

Barrio Logan Case Study: Modern Environmental Injustice [†]

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Abstract: Barrio Logan is a Mexican American community in San Diego in which industrial companies and residences share a space enclosed by a bay and an interstate. Ever since WWII, the Barrio Logan community has faced environmental injustice. There is a gap in Barrio Logan's ability to self-monitor, so business models were developed to bring forth citizen science projects based on data collected from government environmental studies, the nurse's office at Barrio Logan's Perkins K-8 School, and interviews with Perkins K-8 School's principal and the director and staff at the Chicano Park Museum and Cultural Center. It was found that children in Barrio Logan are experiencing a health crisis. Homelessness, single-parent households, unemployment, gentrification, low-wage jobs, continuous diesel particulate matter exposure, and high levels of asthma can be found in Barrio Logan. There is a lack of easily accessible, community-wide health programs that address ACEs and a lack of air pollution monitoring.

Keywords: Barrio Logan; environmental injustice; air pollution; ACEs; disadvantaged community; citizen science; childhood asthma

1. Introduction

Barrio Logan is a unique community where industrial companies and residents (renters and homeowners) coexist in an area that is enclosed by a bay and an interstate. Around 1910, Mexican refugees from the Mexican Revolution relocated to the residences in the southern part of Logan Heights, which is now called Barrio Logan. The Barrio Logan community lost its waterfront as the Naval Base expanded during World War II. In 1944, the National Iron Works, now NASSCO, moved its shipbuilding facility to Barrio Logan's waterfront [1]. In the 1950s, other ship building companies, small factories, and junk yards moved into the Barrio Logan community as part of the City of San Diego's plan to move the residents out and convert what is now Barrio Logan into an industrial zone through new zoning laws [2]. The Barrio Logan community used to be part of the Logan Heights community before the construction of Interstate 5 in 1963, permanently split off Barrio Logan into its own community. The construction of the Coronado Bridge added tensions in 1969, when the community peacefully protested the city not going through with a community park. The next significant event for Barrio Logan was the agreement on the 1978 Barrio Logan Community Plan. The 1978 Barrio Logan Community Plan provided zoning guidelines, so that industrial zones could be developed without disrupting the already established residences and businesses. As technology and times changed, the 1978 Community Plan did not accommodate or change accordingly. By 1979, there were only about 5000 residents left in Barrio Logan from what used to be the second-largest Mexican American community in California of about 20,000 residents [2].

Organizations in Barrio Logan consisting of community members and local residents, such as the Barrio Logan Community Planning Group and the Environmental Health Coalition (EHC), have teamed up in order to raise awareness on the air pollution found in Barrio Logan. The Barrio Logan Community Action Team (CAT), the EHC, and the



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Barrio Logan Community Planning Group collaborated with the shipyard industry and other stakeholders in order to update the 1978 Community Plan with a 2013 Barrio Logan Community Plan Update. Even though the 2013 plan was voted against, the same organizations met again and agreed on what would become the 2020 Barrio Logan Community Plan. Although this new update will redefine zoning in Barrio Logan and will protect the residents already living in Barrio Logan, there is no mitigation for the air pollution in the area.

According to a 2014 report by California’s Office of Environmental Health Hazard Assessment (OEHHA), Barrio Logan has higher amounts of diesel particulate matter than 80 percent of Californian cities [3]. Furthermore, the same report stated that Barrio Logan’s rate of asthma-related hospital visits was higher than 92.9% of all of California. The purpose of this case study on Barrio Logan is to increase awareness of the health programs and alternative projects that are available to current Barrio Logan residents. The case study will discuss the severity of the diesel pollution, the costs of respiratory-related treatments, and the impact on children’s health due to air pollution.

2. Findings

2.1. Nurse’s Office at Perkins K-8 School

Perkins K-8 School is situated on Beardsley St. in Barrio Logan, approximately at the border between the industrial and protected sections. Paulette Deyo Stohlmann, the nurse at Perkins K-8, mentioned that Perkins currently has 32 students that are diagnosed with asthma out of around 400 total students, 14 of which have PRN inhalers prescribed at school. There were 19 uses of the inhalers in the 2022/2023 school year, and 107 health office visits for headaches in this school year as well. Paulette provided the contact info of Karen Tinker, an operations specialist in the San Diego Unified School District, in order to collect historical data on nurse office visits due to respiratory causes at Perkins. Figure 1 represents the data collected from July 2018 to April 2023 (a span of 5 years).

