

The History and Impact of Environmental Racism Regarding Air Pollution and a Review of Long-Term Solutions

Sivani Ryali¹, Paul Morrison², Sofia Sanchez³

1. Valley Christian High School; sivani.ryali25@gmail.com

2. Texas Academy of Biomedical Sciences; paul.s.morrison9@gmail.com

3. San Ysidro High School; sofiaa.scsr@gmail.com

ABSTRACT: Previous failures of policymakers to minimize the effects of industry-born air pollution created a decrease in conditions for low-income communities in the U.S. and a rise in environmental racism. The dominating explanation for this trend is housing discrimination, attributed to the 1930s residential security maps deconstructing neighborhoods based on class, nationality, and skin color under the guise of mortgage default threats. However, other racist and anti-immigrant policies in America also contributed to the new form of segregation that barred marginalized communities from affluent and middle-class neighborhoods because they were used to benefit private enterprises for the sake of economic growth. Today, racial and ethnic minorities and low-income people are disproportionately impacted by airborne particulate matter. As methods of combating pollution-borne diseases create a more significant financial burden on these communities, individuals affected by environmental racism in industrial areas may reside in inadequate facilities, further increasing the risk of long-term exposure to pollution (PM_{2.5}). Introducing air pollution mitigation strategies such as renewable energy, green infrastructure, and deindustrialization in low-income communities can help alleviate the effects of air pollution, ending environmental racism.

KEYWORDS: Earth and Environmental Sciences; Climate Science; Environmental Justice; Environmental Policy; History.

■ Introduction

Fossil fuels have produced the modern world's capital growth by being the primary energy source for industrial companies throughout the past century and consequently have transformed worldwide navigation and standard of living. Industries' role in producing goods benefitting countries and people today is undeniable. However, these companies have left an equally long legacy of environmental issues as the pollutants they have created remain within the Earth's atmosphere and continue contributing to global air pollution. Past policies have both positively and negatively impacted the ability to mitigate the effects of air pollution on health and quality of life.

For communities in industrial areas, the release of fumes poses a significant threat to health and quality of life. Large-scale studies of air pollution and its impact have labeled pollution the cause of non-transmittable diseases such as cancer, pulmonary disease, neurodevelopmental disorder, asthma, and heart disease. The rate of increase in pollution-caused deaths points to an increase of over 50% by the year 2050.¹ Urbanization and industrialization can be mainly held responsible for the rise in global environmental pollution levels. The consequences of industrialization in densely populated areas can be prevented or slowed through increased access to adequate sanitation and maintenance, education, and health facilities. The role of these variables in combating pollution-caused disease leads to air pollution disproportionately affecting individuals in lower-income communities with less access to sanitation, education, and healthcare. An increase in industrialization without implementing combative techniques points to significant growth in mortality and disease rates, predominantly in children and

infants.² By combining previous research that quantifies the effects of air pollution on low-income marginalized communities with a comprehensive retelling of the policies that created environmental racism in the United States, the problem of air pollution may be analyzed from multiple perspectives. Moreover, the effectiveness of possible solutions may also be analyzed within social, economic, and political real-world aspects. By viewing environmental racism from the perspective of policymakers, businesses, or the elite alongside grassroots organizations and the individuals most affected, this study seeks to reveal how the way society operates contributes to air pollution-related issues and define the sacrifices needed to prevent its effects on people of today and future generations.

The literature identifying and exposing environmental racism in the current age suggests that it is a systemic issue rooted in the racial and economic segregation of neighborhoods encouraged by state-mandated policies. Many scholars suggest that environmental hazard hot spots in underserved communities were created when eminent domain and security maps allowed the industrialization of such areas under the guise of benefiting poor communities' economic development. At the same time, restrictive clauses in real estate deeds prevented these communities from moving into suburbs and social mobility opportunities.³ The effects of the security maps created by the Home Owners' Loan Corporation (HOLC) in the 1930s have been extensively researched, and findings suggest that areas graded as hazardous or redlined had diesel exhaust particle emission estimates nearly twice as high as low-risk or grade A areas in which predominantly upper-class whites resided. Such segregated communities have higher levels of in-

dustrial pollution, lower homeownership rates, and are likely medically underserved.⁴

