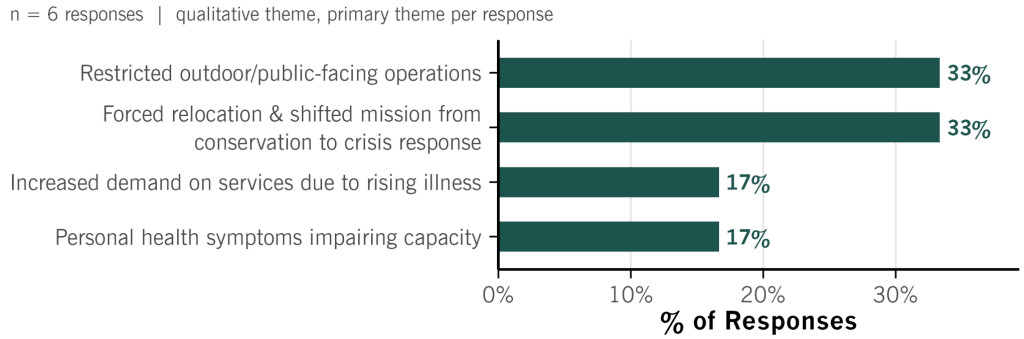

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 71. Can you describe how pollution in the Tijuana River has impacted the businesses or communities you serve?**



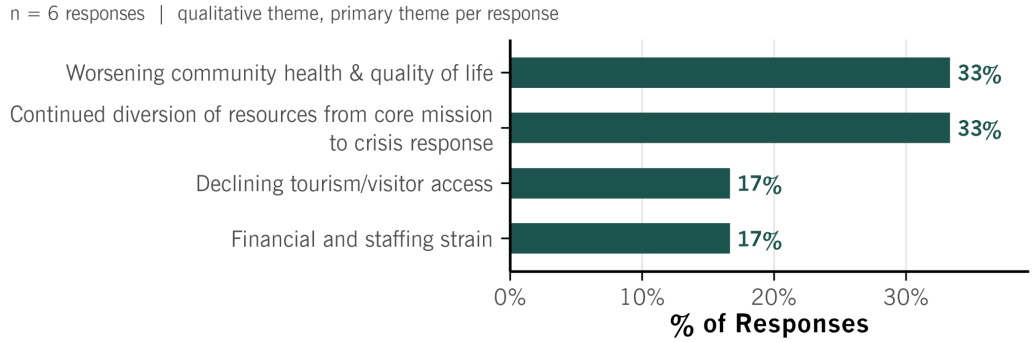

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 72. Can you describe how pollution in the Tijuana River has impacted your own operations and ability to serve your clients/communities?**



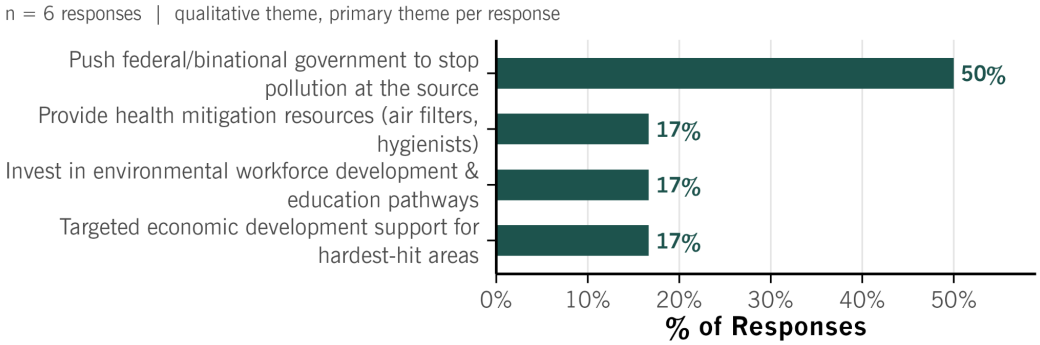

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 73. If conditions remain the same, how would your organization be affected over the next 2-5 years?**



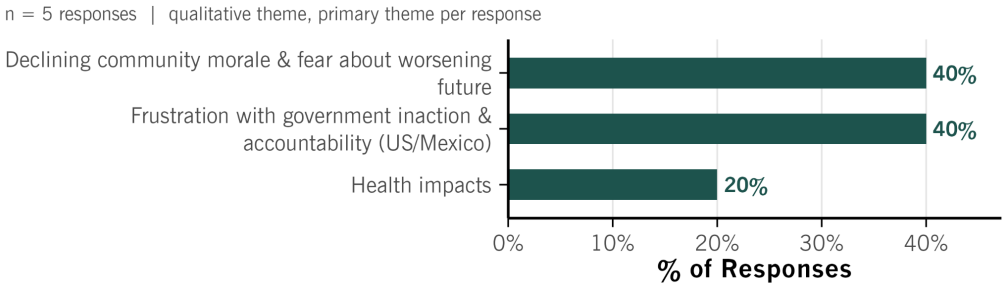

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 74. What could the County do to mitigate the economic impacts of the Tijuana River Valley crisis?**




Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

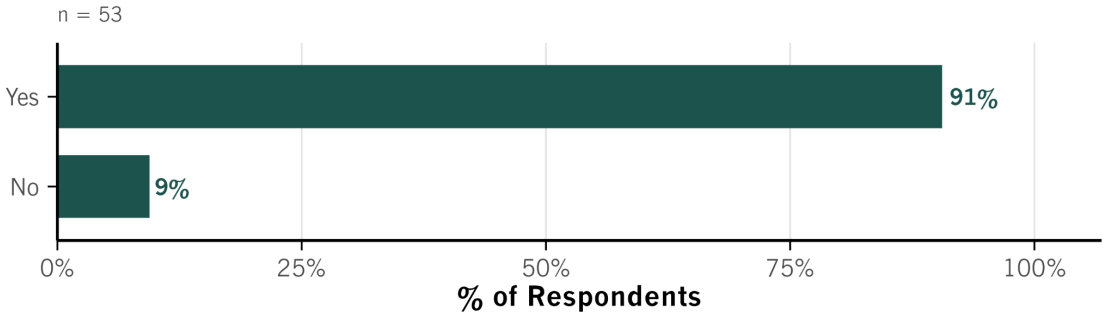
**Figure 75. Is there anything else you would like to share about how pollution in the Tijuana River has impacted on your organization or the community you serve?**




Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

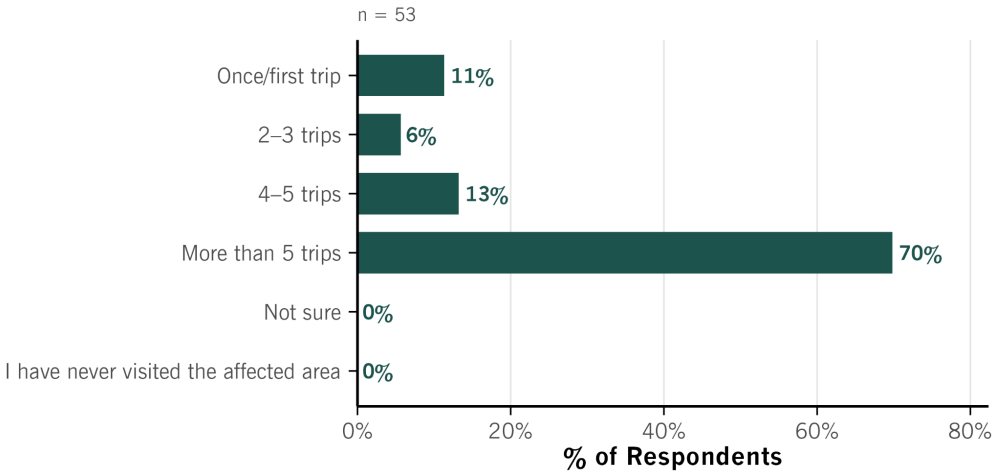
## VISITOR IMPACTS

**Figure 76. Have you recently visited the area? (please select Yes if you are currently visiting the area)**



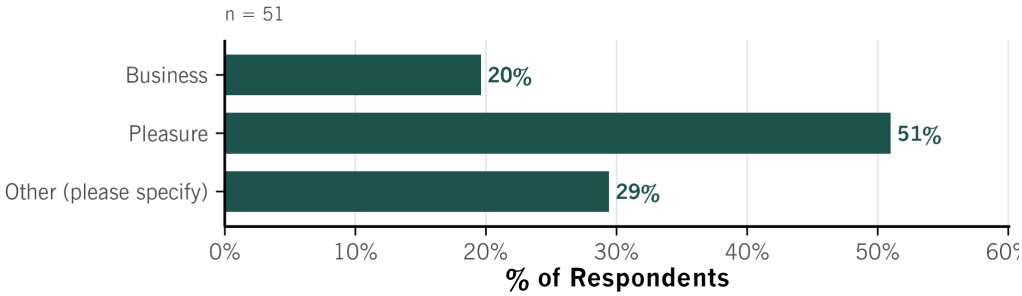

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 77. In the past 5 years, how many times have you visited the area?**



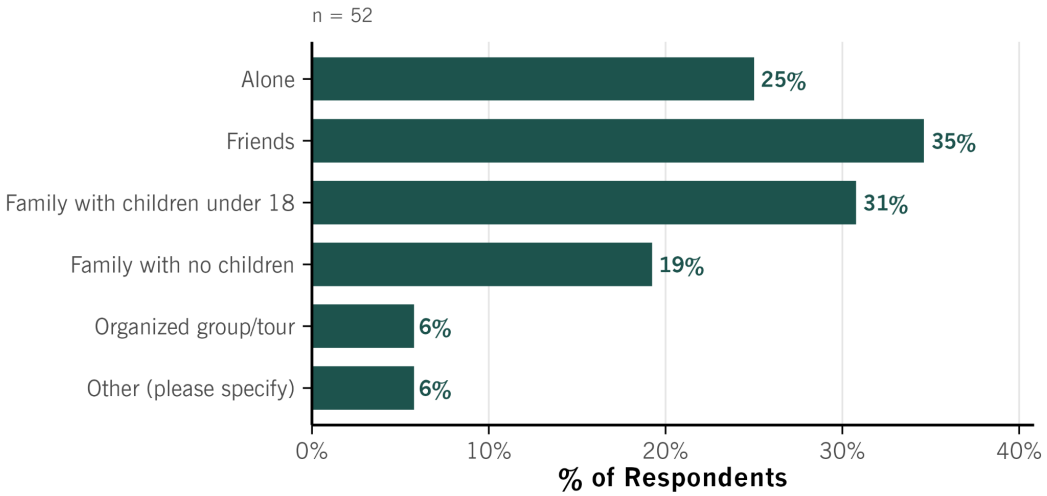

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 78. What was the purpose of your visit to the area?**



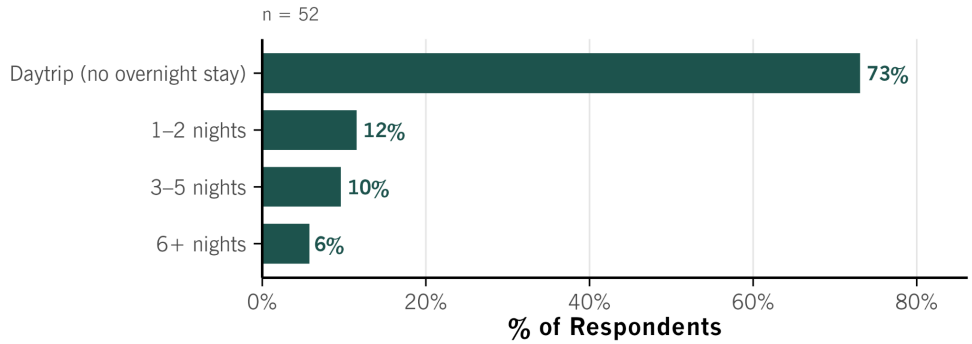

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 79. Who were you traveling with on this trip? (select all that apply)**



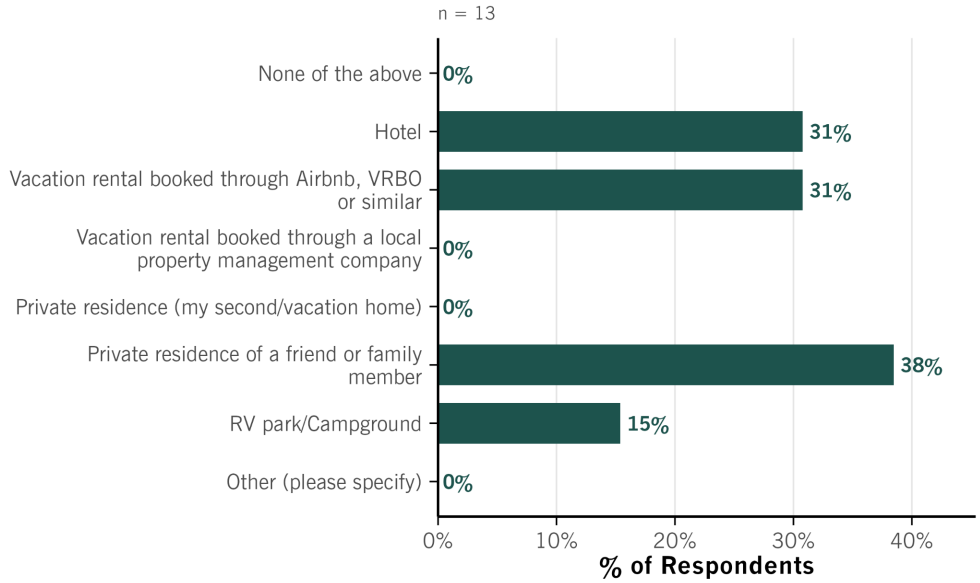

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 80. How long was your visit to the area?**