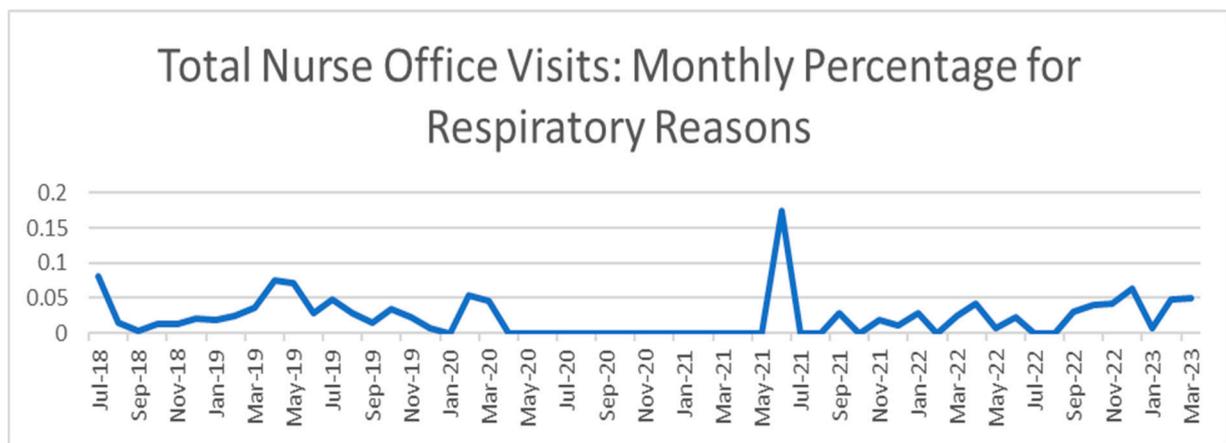


Figure 1. Total student visits to the nurse’s office at Perkins for respiratory issues.

Figure 1 shows that the pattern was stagnant for respiratory cases before the pandemic and that the pattern is increasing for respiratory cases after the pandemic. It would be worth comparing air pollution levels during these peaks with the schedules of the industrial companies in Barrio Logan to look for any heavy activity during these months. It is critical to determine if these same students are being treated outside of school, and if the students’ health is affected on the days that they are not in school, such as when the students are on summer break and increase their outside air exposure.

2.2. Perkins K-8 School

Perkins K-8 School has adapted to the new educational environment that derived from the COVID-19 pandemic. Perkins places a large focus on their students' academic success, and an even larger focus on their health. Student homelessness rose from 3% in 2014 to 40% in 2019. Moreover, the COVID-19 pandemic caused families to lose their wages because of the lack of jobs. Principal Hernandez worked with faculty and administration in order to develop a culture change to provide their students with the health support that they need. This involved developing a garden inside the school that the students maintain and adopting a culture that increased awareness on the subject of adverse childhood experiences (ACEs). A high ACE score implies an increased risk of lung and heart disease and shortens life expectancy by an average of 20 years. Increasing a students' academic focus is a secondary benefit from making sure that a student is healthy when it comes to both their physical and mental states.

2.3. Logan Heights Family Health Center

There were no pamphlets or information on what families can do for their children at the Logan Heights Family Health Center in Barrio Logan, which is also near Perkins. This location would become a great target spot to disseminate awareness on air pollution effects and to reach target segments.