In an ecological study, Anthony Nardone discusses how eminent domain was utilized to take tracts of land in low-income communities to benefit private industries because they didn't have the resources to appeal to the policymakers deciding on these issues.⁴ When this land was given to private businesses that industrialized the area, there was an exponential increase in local air pollution. For example, Magali Nunez examines a case study of the 1942 Bracero Program, which brought Mexican immigrants to complete short-term work on unsafe and polluted agricultural land in San Joaquin Valley, California. These immigrants were rounded up and sent back to Mexico with severe illness and injury during Operation Wetback around a decade later.⁵ Scholars argue that one of these policies' significant legacies was the negative impact on people's health. Air pollution directly correlates to many of the leading causes of death worldwide, such as cancer, heart disease, and asthma, contributing to the deaths of around 7 million people yearly.⁶ Racism, segregation, and differences in wealth mean these effects are not experienced equally by all groups of people. The literature shows that marginalized communities are much more affected by environmental hazards than middle and high-income communities due to their inability to access adequate health care and preventative measures. Those forced to live in these communities face a much higher death and illness rate than those who can afford to live in industrialized areas.²

In a case study observed by Renee N. Salas, structural racism was observed in the low-income community of a young asthmatic girl, exposing her to increased levels of air pollutants and exacerbating her condition.⁷ The child's community was in a previously redlined area, and a highway had been constructed near the area. Inhalation of roadside vehicle emissions significantly contributes to respiratory and cardiovascular diseases. Unfortunately, low-income communities and communities of color remain disproportionately exposed to these emissions and emissions from industrial construction. The case Salas describes in her study is one of many; communities subjected to redlining policies suffer from constructing major highways and industrial plants near neighborhoods and are denied forms of health-protective structures commonly seen in higher-income urban areas, such as green space.

Studies of exposure to particulate matter, or PM_{2.5}, reveal a direct correlation between populations of people of color within a zip code and levels of ambient PM_{2.5}.⁸ A study conducted with data from the years 2004–2016 showed areas with high white and Native American populations to be exposed to lower levels of PM_{2.5} than areas with high Black, Asian, and Hispanic or Latino populations. PM_{2.5} is the result of car and other vehicle exhaust, as well as the result of large-scale operations that involve the burning of fuels. Exposure to high levels of PM_{2.5} is ranked as the fifth most significant risk factor for mortality globally. Ethnic and low-income populations are at a higher risk of death because of higher exposure to fine particulate matter in their communities. Air pollutants were found to be detrimental to the health of the elderly and

older adults across the board, in the case of both physical capability or the ability to perform tasks and mental health and speed of memory loss.⁹ Exposure to air pollution poses a significant negative impact on both physical and mental health. It may cause the health and capability of older individuals to degrade at an increased rate. Epidemiological studies have suggested a relationship between exposure to air pollution and the exacerbation of disability, specifically in older adults. Air pollution may lead to systemic inflammation or oxidative stress and may cause some cases of depression or memory loss. Memory quality in elderly populations in communities with high and low air pollution exposure showed a difference in memory ability as great as that caused by an additional decade of aging. As well as the elderly, children in marginalized poor communities and communities of color suffer more from challenges to health, such as those caused by local pollutants and the COVID-19 pandemic.¹⁰ Rising temperatures cause a more extended pollen season, increased wildfires, dust levels, and smoke. Warming conditions can also be the source of a rise in ground-level ozone, a significant trigger of asthma. According to data from the Centers for Disease Control and Prevention, younger and non-Hispanic Black children are the most frequent pediatric asthma patients in emergency and urgent care.¹⁰ Redlined communities, because of increased harmful structure construction and a lack of green space, are now hotter than most non-redlined communities. An excess of man-made materials like asphalt can cause an urban island effect and create extreme seasonal heat. An increase in temperature in low-income communities contributes to disparities in exposure to air pollutants within communities and contributes to higher levels of respiratory disease in ethnic populations. Studies of low-income communities with higher overall exposure to pollution revealed that compared to communities with low exposure, communities overburdened with pollution experienced increased respiratory allergic symptoms and higher stress when exposed to the floodwaters of Hurricane Harvey. In addition, when exposed to excess pollution levels and adverse environmental conditions, communities show that they cannot adapt and persevere in response to the additional effects of air pollution.