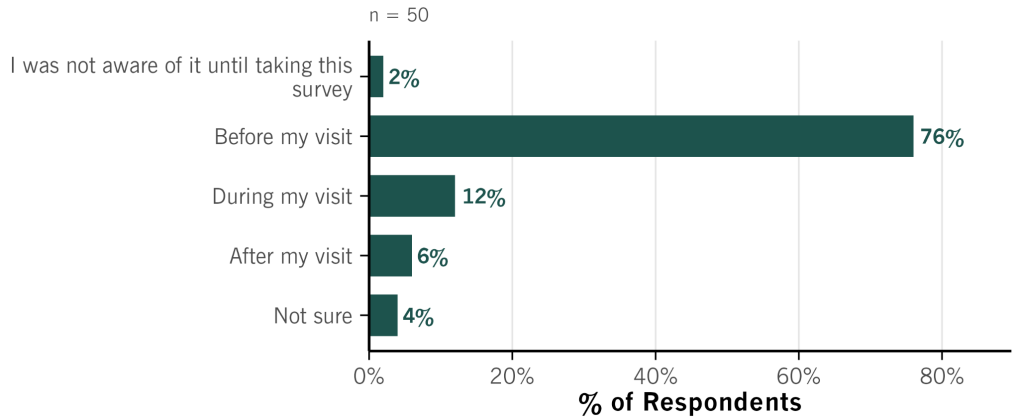

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 81. Which types of accommodations did you use on your trip? (select all that apply)**



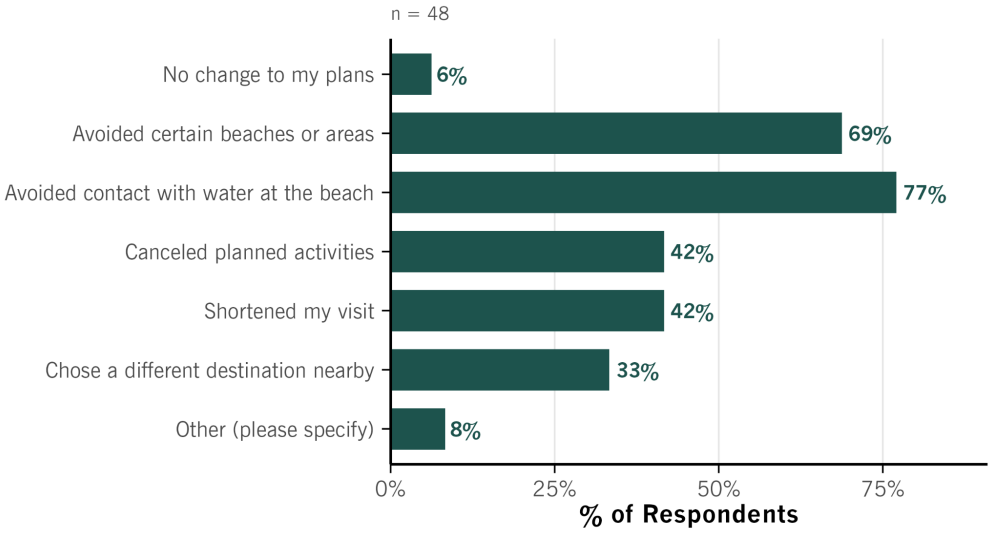

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 82. When did you first become aware of the Tijuana River pollution and associated beach closures?**



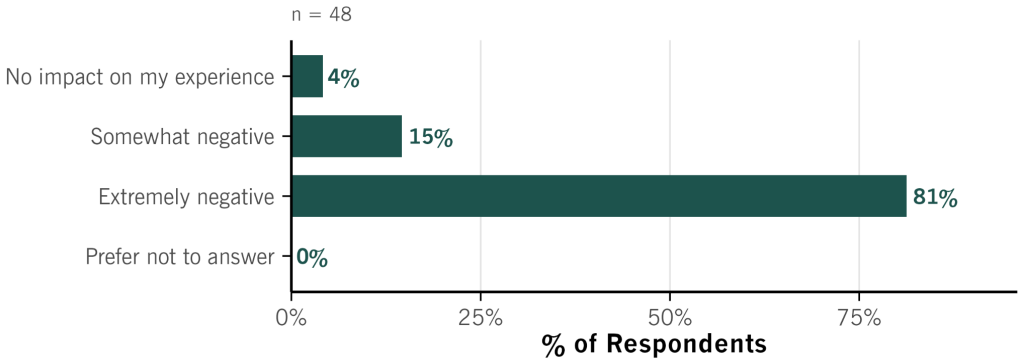

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 83. How did river pollution or beach closures affect your behavior during your visit? (select all that apply)**



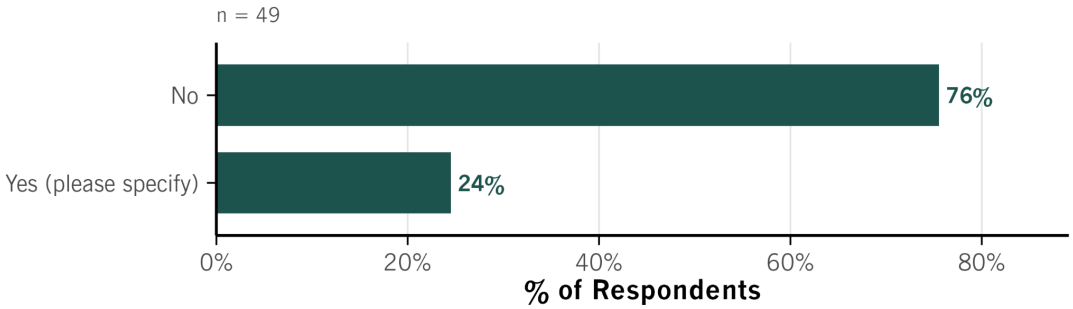

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 84. Overall, what was the effect of the Tijuana River pollution on the quality of your experience?**



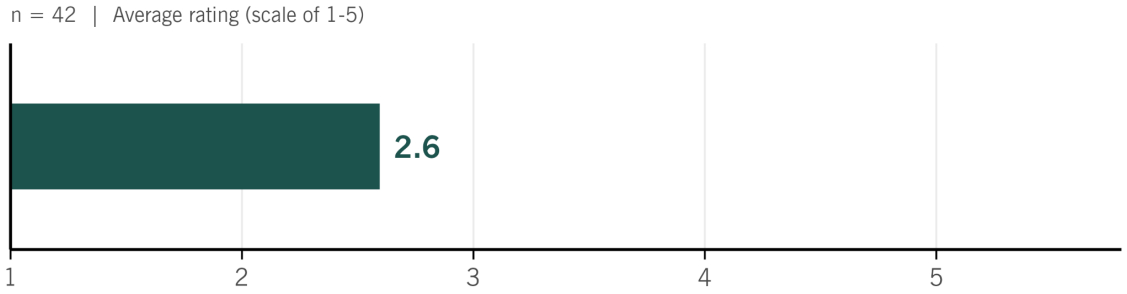

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 85. Did you experience any health concerns after visiting the affected area?**



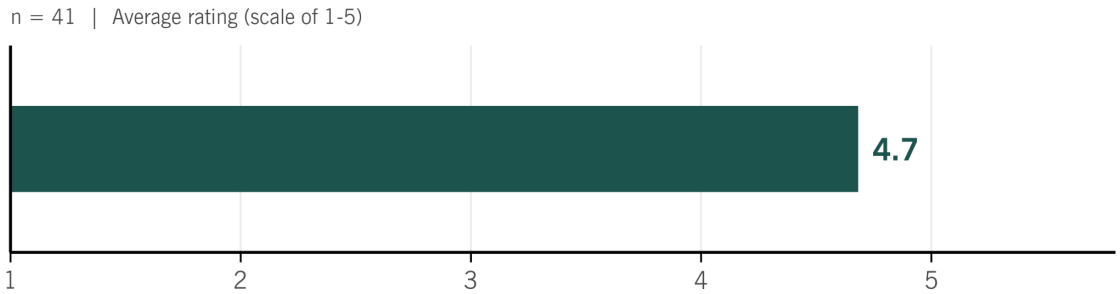

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 86. On a scale of 1–5, how likely are you to visit the affected area again in the next two years?**



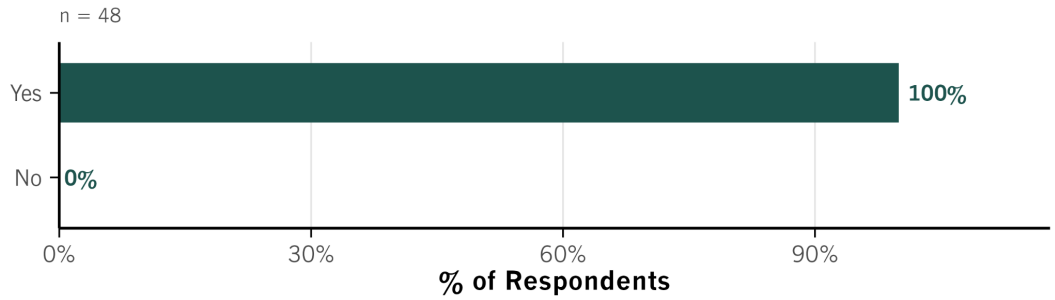

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 87. On a scale of 1–5, How important is the Tijuana River pollution and associated beach closures in your decision about whether to visit the area again?**



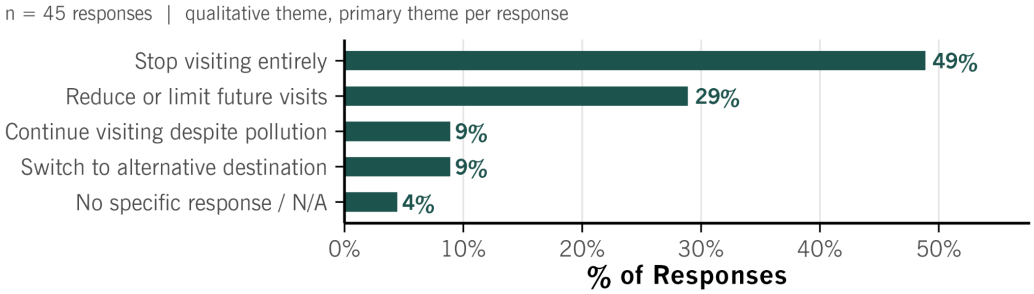

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 88. Do you live in the U.S.?**



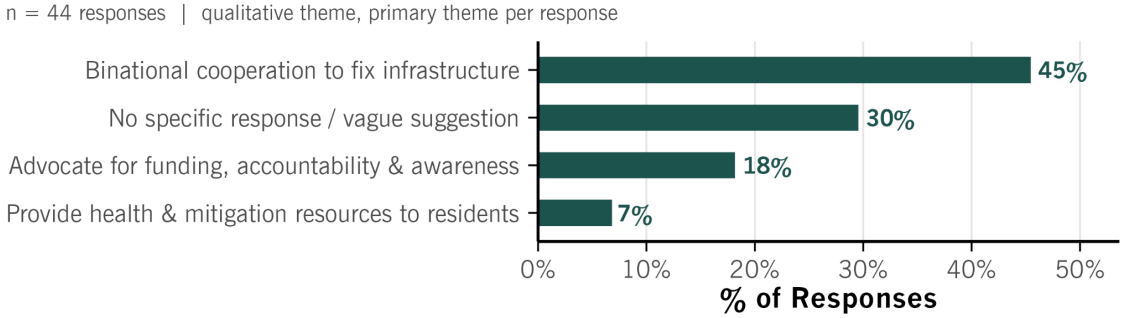

Source: ECOnorthwest analysis of SurveyMonkey survey results.

**Figure 89. If conditions remain the same, how would this influence your decision to visit the area over the next five years?**



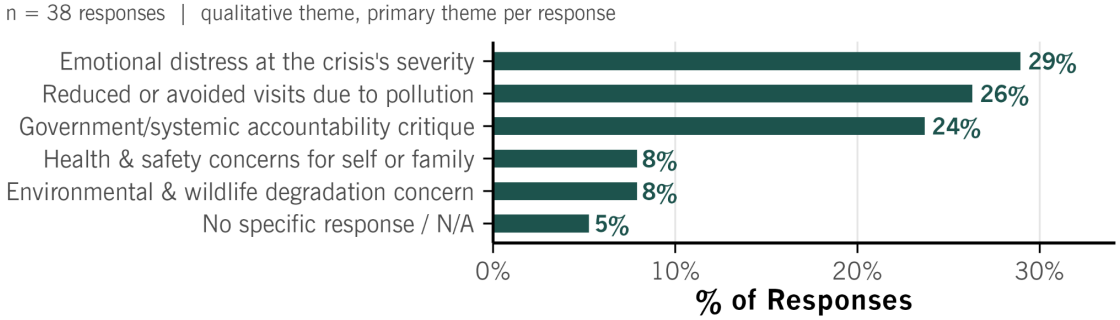

Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 90. What could the County do to mitigate the impacts of the Tijuana River Valley crisis?**




Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

**Figure 91. Is there anything else you would like to share about how pollution in the Tijuana River has impacted your visit?**




Source: ECOnorthwest qualitative coding of open-ended SurveyMonkey responses.