2.4. Chicano Park Museum and Cultural Center

The Chicano Park Museum and Cultural Center (CPMCC) places an emphasis on both history and activism. Ashley Gonzalez, an intern at the EHC and a volunteer at the CPMCC, mentioned that there is much work to do when it comes to Assembly Bill (AB) 617, which is a bill that the Community Air Protection Program (CAPP) is focusing on to reduce the exposure and impact of air pollution in disadvantaged communities through strategies that aim to measure air quality and reduce local air pollution. Both Audrey Jakubowski, a CPMCC employee, and Alberto Pulido, the vice chairperson at the CCMCC, mentioned that there are no health services in Barrio Logan, especially when it comes to regular health checkups and outreach. Currently, there is a proposal to utilize a bus to provide educational and health check-ups as a mobile means of reaching the residents who do not have the means or the financial support to get checked. For the CPMCC, their biggest need due to their lack of manpower is a project that counts and tracks semi-trucks that pass every day through Barrio Logan without using the proposed routes specified by the EHC and the City of San Diego. Councilmember Vivian Moreno requested the San Diego Police Department (SDPD) to cite these drivers as of 2018.

3. Discussion

3.1. Poverty and Diversity

Based on census tract number 50, it can be noticed that it is primarily Hispanic or Latino families that are struggling financially (Figures 2 and 3). The average annual asthma treatment in the United States costs about USD 3266, which would translate to about 10% of a family's annual salary in Barrio Logan [4]. Latino families are being left behind.

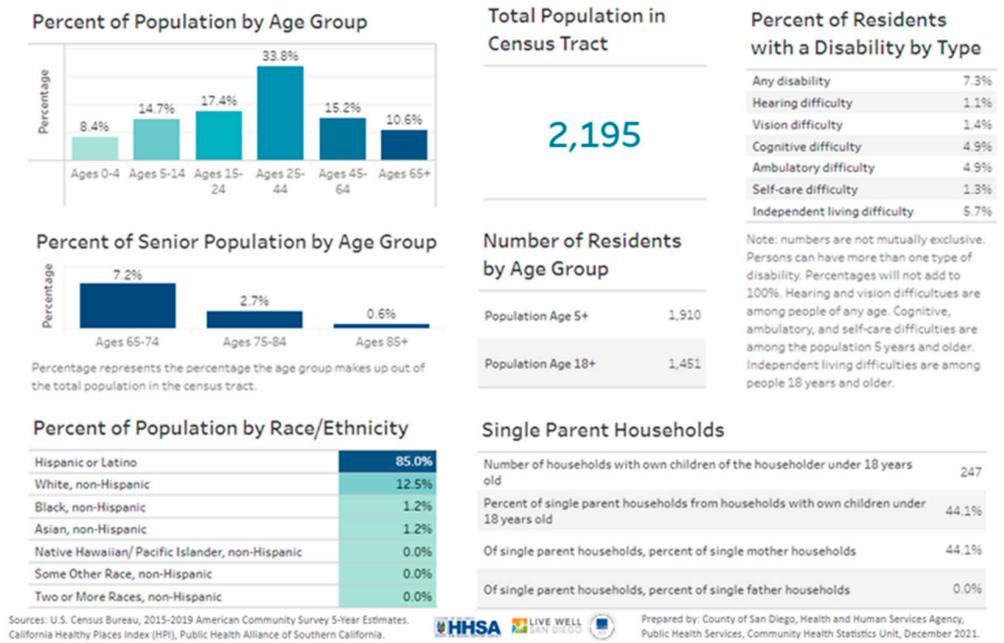


Figure 2. Demographics of census tract number 50. Adapted with permission from Ref. [5]. 2021, Community Health Statistics Unit.