Literature discussing the impact of air pollution on human health heavily indicates that due to redlining and racially motivated policies, communities of color suffer from air pollutants and particulate matter exposure on a much greater level than in predominantly white communities. Some scholars have proposed that the solutions to environmental racism lie in structural changes within state policy rather than creating new technologies.¹¹ However, switching to more sustainable energy sources is imperative to significantly reduce the effect of the carbon dioxide emissions that have been the primary cause of global warming throughout the past two centuries. These scholars claim that industries and governments must look at past policies affecting air pollution and environmental racism since the 1960s to understand what strategies must be implemented to mitigate these consequences.¹²

This article proceeds as follows: Section A focuses on the history of environmental racism by delving into the effects of

redlining and eminent domain on low-income communities; Section B focuses on the impact of air pollution on low-income communities; Section C investigates how we can use this history to implement new air pollution mitigation strategies such as sustainable energy, green infrastructure, and deindustrialization.

■ Discussion

A. The History of Environmental Racism:

In the 1930s, New Deal legislation was adopted under the presidency of Franklin D. Roosevelt to suspend the losses of the Great Depression. The Home Owners' Loan Corporation (HOLC) would be instituted in 1933 under the New Deal initiative as a countermeasure to foreclosures endangering Americans in the Depression-era economy by allowing homeowners to refinance mortgages into long-term payments.¹³ With the introduction of long-term mortgages and low fixed interest rates, the government-sponsored corporation found the need to create security maps that delineated areas' perceived risk of lending. This included four categories or grades ranging from "A" to "D," with grades C and D described as areas of poor investment. Grade "D" areas are the most infamous and behind the redlining history. It is often stated that the HOLC did not provide loans to grade D areas due to the high presence of people of color. These high-risk areas are described as having an "undesirable population or an infiltration of it."¹⁴ These red sections on the maps signify immigrant populations and low-income communities. Descriptions of higher-graded areas, which are predominantly white, explicitly state there is "No racial concentration. No threat of foreign infiltration." The use of this language underscores the racial undertones these security maps had.

Nevertheless, it is essential to note that contrary to its guidelines, HOLC provided loans to high-risk areas and essentially loaned to racial minorities.¹³ However, these loans were approved for racial and ethnic minorities in areas where predominantly minority populations already resided. This meant that although homeownership was open to racial minorities, the areas they lived in would still be regarded as low-value, minimizing the wealth-building opportunities homeownership entailed. Low-valued areas such as these would not receive the exact political representation as affluent neighborhoods, nor would individuals receive the same quality or access to healthcare. In this way, discriminatory housing policies created neighborhood segregation that set the stage for environmental racism. Low-income, underprivileged communities would be disproportionately exposed to environmental hazards and suffer the most from air pollutants caused by industrial facilities, toxic waste sites, and highways. Such disparities would continue to grow throughout generations with the adoption of similar laws with the same effects. In the present day, these high-risk historically redlined areas had diesel exhaust particle emission estimates nearly twice as high as low-risk or grade A areas.⁴ Statistics such as these reveal the unexpected connection between pollution distribution and race.

It is important to note that HOLC's security maps are not the first nor sole instance of racial discrimination in the home-