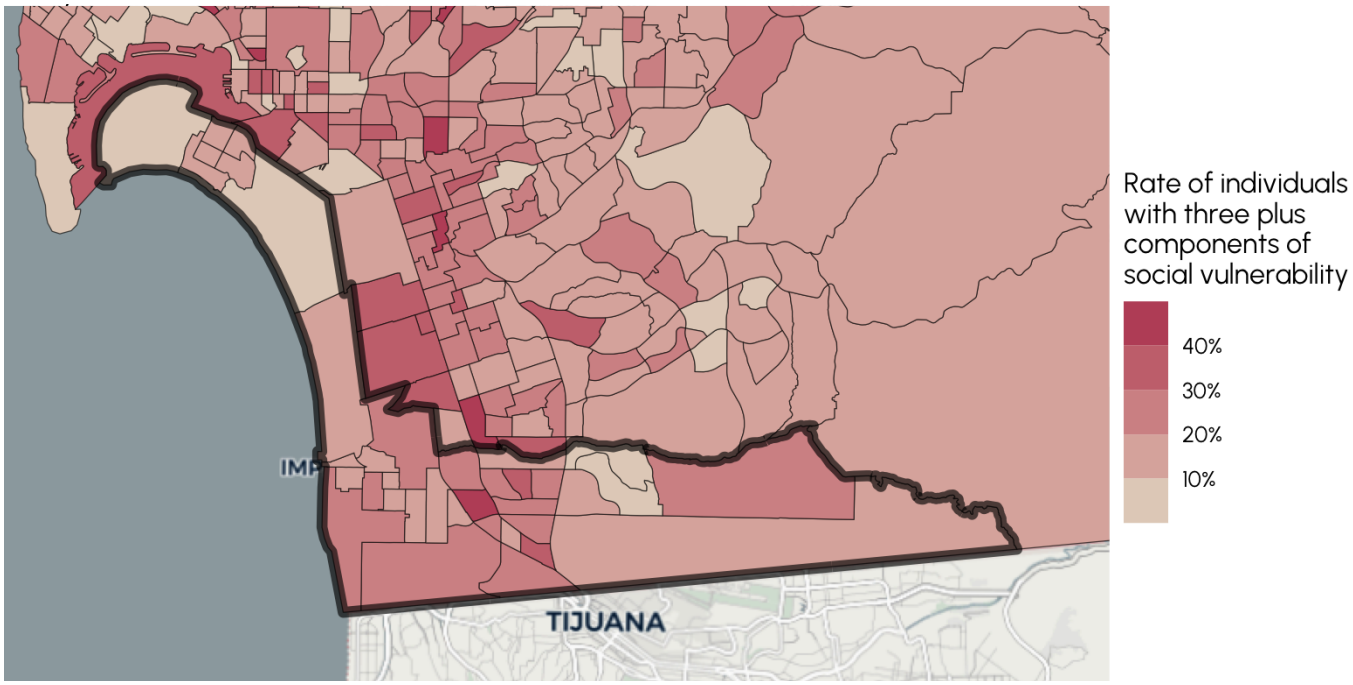
# Appendix I. Demographic Data

This section describes the data preparation and analytical methods used to understand the baseline conditions of the primary study area compared to the larger San Diego county area. For the purposes of this analysis, the primary study area included Imperial Beach, Coronado, and southern neighborhoods of the City of San Diego. The most current and reliable data

available for demographic information comes from the U.S. Census Bureau 2024 American Community Survey (ACS) 5-year Census data to capture the most recent data at a more granular level.

Figure 92 presents the U.S. Census Bureau's Community Resilience Estimates for the primary study area, providing an overview of social vulnerability based on factors such as poverty, employment, disability, health insurance coverage, and access to transportation and broadband.

**Figure 92. Community Resilience Estimates, Primary Study Area, 2024**




Source: U.S. Census Bureau, Community Resilience Estimates, 2024. ECOnorthwest analysis.

Note: Factors contributing to social vulnerability indicators include: poverty status, number of caregivers in the households, unit-level crowding, communication barrier, employment, disability status, health insurance coverage, age (65+), vehicle access, and broadband internet access.

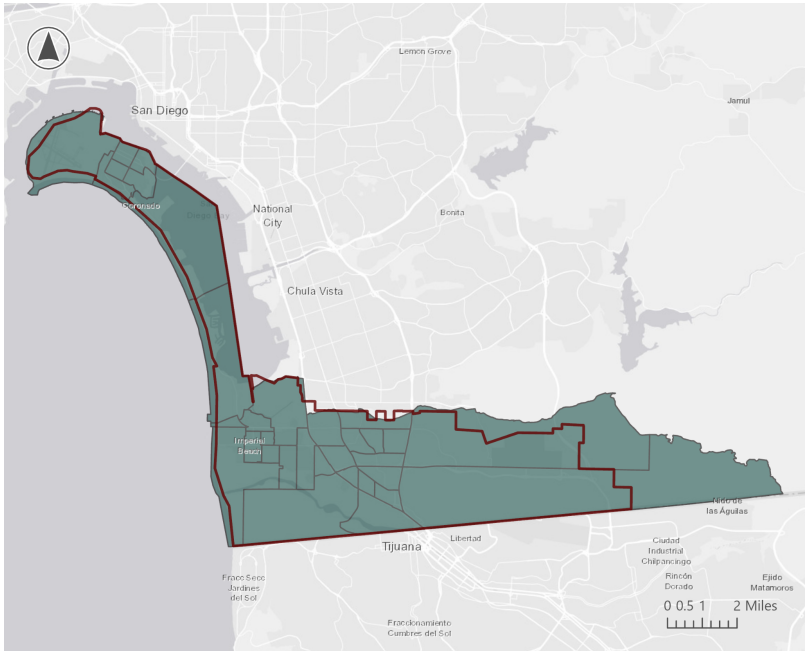
Figure 93 summarizes the ACS variables and corresponding table codes used to analyze demographic and socioeconomic characteristics across the study area.

**Figure 93. ACS Variables Used in Baseline Economic and Demographic Analysis**

| Topic | Variable | Variable Table |
|---|---|---|
| Tenure | Owner Households | B25003_002 |
| Tenure | Renter Households | B25003_003 |
| Race and Ethnicity | Hispanic | B03002_012 |
| Race and Ethnicity | Non-Hispanic, White | B03002_003 |
| Race and Ethnicity | Non-Hispanic, People of Color | B03002_004, B03002_005, B03002_006, B03002_007, B03002_008, B03002_009 |
| Age | Age Less Than 10 Years Old | B01001_003, B01001_004, B01001_027, B01001_028 |
| Age | Under 20 Years of Age | B01001_003, B01001_004, B01001_005, B01001_006, B01001_007, B01001_008, B01001_027, B01001_028, B01001_029, B01001_030, B01001_031, B01001_032 |
| Age | Over 65 years of Age | B01001_020, B01001_021, B01001_022, B01001_023, B01001_024, B01001_025, B01001_044, B01001_045, B01001_046, B01001_047, B01001_048, B01001_049 |
| Cost-Burden | Cost-Burdened Renters | B25070_007, B25070_008, B25070_009, B25070_010 |
| Cost-Burden | Cost-Burdened Owners | B25091_008, B25091_009, B25091_010, B25091_011, B25091_019, B25091_020, B25091_021, B25091_022 |
| Health | With Disability | B18101_004, B18101_007, B18101_010, B18101_013, B18101_016, B18101_019, B18101_023, B18101_026, B18101_029, B18101_032, B18101_035, B18101_038 |
| Health | No Health Insurance | B27010_017, B27010_033, B27010_050, B27010_066 |
| Household Income | Household Income Below $75,000 | B19001_002, B19001_003, B19001_004, B19001_005, B19001_006, B19001_007, B19001_008, B19001_009, B19001_010, B19001_011, B19001_012 |
| Total Income | Below FPL | B17001_002 |
| Group Quarters | Group Quarters | B26001_001 |
| Educational Attainment | Highschool or Higher | B15001_014, B15001_015, B15001_016, B15001_017, B15001_018, B15001_022, B15001_023, B15001_024, B15001_025, B15001_026, B15001_030, B15001_031, B15001_032, B15001_033, B15001_034, B15001_038, B15001_039, B15001_040, B15001_041, B15001_042, B15001_055, B15001_056, B15001_057, B15001_058, B15001_059, B15001_063, B15001_064, B15001_065, B15001_066, B15001_067, B15001_071, B15001_072, B15001_073, B15001_074, B15001_075, B15001_079, B15001_080, B15001_081, B15001_082, B15001_083 |
| Educational Attainment | Bachelor's Degree or Higher | B15001_017, B15001_018, B15001_025, B15001_026, B15001_033, B15001_034, B15001_041, B15001_042, B15001_058, B15001_059, B15001_066, B15001_067, B15001_074, B15001_075, B15001_082, B15001_083 |
| Workforce | In Labor Force | DP03_0002 |
| Workforce | Unemployed (in Labor Force) | DP03_0005 |
| Educational Enrollment | Not Enrolled (in K-12) | B14003_022, B14003_023, B14003_024, B14003_025, B14003_050, B14003_051, B14003_052, B14003_053 |
| Educational Enrollment | Enrolled in Private School (1-12) | B14002_012, B14002_015, B14002_018, B14002_036, B14002_039, B14002_042 |
| Educational Enrollment | Enrolled in Public School (1-12) | B14002_011, B14002_014, B14002_017, B14002_035, B14002_038, B14002_041 |

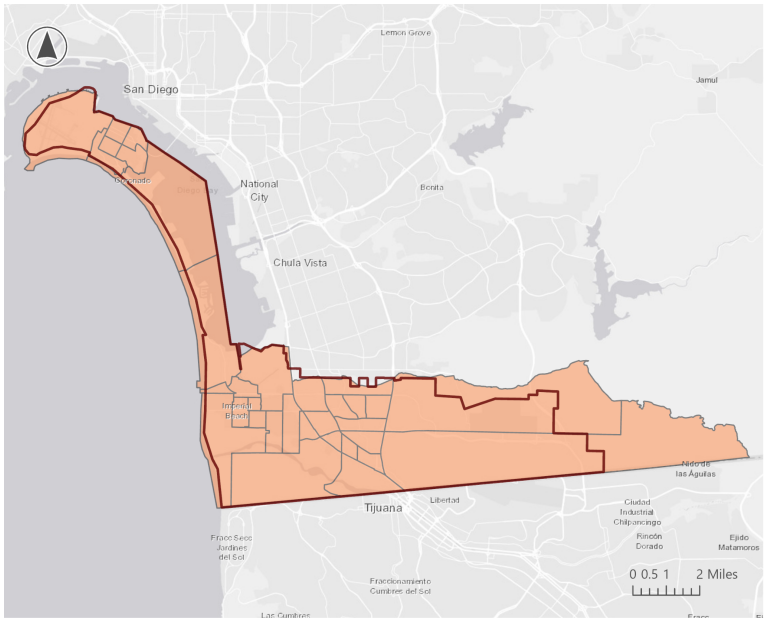
There are important limitations to this analysis: the 2024 ACS 5-year estimates are based on survey responses collected over a five-year period and represent conditions over a period rather than a single year. This period includes the COVID-19 pandemic, which may have affected the reporting of conditions captured in this analysis (i.e. employment, poverty, school enrollment, etc). Because the ACS relies on survey participation, some populations may be underrepresented in the data set, such as people experiencing housing instability, people with limited English proficiency, among others. This is particularly relevant for our analysis as some of the demographic and socioeconomic conditions may be understated. Additionally, because our analysis relies on census-tract level data, estimates for the study area, a smaller population, may have greater sampling variability and larger margins of error. These results should be interpreted in the context of these listed ACS data limitations. Figure 94- Figure 96 illustrate how the tract coverage shifts in between decades across the primary study area.

## Figure 94. Primary Study Area Census Tracts, 2000



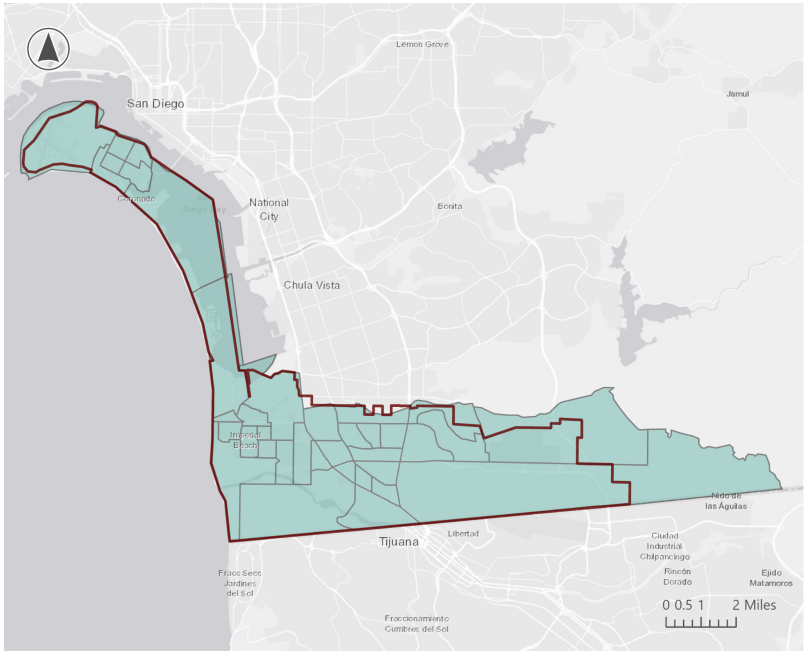

Source: ECOnorthwest, 2026.

## Figure 95. Primary Study Area Census Tracts, 2010




Source: ECOnorthwest, 2026.