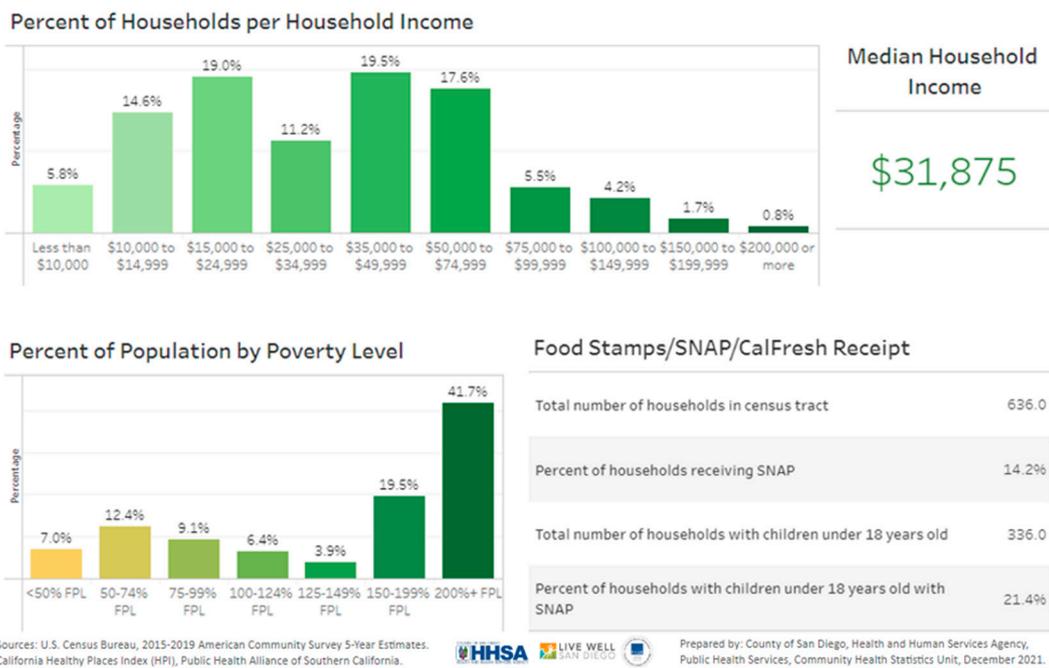
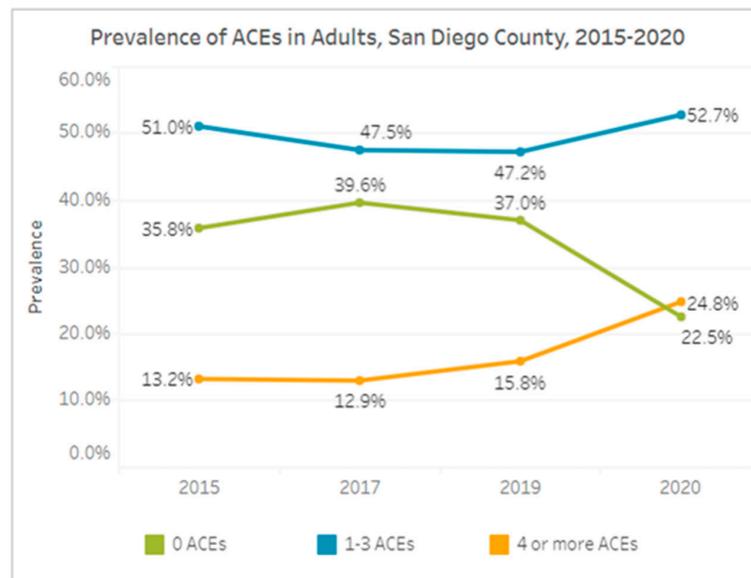


Figure 3. Socioeconomic disparity of census tract number 50. Adapted with permission from Ref. [5]. 2021, Community Health Statistics Unit.

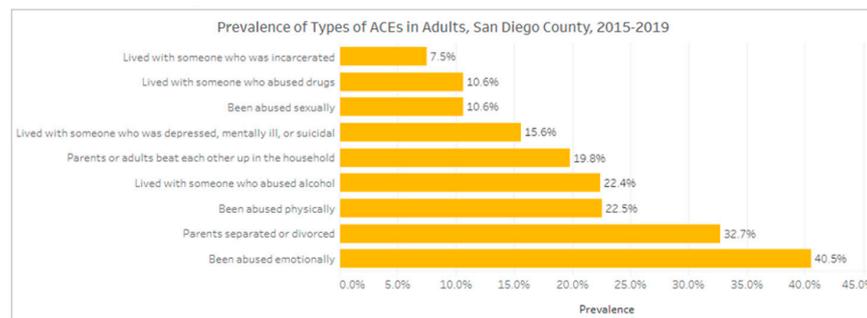
3.2. Children in Barrio Logan and ACEs

ACEs are deeply correlated with higher chances of developing life-threatening diseases. When Figures 4–7 are taken into consideration, one will realize that the administration and faculty staff at Perkins K-8 School caught wind of the detrimental effects of ACEs in their students’ futures. In order to continue reducing the asthma levels in Hispanic and Latino children in Barrio Logan, programs will also need to consider providing care for those currently developing ACEs.