ownership and loaning industries. Similar discriminatory guidelines had existed locally in discriminatory neighborhood covenants before the corporation's owners. Moreover, these discriminative appraisal methods were not federalized solely by HOLC, as other government agencies practiced similar techniques. The Federal Home Loan Bank Board, the supervising agency for HOLC, initiated the City Survey Program and utilized HOLC's security maps in their loan-giving. Meanwhile, the Federal Housing Administration would provide loans for only white families in the suburbs. Such government-mandated corporations further encouraged players in the real estate industry to continue engaging in long-standing discriminatory practices.¹³ Using these tools in loan giving became a new form of segregation as these policies worked to justify racial separation and barred groups of marginalized communities from affluent and middle-class neighborhoods. The ideology that racial diversity lowered home values and, therefore, segregation was justified impelled the idea that homogeneity was a constitutional right.¹⁵ The way this ideology was instituted within American neighborhoods can be seen in the construction and expansion of the highway system, which increased the development and desirability of suburbs after the Second World War.¹⁶ In constructing the highway system, commuting between suburbs and urban environments became the daily lives of middle and upper-class Americans. It created a car-dependent society, driving a significant source of air pollution. In addition, suburban living was restricted to white middle-income Americans due to restrictive and discriminatory housing deeds that barred people of color. Therefore, through government-mandated community segregation and eminent domain, low-income communities and people of color were confined to urban or industrial environments, air pollution hotspots. This meant the security maps were only the beginning of a problem that snowballed into the enduring legacy of climate change inequalities on underprivileged groups today, as racially segregated communities have less political power, access to health services, and quality education while being more exposed to hazardous sites and decaying infrastructure. While these practices ensured communities would be segregated by race and minorities would not have the same wealth-building opportunities as affluent neighborhoods, it was through eminent domain in which land from these communities could be taken for private industrial development to become the air pollution hotspots of modern-day America. Hazardous sites have been allowed to be built in or near low-income neighborhoods to increase the community's economic and job growth; an important component of how this is achieved is through eminent domain. Under eminent domain, the government may condemn private land for public use. This is a constitutional power with limitations, yet following the decision of *Poletown Neighborhood Council v. City of Detroit*, what constitutes public use was expanded. The City of Detroit had condemned land from an interracial community consisting primarily of lower and middle-class African Americans and immigrants from Poland to provide General Motors land to construct a factory. It was determined that the expected increase of jobs in Detroit was justifiable for public use because it would resolve the issue of

unemployment and the slow economy in the city. The public cost of providing General Motors the tract of land was estimated to be over \$200 million. The price General Motors paid was \$8 million. Nonetheless, this court case laid precedence for governments to take private land through eminent domain to be used by private enterprises.³

Another prominent example of environmental racism throughout history was the California Land and Conservation Act of 1965, which caused an agricultural boom in California by protecting agricultural land from urbanization. This intense increase in the amount of agriculture on the land resulted in disastrous consequences for the surrounding regions. This act, combined with the 1942 Bracero Program, which brought in Mexican immigrants to perform intense, short-term agricultural work, ended with enormous consequences and death. The working conditions were extraordinarily inhumane and worsened when Operation Wetback was initiated, sending all the immigrants back to Mexico, although many had become U.S. citizens. These horrific concepts still exist today. In Central Valley, California, many industrial companies are in low-income communities, primarily consisting of minority groups and people of color. This catastrophe severely lowers the quality of life for those living in this area, drawing a distinct line between races and economic levels.⁵ The security maps developed by the Home Owners' Loan Corporation that caused such events are commonly used to describe the history of redlining and racially segregated neighborhoods. However, they are not the only contributing factor to environmental racism. Because minority groups became increasingly separated from the middle and upper class that had greater political representation, it became beneficial for industries to build invasive and hazardous infrastructure near low-income neighborhoods while facing low resistance, thus creating sacrificial zones and environmental hotspots throughout the country, which mainly low-income individuals and people of color inhabit.⁴ The history behind the causes of environmental racism (racial neighborhood segregation) cannot be described simply as products from one government-sponsored corporation. Instead, such maps were used as tools alongside other government-mandated policies on eminent domain and immigration acts in tandem with suburbanization and the social and economic shifts during and following World War II to cement environmental racism in the modern landscape of poor America today.

B. The Impact of Air Pollution in Low-Income Communities Over Time:

Analysis of health patterns in areas subject to high levels of air pollution demonstrates a strong correlation between air pollution exposure and deteriorating health. Poor air quality can be linked to cardiovascular and respiratory disease. Evidence also links air pollution to dementia and other mental health issues, low weight at birth, and increased infant mortality. Other effects of air pollution on health include an increase in the development of respiratory disorders, allergies, malignancies, cardiovascular disorders, oxidative stress, and endothelial dysfunction. The World Health Organization has measured excess ambient exposure to air pollution to be responsible for

around 6.5 million premature deaths per year, most of which occur in urban areas.⁶ Vehicle and transport emissions can be uniquely responsible for exacerbating cardiovascular and respiratory disease. Pollution can also be linked to reduced quality of life as it may cause poor sleep and increased stress levels due to environmental factors.