**Figure 96. Primary Study Area Census Tracts, 2020**

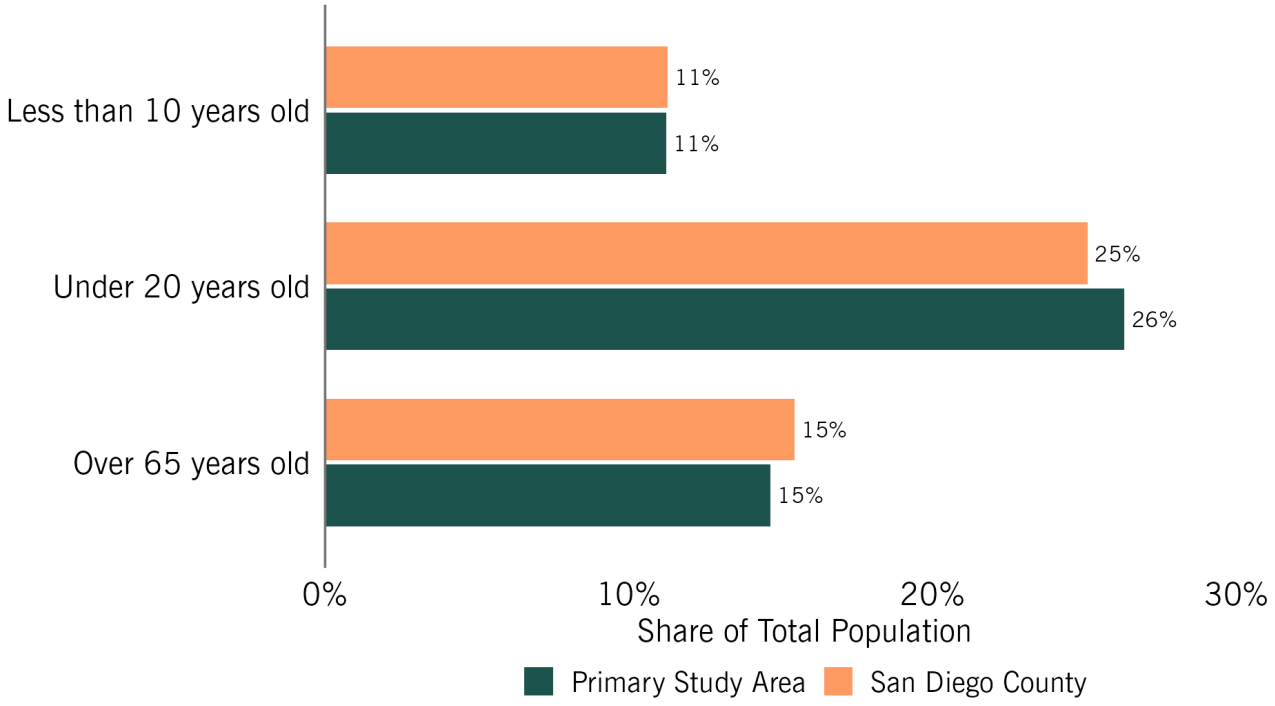



Source: ECOnorthwest, 2026.

## Population

In Figure 97, the highest share of the study's area population in these age buckets is among those under 20 years old (26 percent), followed by those over 65 (15 percent). Those under 10 years old have the lowest share (11 percent). Overall, the age distribution of the study indicates a skew towards a younger population.

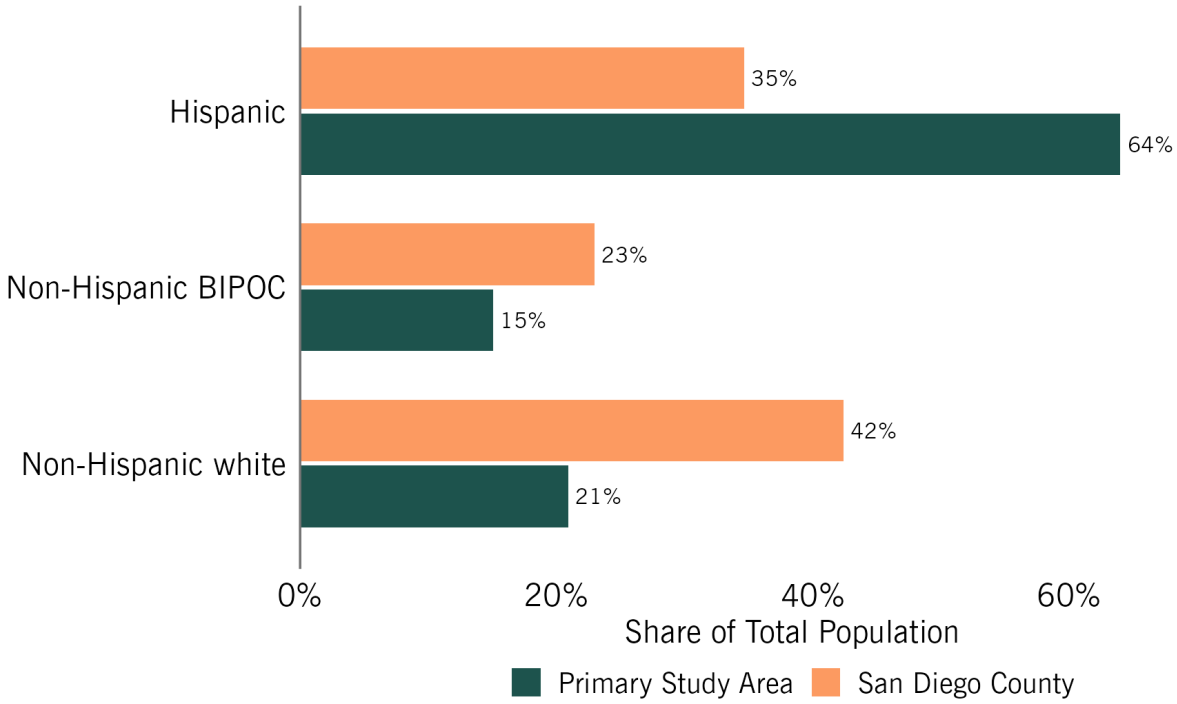
**Figure 97. Distribution of Population Ages, Primary Study Area and San Diego County, 2024**



Source: American Community Survey 2024 5-Year Estimates, Table B01001.

As shown in Figure 98, Hispanic people make up the largest share of the study area population (64 percent), followed by non-Hispanic white people (21 percent) and non-Hispanic BIPOC (15 percent).

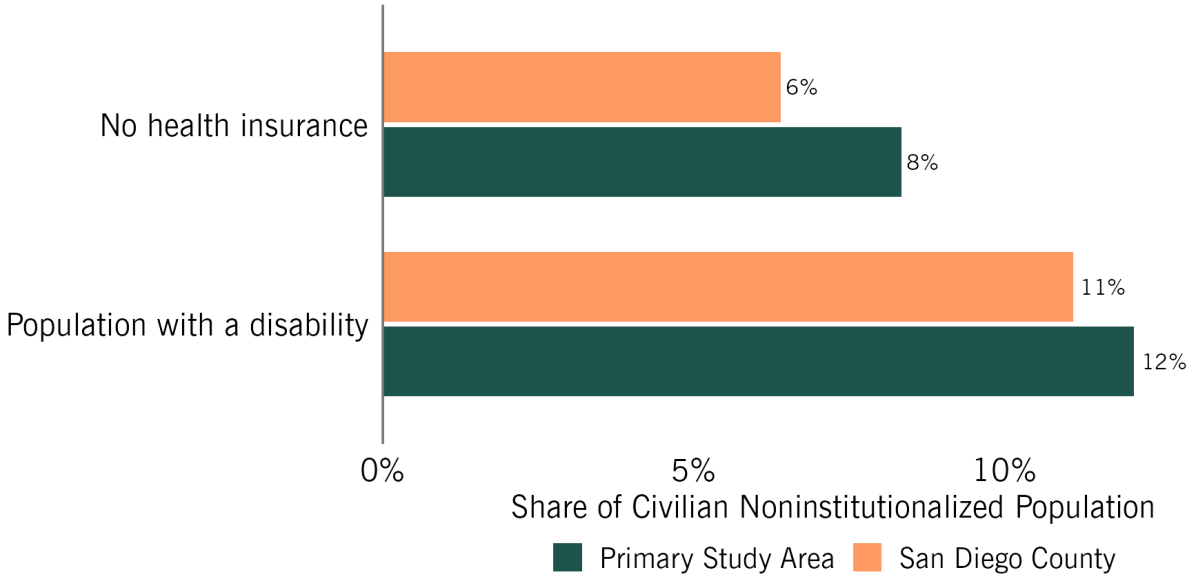
**Figure 98. Race and Ethnicity of Population, Primary Study Area and San Diego County, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B03002.

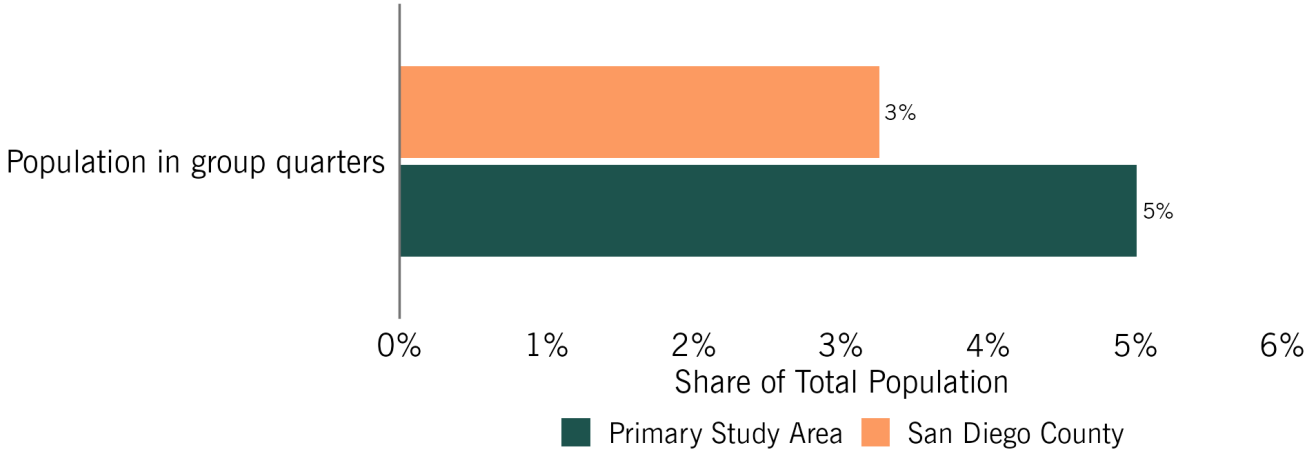
As shown in Figure 99, 12% of the primary study area population has a disability, compared to 11% in San Diego County, while 8% lack health insurance, compared to 6% countywide. Figure 100 shows that 5% of the study area population lives in group quarters, including military barracks, college dormitories, and nursing homes, compared to 3% countywide. Similarly, Figure 101 shows that 11% of the study area population lives below the federal poverty line, slightly higher than the countywide rate of 10%.

**Figure 99. Share of Individuals Without Health Insurance or With a Disability, Primary Study Area and San Diego County, 2024**



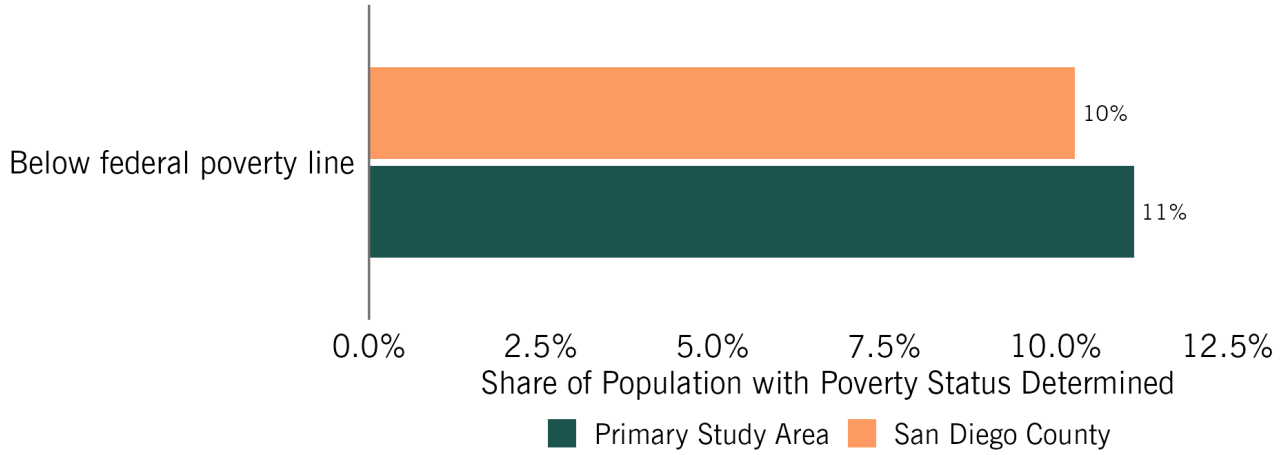

Source: American Community Survey 2024 5-Year Estimates, Table B27010 and B18101.

**Figure 100. Share of Population in Group Quarters, Primary Study Area and San Diego County, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B26001.