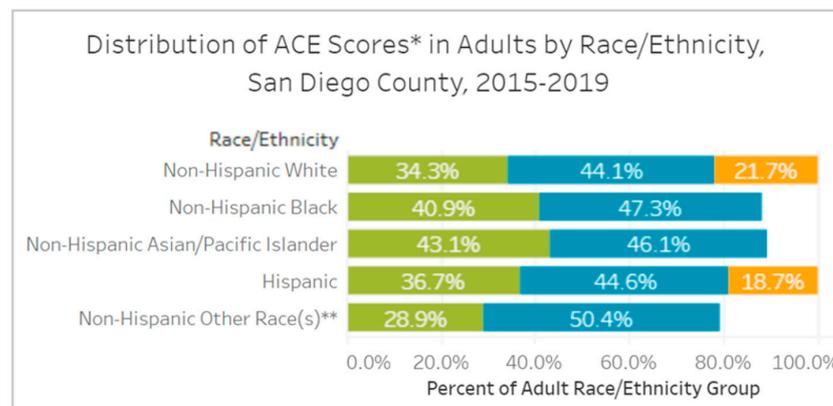
Source: Centers for Disease Control (CDC). The Behavioral Risk Factor Surveillance System (BRFSS) 2015, 2017, 2019-2020. Prepared by: County of San Diego, Health and Human Services Agency, Public Health Services, Community Health Statistics Unit, August 2022.

Figure 4. ACE prevalence in San Diego’s adults. Adapted with permission from Ref. [6]. 2022, Community Health Statistics Unit.



Source: Centers for Disease Control (CDC). The Behavioral Risk Factor Surveillance System (BRFSS) 2015, 2017, 2019-2020. Prepared by: County of San Diego, Health and Human Services Agency, Public Health Services, Community Health Statistics Unit, August 2022.

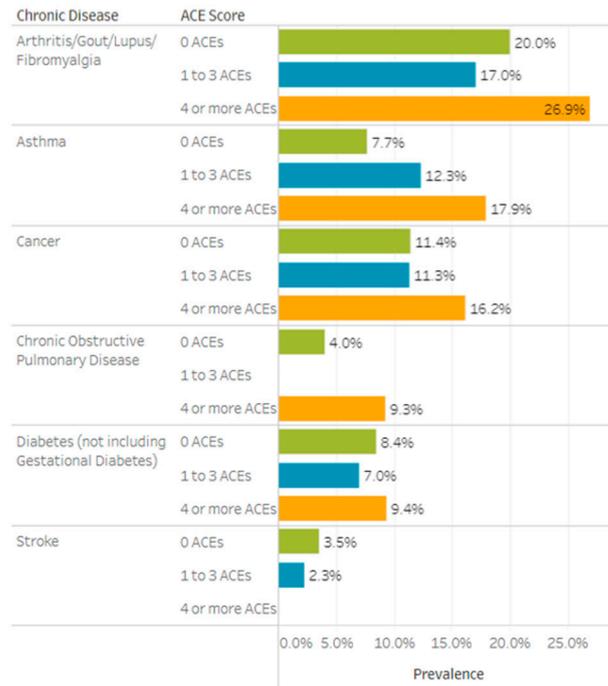
Figure 5. ACE types in San Diego’s adults. Adapted with permission from Ref. [6]. 2022, Community Health Statistics Unit.



*Statistically unstable estimates not shown.
 ** Other Race(s) includes: non-Hispanic American Indian/Alaskan Native, multi-racial, and other race/ethnicity.
 Source: Centers for Disease Control (CDC). The Behavioral Risk Factor Surveillance System (BRFSS) 2015, 2017, 2019. Prepared by: County of San Diego, Health and Human Services Agency, Public Health Services, Community Health Statistics Unit, August 2022.

Figure 6. ACE scores in San Diego’s adults by ethnicity. Adapted with permission from Ref. [6]. 2022, Community Health Statistics Unit.

Chronic Disease Prevalence* by ACE Score Among Adults, San Diego County, 2015-2019



*Statistically unstable estimates not shown.