Evidence suggests that low-income areas with high populations of people of color are consistently exposed to higher levels of air pollution. Observing PM2.5 levels across zip code tabulation areas (ZCTAs) and ethnic populations within ZCTAs reveals higher PM2.5 exposure in Black, Hispanic/Latino, and Asian communities and lower PM2.5 in white-dominated communities. In 2016, the average PM2.5 concentration Black and Hispanic/Latino populations were exposed to was measured to be around 13.6% percent higher than the average PM2.5 exposure white populations experienced.⁸ Similar research about income level revealed low-income populations to have been consistently exposed to higher average PM2.5 levels than areas with high-income populations between 2004–2016. PM2.5 is recorded as one of the air pollutants posing the most significant risk to human health.⁹

The factors impacting the crude death rate caused by pollution are economic growth, availability of health professionals, urbanization, and access to sanitation and education.² While industrial pollution severely affects people's health, the death rate has been shown to decrease when the community's economic standing rises significantly. In communities with low economic standing, a lack of access to resources contributes to respiratory disease and infection rates, cardiovascular disease, and overall mortality, strengthening the disparities in life quality caused by air pollution. The impact of environmental racism on patient health and condition is today largely unconsidered in healthcare and disease diagnosis, allowing the root of many respiratory and cardiovascular diseases to go ignored. Systemic issues such as environmental and structural racism are critical in diagnosis.⁷ To further understand the impacts of industrialization on communities of color and low income, the following sections will examine two previously redlined, heavily polluted communities: The Cancer Alley region in Louisiana and the community of Barrio Logan in San Diego.

The area between Baton Rouge and New Orleans, Louisiana, is known as "Cancer Alley" due to high pollution levels due to petrochemical production. The entire region is considered to be part of Cancer Alley and stretches over the course of 100 miles. The controversy surrounding the existence and legacy of Cancer Alley is owed to the belief that the reason for developing petrochemical industrial plants within the area lies solely in the density of African American and Native-American populations already living in the region. The area's legacy as a major plantation area and using income maps identified it as a highly ethnic community open to industrial development. The exploitation of minority populations in Cancer Alley has been a source of outrage amongst activists and serves as a real-world example of environmental racism.

As of 2010, the Cancer Alley region accounted for almost a fourth of national petrochemical production. The area includes over 130 plants, landfills, refineries, and factories, most

of which contribute to this petrochemical production. Socio-economic studies of the region reflect high levels of poverty and illiteracy and low levels of average income. A total of 79 census tracts in Jefferson, St. John the Baptist, East Baton Rouge, and Orleans Parishes comprise at least 90% Black residents, and most of these tracts also report meager household incomes.¹⁷ Overall, the racial composition of Cancer Alley is estimated to be 55% white and 40% Black, compared to state averages of 64% and 32% and national averages of 75% and 12%.¹⁸ Despite high rates of air pollution, the area Cancer Alley inhabits is known well for its cultural experiences and rich multi-cultural history, making it a popular tourist location in Louisiana. To highlight the impacts of industrial construction on the region's landscape and people, residents of the area have combined the region's two most significant industries, tourism and chemicals, in tours referred to as "toxic tours". Toxic tours walk visitors through Cancer Alley's residential areas, stopping to highlight areas of unique interest, such as heavy visible smog, physical impairments of community members, and other visible reasons for pollution/environment-related concern. In a segment from a recorded tour, a resident of Cancer Alley describes the landscape before him. "And in this dome is a nuclear power plant in front of us. And beyond the nuclear power plant are two gas-fired energy plants on that side of the river. And two gas-fired plants on this side of the river... this plant moved in on top of this community. And this happens time and time again."¹⁹ On the tour, visitors make many stops at homes, businesses, daycares, and graveyards, each surrounded by industrial construction. These tours are guided by community residents, leading tourists through the places Cancer Alley residents lead their lives. These tours aim to provide awareness of the effects of polluting industries and incentivize environmental justice. The effects of petrochemical plants pose significant health risks to individuals living in Cancer Alley. According to a study completed in 2012, the mean cancer risk in Cancer Alley was 45.8 per million, meaning that up to 46 individuals out of one million could potentially develop cancer over a lifetime of exposure to all carcinogenic air toxics in ambient air.¹⁸ Collected data also indicated that as household income decreased, cancer risk increased. For each decrease of \$10,000, an additional person per one million was measured to develop cancer in a lifetime. Formaldehyde and benzene were the two largest contributors to increased cancer risk and were estimated to account for 39% and 36% of the total disparity magnitude. Rates of recorded cancer development and cancer-caused deaths exceed the national average in Cancer Alley and industrial areas across Louisiana.¹⁸ The impacts of industrialization extend not only to physical health but to mental health. Exposure to industrial air pollution, in addition to its risk to health, may impair the perception of the self-rated health status of individuals in polluted areas.