**Figure 101. Individuals with Income Below the Federal Poverty Line, Primary Study Area and San Diego County, 2024**

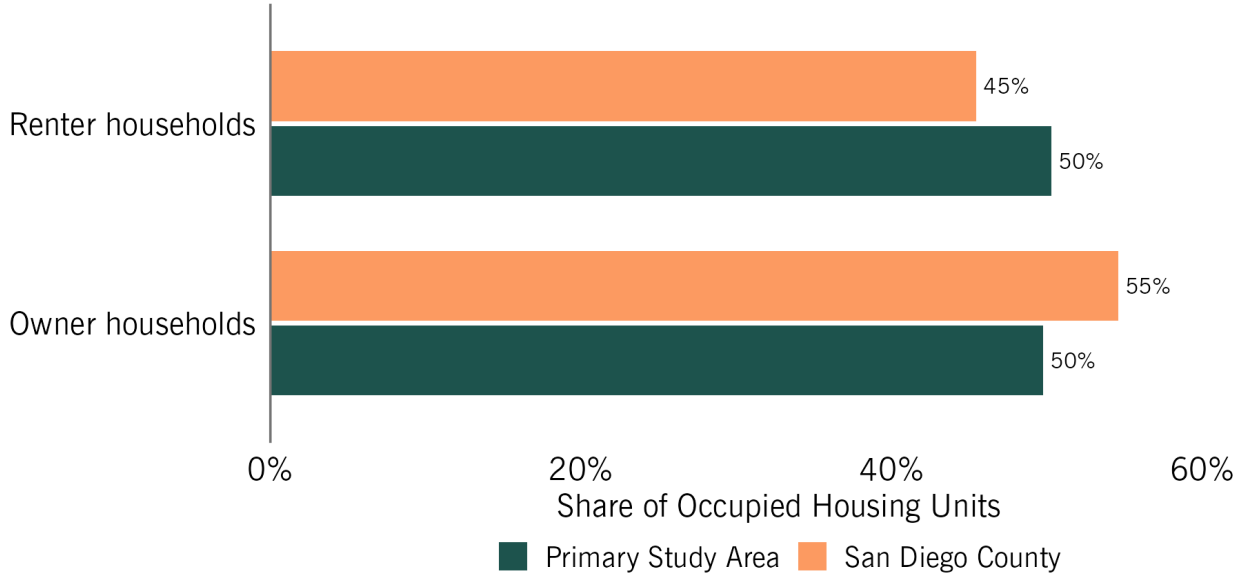



Source: American Community Survey 2024 5-Year Estimates, Table B17001.

## Households

In 2024, the primary study area had 47,759 households in 2024, with 50 percent owners and 50 percent renters, as seen in Figure 102 below. Relative to the County, the primary study area has a lower share of owners and a higher share of renters.

**Figure 102. Share of Owner and Renter Households, Primary Study Area and San Diego County, 2024**

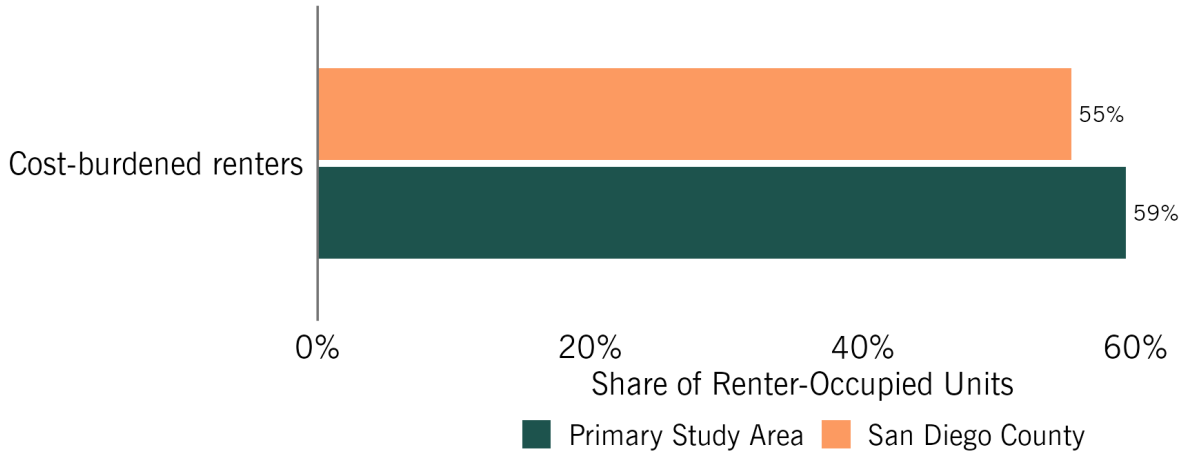



Source: American Community Survey 2024 5-Year Estimates, Table B25003.

A household is considered cost-burdened when it spends more than 30 percent of its income on housing costs, including rent or mortgage payments and utilities. The U.S. Department of Housing and Urban Development uses this threshold because households that exceed it may have difficulty affording other necessities such as food, transportation, and medical care;

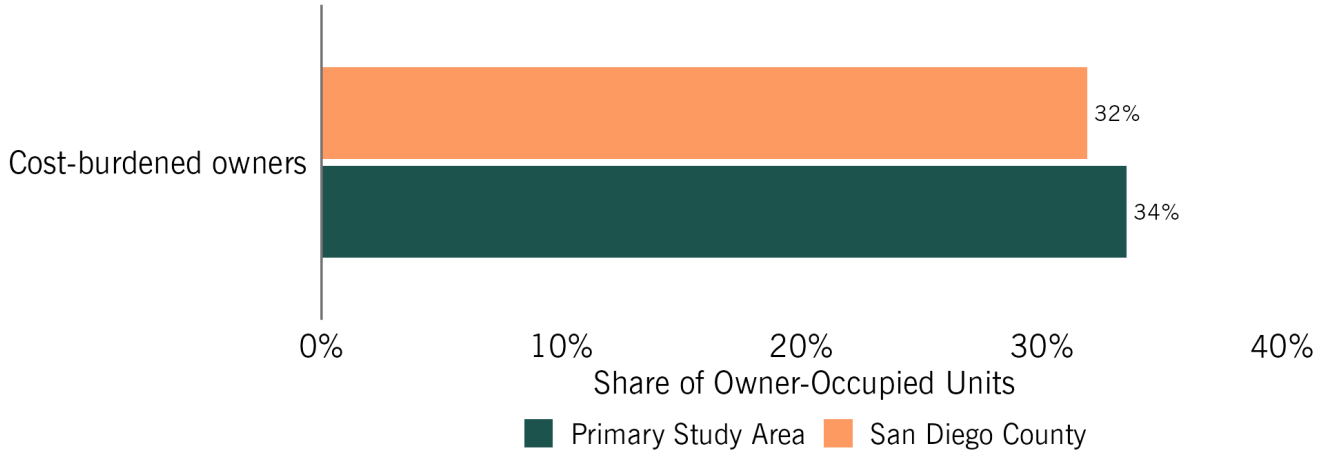
households spending more than 50 percent are considered severely cost-burdened.[111] As shown in Figure 103, 59% of renter households in the primary study area are cost-burdened, compared to 55% in San Diego County. Similarly, Figure 104 shows that 34% of owner households in the primary study area are cost-burdened, compared to 32% countywide.

**Figure 103. Share of Cost-Burdened Renters, Primary Study Area and San Diego County, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B25070.

**Figure 104. Share of Cost-Burdened Owners, Primary Study Area and San Diego County, 2024**

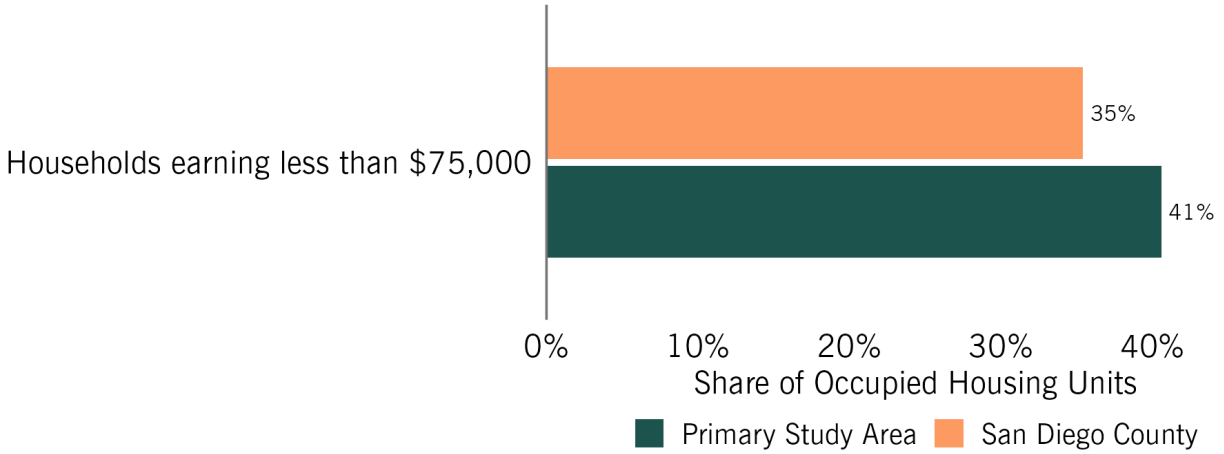



Source: American Community Survey 2024 5-Year Estimates, Table B25091.

As shown in Figure 105, 41% of households in the primary study area earn less than $75,000 annually, compared to 35% in San Diego County.

[111] U.S. Department of Housing and Urban Development, Office of Policy Development and Research (HUD PD&R). "CHAS Background." https://www.huduser.gov/portal/datasets/cp/CHAS/bg_chas.html.

**Figure 105. Household Income Below $75K, Primary Study Area and San Diego County, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B19001.

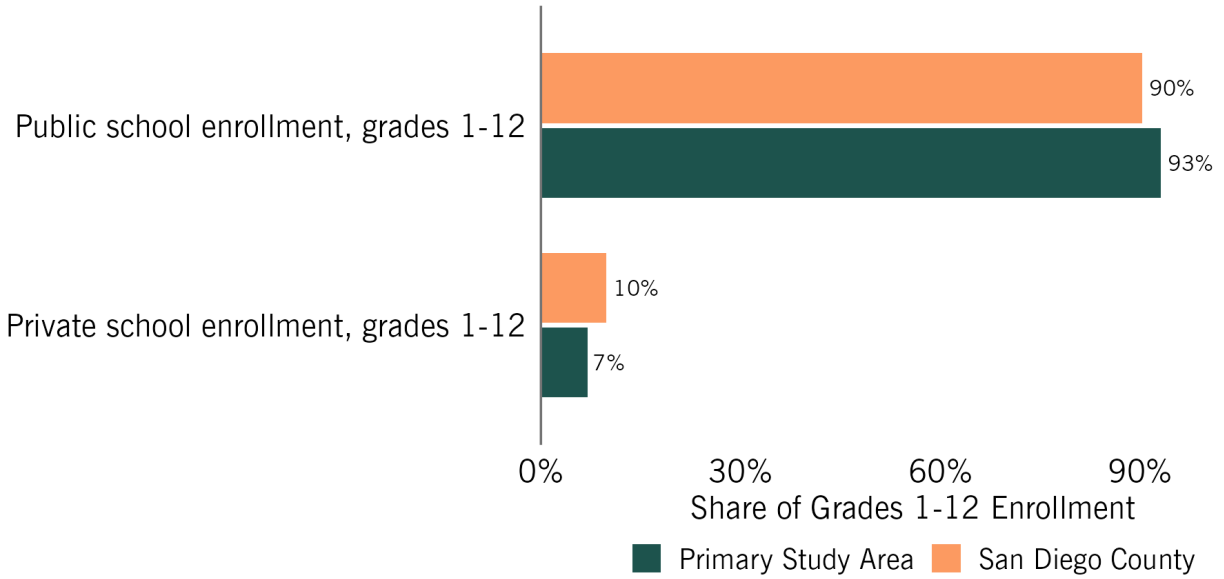
The federal poverty line (FPL) is the minimum income standard the federal government uses to measure poverty and set eligibility for assistance programs. It is the same across the 48 contiguous states; in 2024, it was $31,200 for a family four. About 11 percent of people in the primary study area have a total income less than the FPL. Because the poverty line does not account for local costs, it can understate the financial hardship in a high-cost region. In 2025, the County estimated that within the region, a family of two adults and two children need about $112,682 a year to meet basic needs without assistance, about 3.5 times the poverty line.[112]

## Education

This section examines educational attainment and school enrollment in the primary study area, including the share of residents with a high school diploma or bachelor's degree, public and private school enrollment, and children not enrolled in school. As shown in Figure 106, 93 percent of students in grades 1–12 in the primary study area are enrolled in public schools, compared to 90 percent in San Diego County. In contrast, private school enrollment accounts for 7 percent of students in the primary study area, compared to 10 percent countywide, indicating a slightly greater concentration of public-school enrollment in the study area.

[112] SAN DIEGO COUNTY SELF-SUFFICIENCY STANDARD BRIEF: Household with Two Adults and Two Children, 2025. County of San Diego. March 2026. https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/CHS/Household%20of%204%20Self-Sufficiency%20Brief%202025.pdf

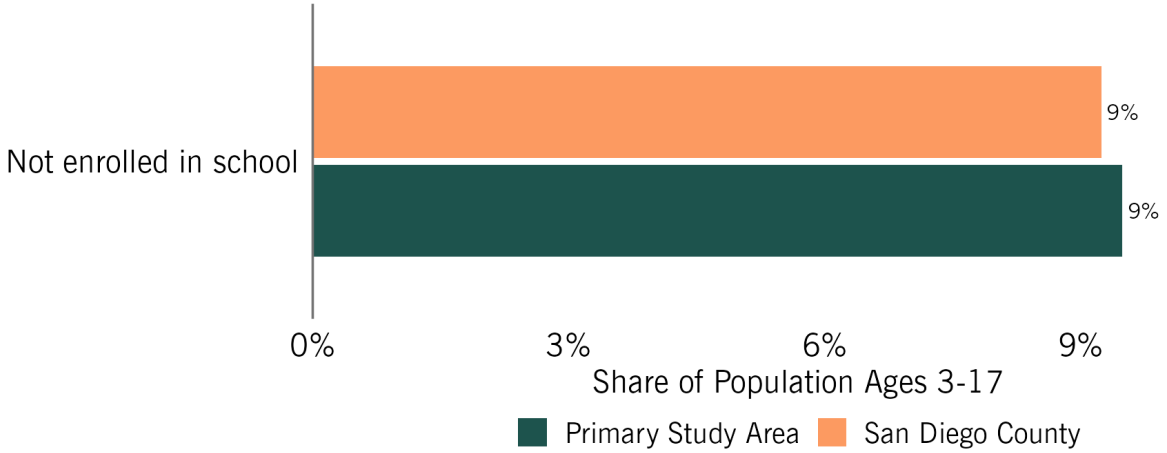
**Figure 106. Educational Enrollment by Private or Public-School Enrollment, Primary Study Area and San Diego County, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B14002.