Source: Centers for Disease Control (CDC). The Behavioral Risk Factor Surveillance System (BRFSS) 2015, 2017, 2019.

Figure 7. ACEs and connections to chronic disease in San Diego’s adults. Adapted with permission from Ref. [6]. 2022, Community Health Statistics Unit.

3.3. Asthma in Children in Barrio Logan

Barrio Logan is a predominantly Hispanic and Latino community that has low wages, has large amounts of homelessness and single-parent households, has been exposed to high levels of diesel particulate matter, and has a population of children that can accredit the above to their high ACE scores. Figures 8–11 were created from the CalEnviroScreen data that were released by OEHHA in 2018 and 2021. The Barrio Logan area is higher for asthma rates than all the zip codes that surround it, and is in the top 10% in California.

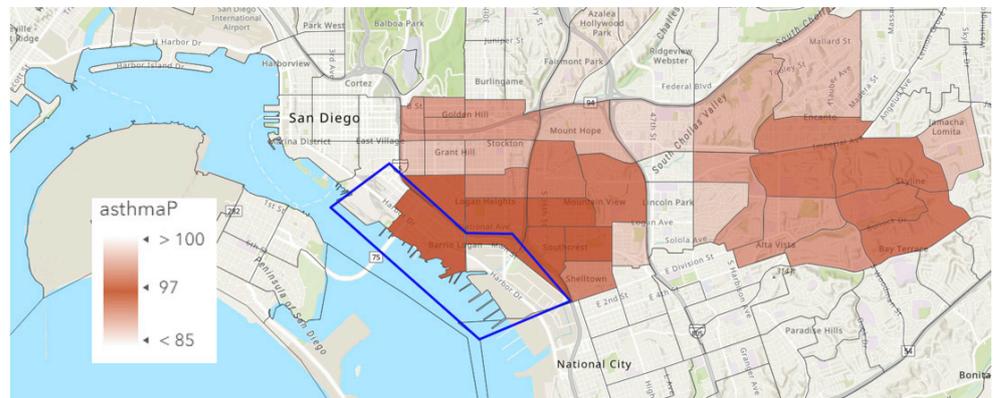


Figure 8. Statewide asthma score for Barrio Logan via CalEnviroScreen 3.0 in 2018.

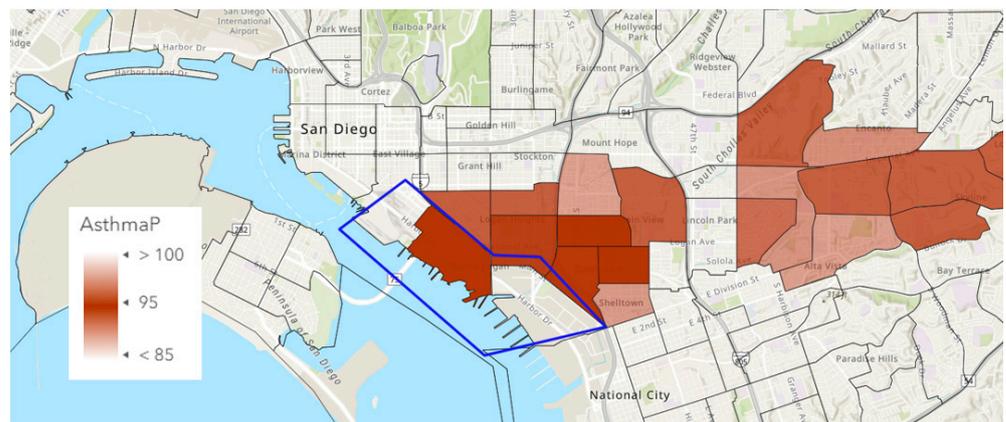


Figure 9. Statewide asthma score for Barrio Logan via CalEnviroScreen 4.0 in 2021.