In intensely polluted areas such as Cancer Alley, air pollution may lead to systemic inflammation or systemic oxidative stress and may cause some cases of depression or memory loss.¹⁸ Impacts on health caused by the mixing of residential and commercial/industrial areas can further be understood through the analysis of the neighborhood of Barrio Logan,

located in San Diego, California. During the 1920s to 1950s, Mexican American, African American, and Asian residents, as well as Mexican immigrants, moved into Barrio Logan after the construction of highways and the trolley system allowed others to move further from their jobs into the suburbs. Restrictive clauses in real estate deeds prevented such minorities from moving into the suburbs even if they had the means. The Mexican-American population in the area increased as they were attracted by cultural familiarity, available housing, and unskilled labor in agriculture, railroad construction, commercial business, and military-related industry following the Mexican Revolution. European and Asian immigration was restricted following WWI; Mexican immigrants filled labor demands in the area. Immigration and Naturalization Service and the American Federation of Labor encouraged local governments to find and move undocumented Mexicans to Mexico in the 1930s. Still, Mexican immigration rose again after the need for agricultural and industrial labor during WWII and the introduction of the Bracero Program. Throughout the 1940s and into the 1950s, Logan Heights contained fifteen percent of San Diego's Spanish-speaking population. Today, the community is home to a predominantly Hispanic/Latino population. Data from the 2000 U.S. Census records that 91% of Barrio Logan's residents are Hispanic or Latino, and 37% live below the census-defined poverty threshold.²⁰ The community is recognized as one of "environmental justice" or a "community of color and low income ... faced with a disproportionate share of unwanted land uses and disparities in environmental protection" and is cited as one of the areas with the highest diesel exposure in California.²¹ According to CalEnviroScreen, Barrio Logan is number one in the county for pollution burden and is near the top for diesel particulate pollution. Additionally, the community ranks in the top ten statewide for high rents and low wages. By 1946, industries began encroaching upon residential and commercial areas, including a re-tinning plant, a floor tile manufacturer, several iron works, furniture manufacturing, battery manufacturing, bottling works, and a manufacturer of small cars. During the 1950s, Barrio Logan was rezoned from residential to mixed-use zoning and, over the next twenty years, saw an increase in automotive scrap yards and industrial businesses. Barrio Logan, in the present, utilizes land patterns that mix commercial, residential, industrial, and military-designated land. Using mixed land exposes residents to high levels of industrial pollution from surrounding industrial and military-designated spaces. Located adjacent to Barrio Logan is one of the Tenth Avenue Marine Terminal. The terminal is one of two port facilities surrounding the residential areas of Barrio Logan. The area's second port facility, the National City Marine Terminal, is located 4 miles south of the TAMT and operates in proximity to the Old Town neighborhood, demonstrating similar population demographics to those seen within Barrio Logan.²² The location of these port facilities invites large-scale trailer traffic through Barrio Logan, contributing to local vehicle emissions and residential air pollution. The Barrio Logan community has raised concerns regarding diesel truck impacts caused by the TAMT, including air pollution, noise, and reduced pedestrian safety. The health

risks relating to goods traffic and diesel emissions are well defined: In a study of Los Angeles County, approximately 70% of excess cancer risk has been attributed to diesel particulate matter along the Ports of Long Beach and Los Angeles, which, similarly to Barrio Logan and Old Town, include high densities of low-income and ethnic populations.²² The following figure is a visual representation of land use in Barrio Logan, created by the San Diego County Air Pollution Control District. Residential areas are indicated with green, mixed-use areas with purple, shipyards and commercial zones with black; the trainyard with red; and the Tenth Avenue Marine Terminal (TAMT) with yellow.²