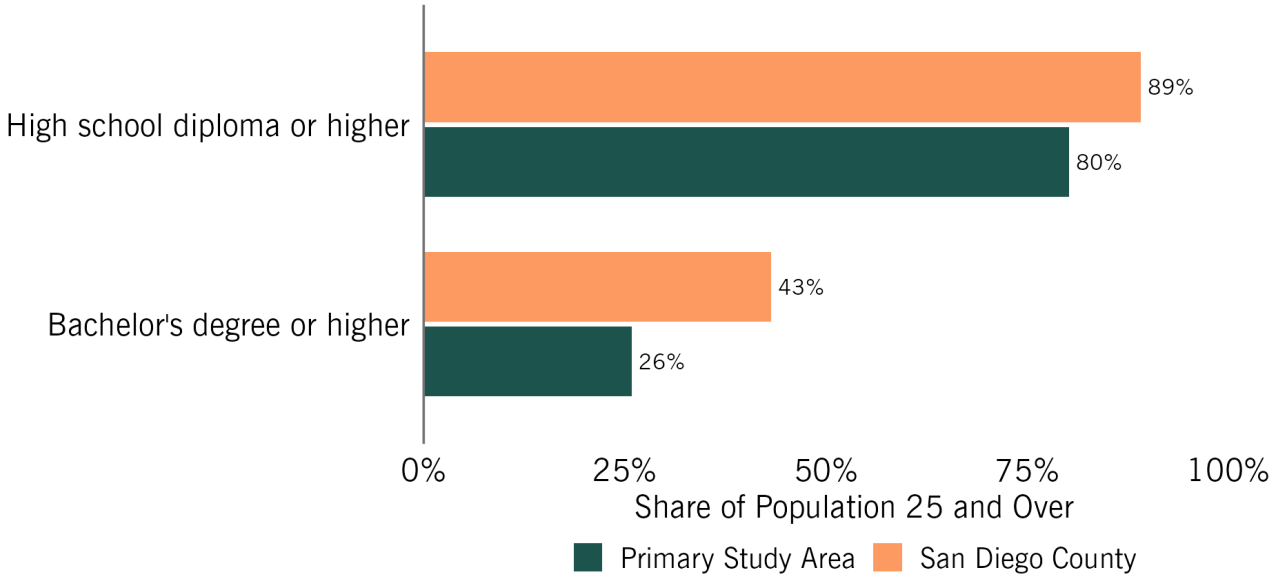
In 2024, 9 percent of children from age 3 to 17 were not enrolled in school (Figure 107). This level is comparable to the County's non-enrolled rate of 9 percent. As shown in Figure 108, 26 percent of residents ages 25 and older in the primary study area have a bachelor's degree or higher, compared to 43 percent in San Diego County. Similarly, 80 percent of study area residents have a high school diploma or higher, compared to 89 percent countywide, indicating lower levels of educational attainment in the study area.

**Figure 107. Share of Children, 3-17 Years Not Enrolled in School, Primary Study Area and San Diego County, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B14003.

**Figure 108. Educational Attainment, Primary Study Area and San Diego County, 2024**



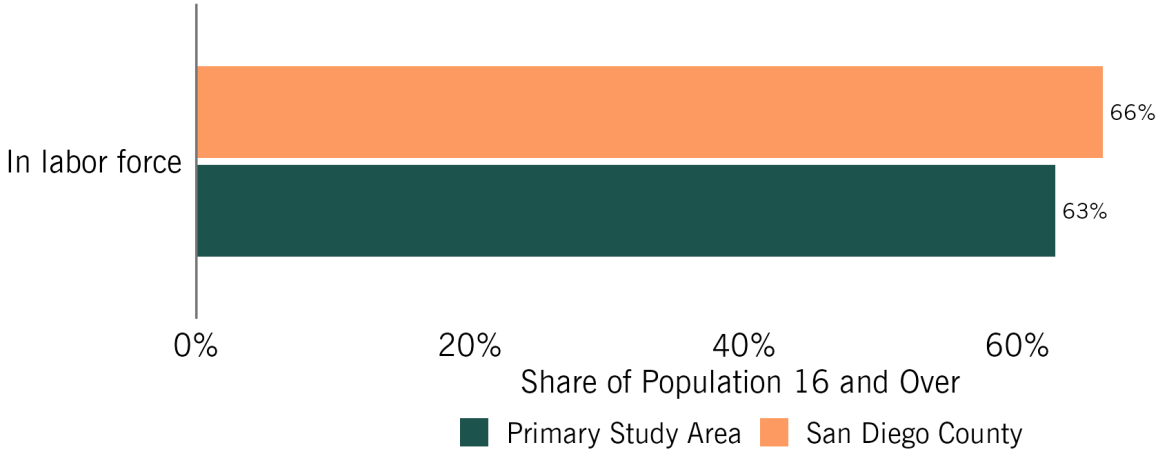

Source: American Community Survey 2024 5-Year Estimates, Table B15001.

## Workforce

The economic effects of the Tijuana River Valley sewage crisis depend in part on who lives and works in the affected area, and which industries anchor its economy. This section summarizes the primary study area's workforce and industry mix, with particular attention to sectors whose operations, workforce, or customer base may be sensitive to water and air quality conditions, such as tourism and recreation, hospitality, and outdoor work environments.

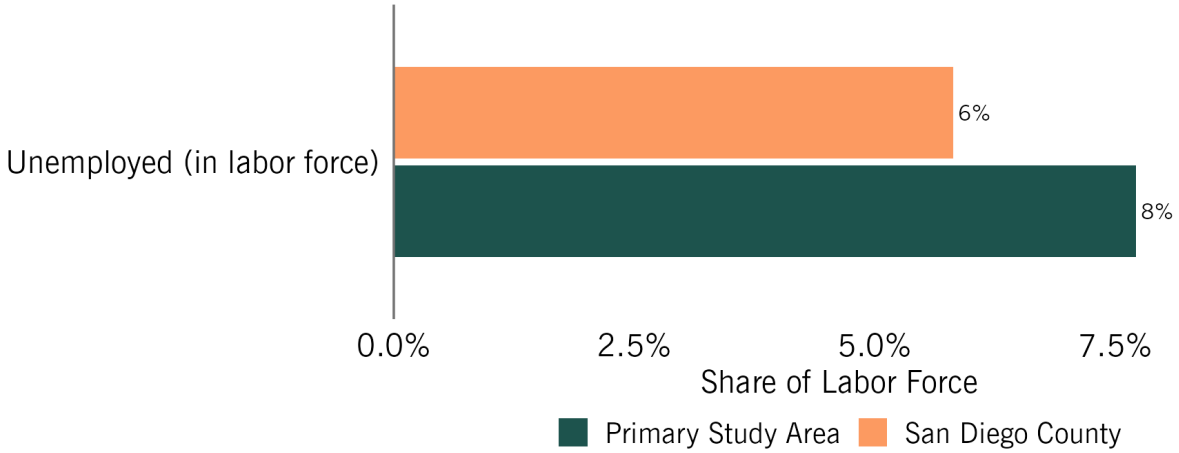
The labor force comprises all people 16 and older who are either working or actively looking for employment. 63 percent of the study area population is in the labor force (Figure 109), with 8 percent unemployed and in the labor force (Figure 110).

**Figure 109. Labor Force Participation, Primary Study Area and San Diego County, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table DP03_0002 (in LF)

**Figure 110. Unemployment Rates, Primary Study Area and San Diego County, 2024**

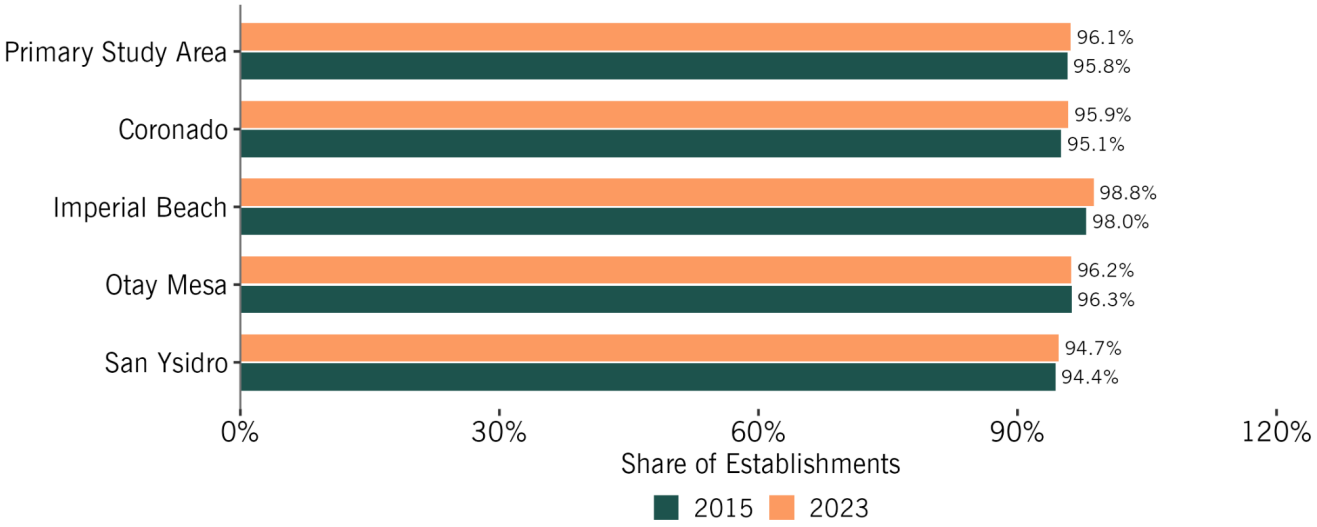



Source: American Community Survey 2024 5-Year Estimates, Table DP03_0002 (in LF) and DP03_0005 (unemployed in LF).

## Establishments

The majority of businesses within the primary study area are small businesses, and have been small businesses since 2015, seen below in Figure 111.

**Figure 111. Share of Establishments with Less than 50 Employees, Primary Study Area and Jurisdictions Within, 2015 and 2023**




Source: U.S. Census County Business Patterns (CBP), Zip Code Business Patterns, 2015 and 2023.

## Primary Study Area City-Level Demographic Concentrations

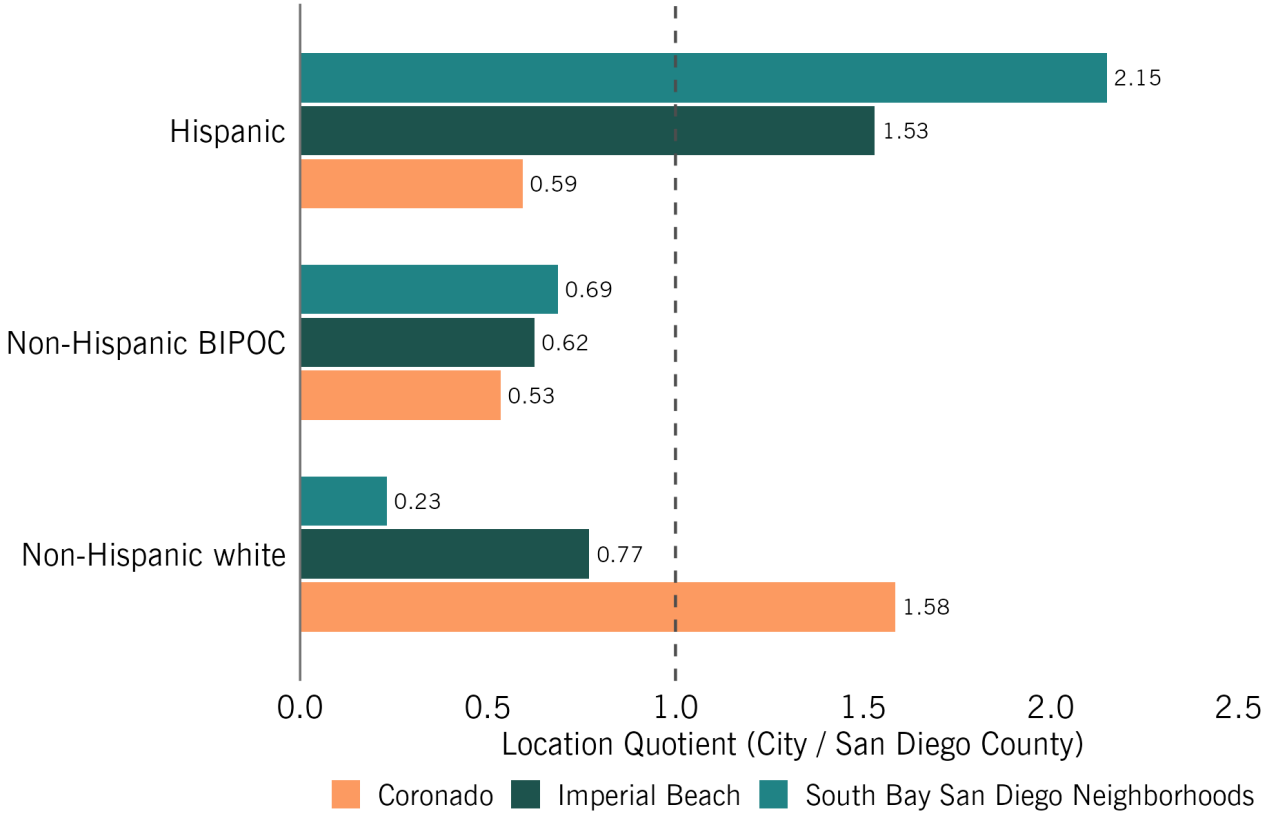
The following analysis examines demographic patterns across the primary study area, which include Coronado, Imperial Beach, and the South Bay neighborhoods of the city of San Diego, to identify differences in population concentrations compared to San Diego County. Examining the primary study area as a whole may mask important differences in

demographic composition at the city and neighborhood levels. The census tracts identified in Figure 94, Figure 95, and Figure 96 were used to define the study geographies. As seen when comparing the figures, the Census boundaries shift over time, as they are updated periodically to reflect changes in population. These adjustments can affect comparisons over time as tract changes may alter the populations in each geography, making it important to consider shifts in census tract boundaries when interpreting demographic trends.