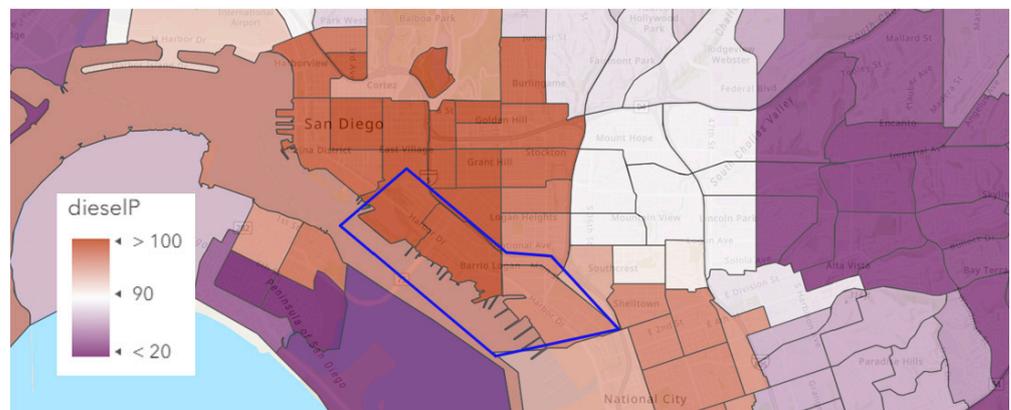


Figure 10. Statewide diesel particulate matter score for Barrio Logan via CalEnviroScreen 3.0 in 2018.

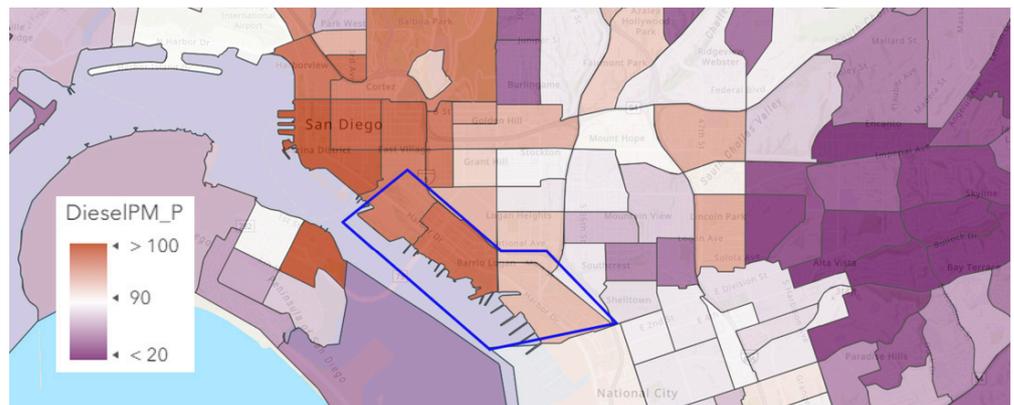


Figure 11. Statewide diesel particulate matter score for Barrio Logan via CalEnviroScreen 4.0 in 2021.

3.4. Business Model Connections and Logical Frameworks for Sustainability in Barrio Logan

The dashboard and pamphlets that will derive from the work of this case study will contain data on ACE awareness and respiratory disease awareness. The idea of using a bus as a mobile health clinic would be a perfect channel to reach out to Barrio Logan residents. Both Perkins and the CPMCC are looking for support and collaboration as they look for methods to raise awareness and ameliorate the living conditions in Barrio Logan.

Two other projects that the CPMCC and Perkins could get involved in are the air quality portable monitor project and the semi-truck detection system. The air quality portable monitor project would incorporate the use of citizen science to gather data on

diesel particulate matter levels across Barrio Logan. These monitors could be distributed to the families at Perkins and at the CPMCC, along with a sheet that explains how to set the equipment up. The semi-truck detection system would involve adding smart camera systems that detect when semi-trucks leave designated truck routes and store photos of their license plates in a database. This system would be powered by small PV panels, and the required cloud space and equipment would be paid for through grants that the CPMCC would be applying to, such as those available in the AB 617. The vertical biofilter wall program would be a recommended option that could be implemented in the Barrio Logan community as an extension to the EHC’s air monitor and purifier program. For example, the Portside Air Quality and Relief (PAIR) program could be adopted. These projects will help San Diego take steps toward meeting its Sustainable Development Goals (SDGs) #3, #9, #11, and #13. The case study’s logical frameworks for all three dimensions of sustainability can be seen in Figures 12–14.

Social	Project Summary	Indicators	Mean of Verification	Risks/Assumptions
Goal	Increased visibility of the health effects of air pollution	Change in the number of asthma attacks in the Barrio Logan community	The printed pamphlets illustrate the hot spot areas affected by air pollution and the consequences of children's respiratory health	No location accept the health pamphlets and/ore there was a lack od data on children respiratory issues and air pollution in Barrio Logan
Outcomes	Portray costs of medical treatments and how exposed the residents of Barrio Logan are to diesel particulate matter	Demographic data show average wage in Barrio Logan compared to asthma treatment costs	Online amounts are collected online for both average wages and asthma costs in Barrio Logan	There are no public data available
Outputs	Develop awareness on the enviornmental injustices occurring in Barrio Logan through health programs like pamphlet distribution and a mobile clinic	Easy-to-look-at visualizations of asthma, air pollution, and poverty in the Barrio Logan community	Pamphlets are taken to Perkins and shown to children to see if they understand the contents	There are no graphics that are easy for readers to look at
Activities	Develop website, online dashboard, and a page that summarizes findings	Website has a summary page that contains everything on the pamphlet	Website is compared to the pamphlet and updated as needed	The website gets taken down or there is a loss of netwrok connection

Figure 12. Social logical framework.

Environment	Project Summary	Indicators	Mean of Verification	Risks/Assumptions
Goal	Develop a dashboard that tracks air pollution levels in Barrio Logan	Air Quality concentration for diesel particulate matter are reducing	Comparing current concetrations to those of CalEnviroScreen 4.0	Air quality monitors not being accurate in the outdoors
Outcomes	Measure diesel particulate matter levels around Barrio Logan	Each block in Barrio Logan has a diesel particulate matter value	The hotspots are compared to the concentrations that have been previously seen by the EHC	Not enough locations are available to have a monitor set up
Outputs	Data are sent to a network that stores and filters the data	Concentration levels are tracked for the day	Go into the cloud and make sure each monitor is submitting data	The monitors lack service and connection to the cloud
Activities	Obtain particulate matter portable monitors	Have 100 monitors to distribute as the first phase	Buying the approved model and it matches the one that meets the project's desired results	No grant money to pay for monitors and cloud services

Figure 13. Environment logical framework.

Economy	Project Summary	Indicators	Mean of Verification	Risks/Assumptions
Goal	Use grants to develop job positions in Barrio Logan	10 positions are created to carry out these projects	The positions are listed online for all to see and at key locations in Barrio Logan	There are little to no jobs created from these projects
Outcomes	Datasets to develop projects	Citizens apply to participate and utilize the technology	Citizens live in Barrio Logan	There are no participants in Barrio Logan
Outputs	Grant proposals	10,000 USD is raised through funds	The raised amount will equal what the projects need to be continued for 2 years at least	There are no grants approved/won
Activities	Gather data through the use of citizen science	Cloud data usage is growing	Personnel in charge of maintaining data streams check that the data is updated daily	Data could not be stored due to network failure

Figure 14. Economy logical framework.

4. Conclusions

The effects of air pollution are everlasting; thus, air pollution should not be accepted as another aspect of the daily life of the Barrio Logan community. This is an environmental injustice that has caused organizations to collaborate with the Barrio Logan community in order to take action. Through this Barrio Logan case study, it was found that children in Barrio Logan are having a health crisis that needs to be addressed as soon as possible. Homelessness, single-parent households, unemployment, gentrification, low-wage jobs, continuous diesel particulate matter exposure, and high levels of asthma can be found in Barrio Logan. A limitation to this Barrio Logan case study was not being able to obtain data from Logan Heights Family Health Center. The case study was not able to observe if the asthma cases reported by Logan Heights Family Health Center include the families from Perkins K-8 School. It would be insightful to observe the number of students and children at Barrio Logan that are affected when school is not in session. Also, time was a limitation since the case study was a semester-long project. Information and policy are essential for citizens in disadvantaged communities.

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Conflicts of Interest: The authors declare no conflict of interest.

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