To assess differences in demographic composition, this analysis uses location quotients (LQs), which measure the relative concentration of a demographic group in each geography compared to San Diego County. An LQ of 1 indicates that a group is represented at the same proportion as the county overall, while values above or below 1.0 indicate overrepresentation or underrepresentation, respectively. The LQ analysis helps identify which demographic groups are overrepresented or underrepresented in Coronado, Imperial Beach, and the South Bay neighborhoods, relative to San Diego County. Overrepresentation indicates that a demographic group has a greater concentration locally compared to its concentration in San Diego County (LQ greater than 1.0). Conversely, underrepresentation indicates that a demographic group has a lower concentration locally relative to the county (LQ less than 1.0).

As seen in Figure 112, Hispanic populations are overrepresented in South Bay San Diego neighborhoods (LQ = 2.15) and Imperial Beach (1.53), while they are underrepresented in Coronado (0.59). In contrast, non-Hispanic white populations are overrepresented in Coronado (1.58) and underrepresented in both Imperial Beach (0.77) and South Bay San Diego neighborhoods (0.23). Non-Hispanic BIPOC populations are underrepresented across all three geographies, with LQs of 0.53 in Coronado, 0.69 in South Bay San Diego neighborhoods, and 0.62 in Imperial Beach.

**Figure 112. Race and Ethnicity Location Quotient by City, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B03002.

Figure 113 shows adults over 65 are overrepresented in Coronado (LQ = 1.37) and underrepresented in Imperial Beach (0.79) and South Bay San Diego neighborhoods (0.91). In contrast, children under 10 are overrepresented in Imperial Beach (1.17), underrepresented in Coronado (0.74), and represented at the same proportion as San Diego County in South Bay San Diego neighborhoods (1.0). Populations under 20 are slightly overrepresented in South Bay San Diego neighborhoods (1.07) and Imperial Beach (1.04), while slightly underrepresented in Coronado (0.96).

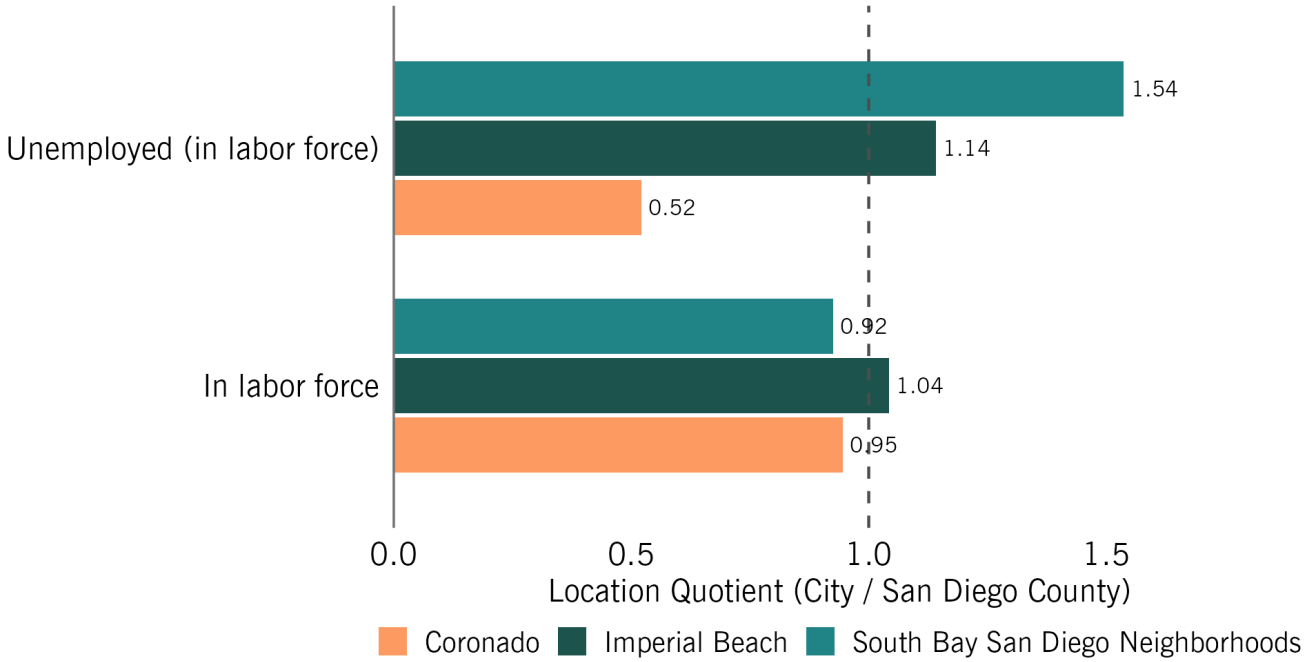
**Figure 113. Population Ages Location Quotient by City, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B01001.

The labor force includes individuals ages 16 and older who are either employed or unemployed, include those actively seeking work. Figure 114 demonstrates that labor force participation is slightly overrepresented in Imperial Beach (LQ = 1.04) and underrepresented in Coronado (0.95) and South Bay San Diego neighborhoods (0.92). Of the primary study area geographies being analyzed, the South San Diego neighborhoods showed the highest concentration of individuals unemployed in the labor force, relative to the county (1.54), followed by Imperial Beach (1.14), while Coronado has a substantially lower concentration of unemployed individuals (0.52) relative to San Diego County.

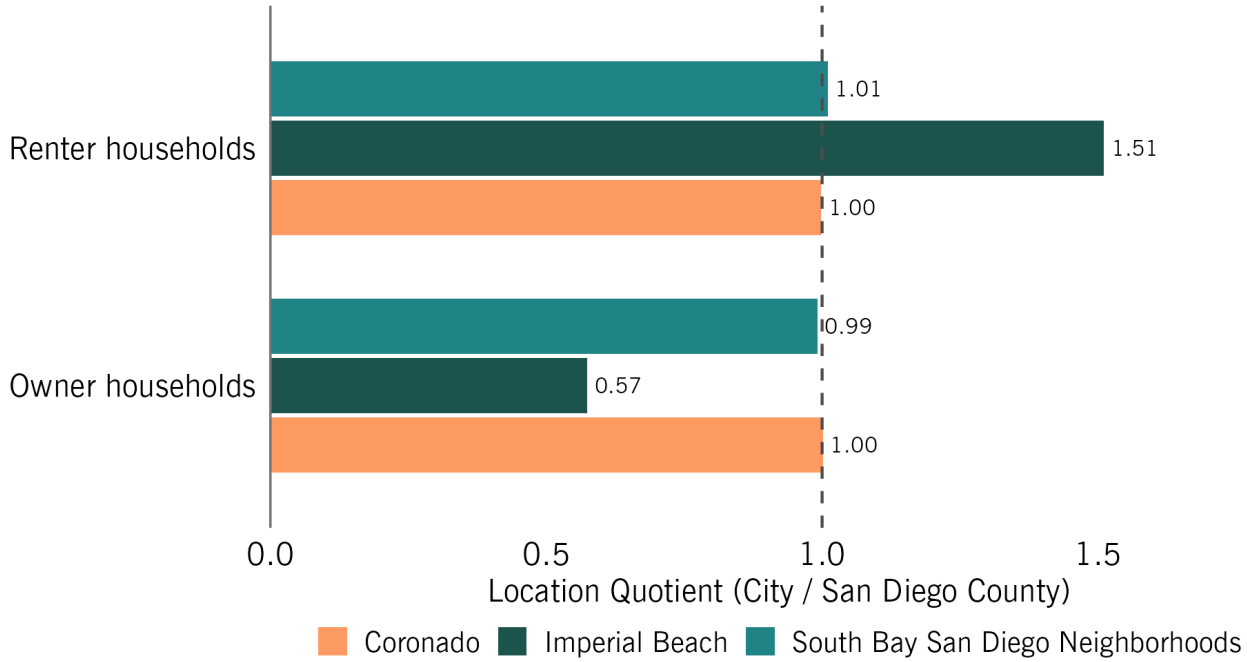
**Figure 114. Labor Force Location Quotient by City, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table DP03_0002 (in LF) and DP03_0005 (unemployed in LF).

Renter households are substantially overrepresented in Imperial Beach (LQ = 1.51), while owner households are underrepresented (0.57) relative to San Diego County. In contrast, Coronado has nearly identical proportions of renter and owner households compared to the county, with LQs of 1.0 for both groups. South Bay San Diego neighborhoods also closely reflect countywide housing tenure patterns, with LQs of 1.01 for renter households and 0.99 for owner households. These findings highlight the greater concentration of renter households in Imperial Beach compared to other study area geographies (Figure 115).

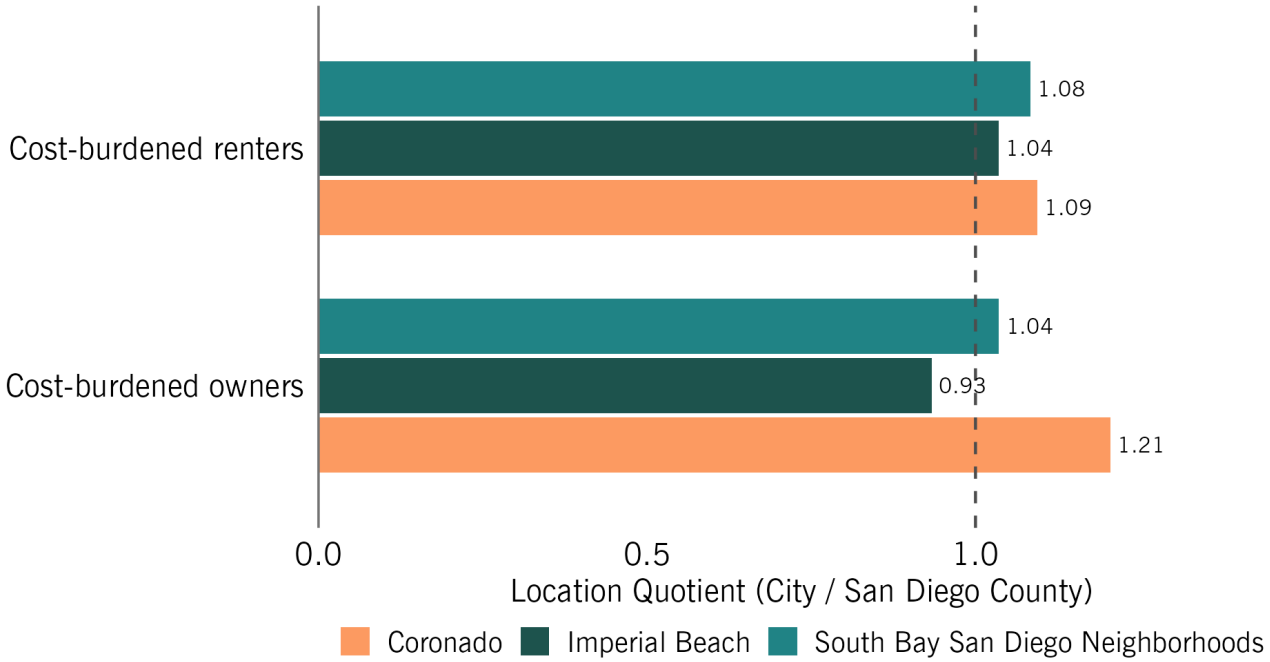
**Figure 115. Housing Tenure Location Quotient by City, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table 25003.

Housing cost-burden refers to households spending more than 30% of their income on housing costs, including rent, mortgage payments, and/or utilities. Figure 116 shows that cost-burdened renters are slightly overrepresented across all three study area geographies, with LQs of 1.09 in Coronado, 1.08 in South Bay San Diego neighborhoods, and 1.04 in Imperial Beach. Cost-burdened homeowners are most overrepresented in Coronado (1.21), followed by South Bay San Diego (1.04), while they are slightly underrepresented in Imperial Beach (0.93).

**Figure 116. Housing Cost Burden Location Quotient by City, 2024**

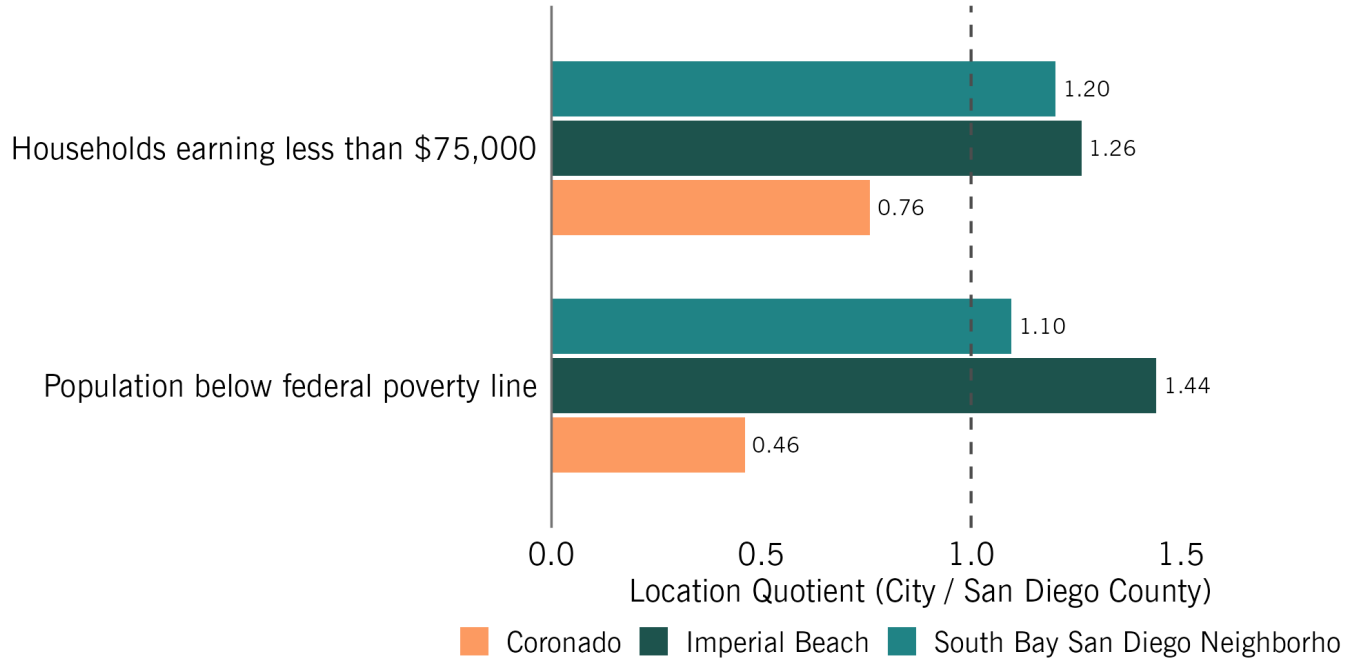



Source: American Community Survey 2024 5-Year Estimates, Table B25070 and Table B25091.

Figure 117 shows that households earning less than $75,000 annually are overrepresented in Imperial Beach (LQ = 1.26) and South Bay San Diego neighborhoods (1.20), while they are underrepresented in Coronado (0.76). Likewise, populations living below the federal poverty line (FPL) are most overrepresented in Imperial Beach (1.44), followed by South Bay San Diego neighborhoods (1.10), while substantially underrepresented in Coronado (0.46). The FPL is the federal income threshold used to measure poverty and determine for specific government assistance programs, set at $31,200 for a family of four in 2024.[113] However, this threshold does not consider regional cost of living difference, which may underestimate the financial hardship of high-cost areas like San Diego County.

[113] County of San Diego, San Diego County Self-Sufficiency Standard Brief, 2026.

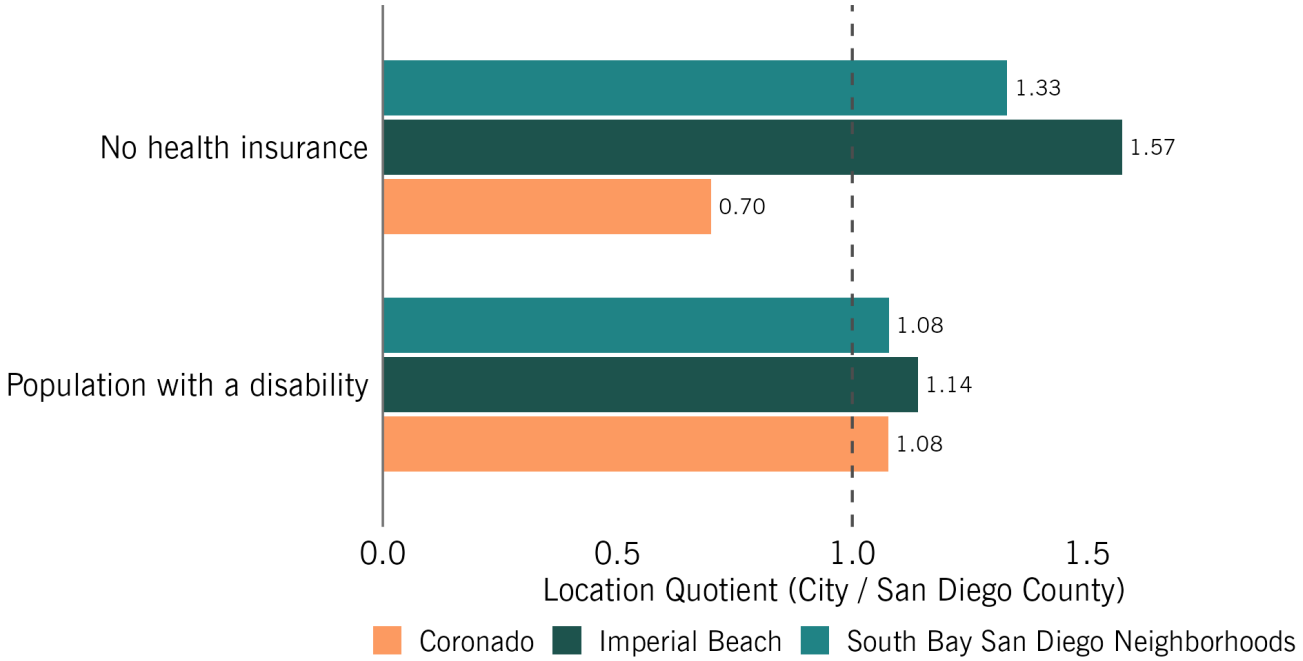
**Figure 117. Household Income and Poverty Location Quotient by City, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B19001 and Table B17001.

Figure 118 demonstrates that uninsured populations are substantially overrepresented in Imperial Beach (LQ = 1.57) and South Bay San Diego neighborhoods (1.33), while underrepresented in Coronado (0.70) relative to San Diego County. Populations with a disability are slightly overrepresented across all three geographies, with the highest concentration in Imperial Beach (1.14), followed by Coronado and South Bay San Diego neighborhoods (both 1.08). These findings highlight disparities in health insurance coverage across the study area, particularly in Imperial Beach, where both uninsured residents and people with disabilities are more concentrated relative to countywide levels.

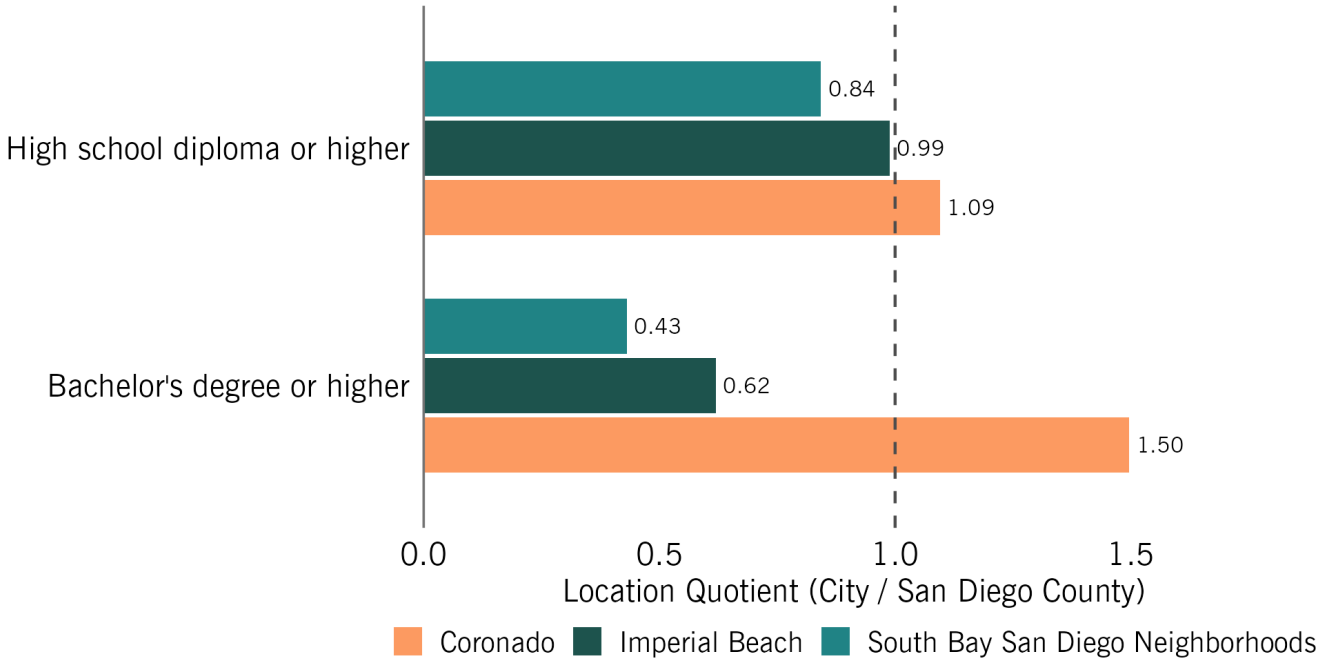
**Figure 118. Health Location Quotient by City, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B18101 and Table B27010.

Figure 119 shows that Coronado has a substantially higher concentration of residents with a bachelor's degree or higher (LQ = 1.50), while this population is underrepresented in Imperial Beach (0.62) and South Bay San Diego neighborhoods (0.43). Residents with a high school diploma or higher are slightly overrepresented in Coronado (1.09), nearly proportional to countywide levels in Imperial Beach (0.99), and underrepresented in South Bay San Diego Neighborhoods (0.84). These findings highlight the greatest educational disparities are occurring at the higher education level (i.e. Bachelor's degree or higher).

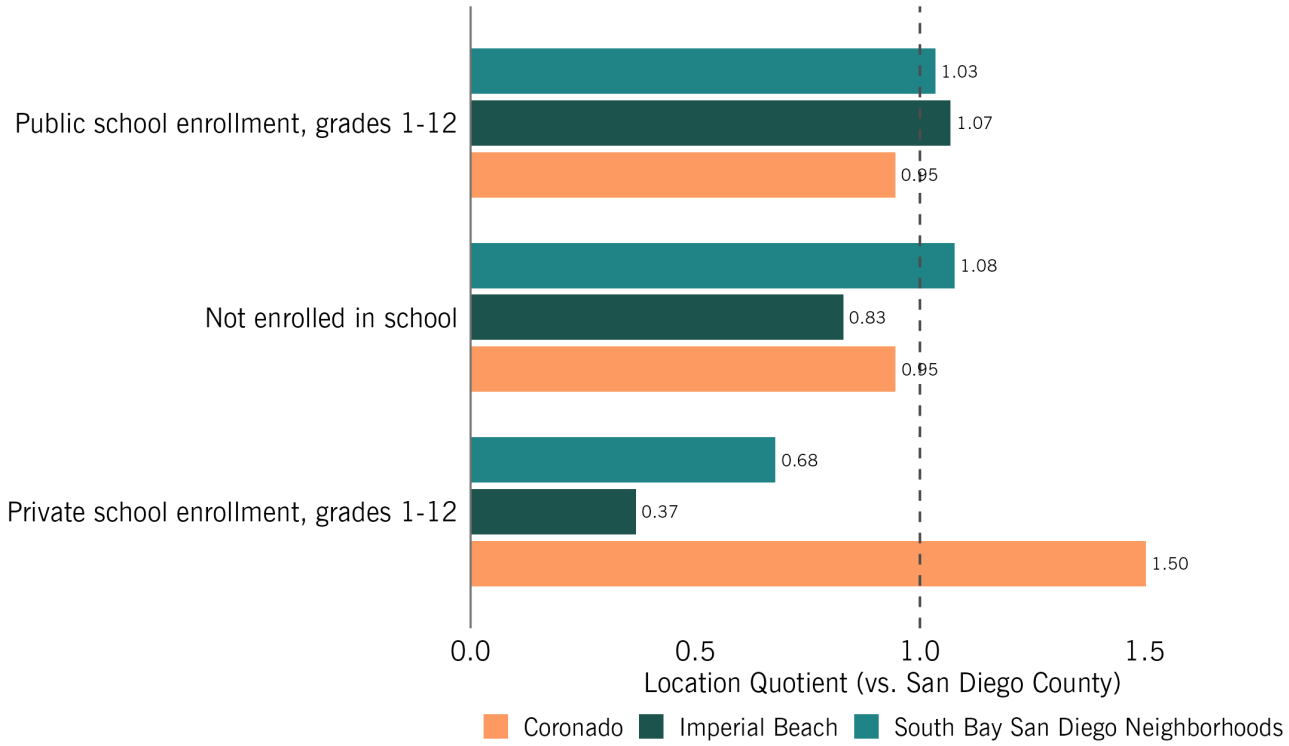
**Figure 119. Educational Attainment (25+) Location Quotient by City, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B15001.

Figure 120 shows public school enrollment among students in grades 1-12 is slightly overrepresented in Imperial Beach (LQ = 1.07) and South Bay San Diego neighborhoods (1.03), while slightly underrepresented in Coronado (0.95). On the other hand, private school enrollment is substantially overrepresented in Coronado (1.50) and underrepresented in South Bay San Diego neighborhoods (0.68) and Imperial Beach (0.37). The population not enrolled in school is slightly overrepresented in South Bay San Diego neighborhoods (1.08) and underrepresented in Imperial Beach (0.83) and Coronado (0.95).

**Figure 120. Educational Enrollment Location Quotient by City, 2024**




Source: American Community Survey 2024 5-Year Estimates, Table B14002 and Table B14003.