Figure 1: Land use in Barrio Logan region.²³

In a summary of interviews conducted with Barrio Logan residents, residents describe their economic struggles and their struggles with construction throughout their community from the 1920s to the 1960s. In an interview with Barrio Logan residents Natalia Riveroll and Norene Riveroll, the residents describe a freeway that “cut the neighborhood in half.”²⁴ Leaving the church on one side of the division and local businesses and homes on the other, the construction of the freeway “truly affected everyone” as it took the opportunity to expand across land forced to sell due to community economic struggles. The freeway construction referenced in the residential interviews refers to the construction of Interstate 5, which, upon its construction in the 1960s, divided the Logan Heights neighborhood and displaced families and businesses. It was constructed before implementing the National Environmental Policy Act, the California Environmental Quality Act, and the National Uniform Relocation Act, which today act to protect communities from potentially harmful public investment projects. Freeway construction was an extension of practices brought into use with redlining, which was used in part to determine which communities received industrial complexes and highways.⁷ Redlined communities are susceptible to constructing roadsides and high-usage highways near or within their communities, increasing exposure to roadside and vehicle emissions. Increased exposure to these emissions leads to respiratory and cardiovascular health degradation. The detrimental impacts of mixed-use land and highway construction throughout neighborhoods in Barrio Logan are clearly exhibited in reported health statistics from the community. Barrio Logan’s rate of asthma-related hospital visits is higher than 92.9% of census tracts throughout the state, with about

81 visits per 10,000 people.²⁵ Asthma hospitalization and ER visit rates are persistently high in the neighborhood. In addition, an analysis of air quality and health risks in Barrio Logan reported the entire community to be exposed to “incremental and total cancer risks greater than the significance threshold of ten in one million due to sources located primarily outside of the Barrio Logan community boundaries.”²⁶ In meetings with district and local officials, residents of the Barrio Logan community have repeatedly raised their concerns regarding truck traffic, truck idling, businesses located near homes and residential complexes, and commercial activities in the Port of San Diego.²³ Pollutants of concern are diesel, toxins, and metals.²³ Community members have also raised extensive concerns about the impact community pollution poses to children and the elderly.

C. Air Pollution Mitigation Strategies:

Since the early 1960s, policymakers have engaged in remediation efforts to combat air pollution issues on a global scale. Several policies have been enacted over the past decades to mitigate the effects of industrial pollutants. Yet, the respiratory diseases air pollution creates still contribute to the death of around 7 million people annually, and since the 1960s, air pollution has been a factor in over 434 million deaths. It is critical to note that the rate of air pollution deaths has significantly decreased over time. Although still accounting for around 11.65% of deaths globally in 2020, improvements in indoor pollution have nearly halved the number of air pollution-related deaths since the 1990s.²⁷ But despite the overall downward trend in air pollution-caused deaths, patterns of racial and socioeconomic inequality remain. Statistics show that people in low socioeconomic housing areas are significantly more impacted by air pollution’s effects than those in middle- or upper-class neighborhoods.³

The failure of climate initiatives to eliminate environmental racism can be attributed to a prominent focus on global climate change.

In 2006, California began the implementation of its Global Warming Solutions Act, otherwise known as AB 32, which included policies aiming to reduce in-state GHG emissions.²⁸ Key components of AB 32 included increasing energy efficiency in homes, buildings, and vehicles, increasing reliance on renewable energy, and reducing carbon pollution.²⁹ AB 32 specifically sought to include provisions for local air quality and directed the California Air Resources Board to monitor and control greenhouse gas emissions on a community level. However, despite its novel focus on environmental justice concerns, AB 32 faced difficulties in its practical actualization. These difficulties included conflict with the environmental justice community regarding the widely controversial greenhouse gas cap-and-trade program, economic difficulties balancing the act on both a broad and specific level, and allegations that AB 32’s implementation was misaligned with the intent to protect environmental justice communities.²⁸ Efforts to amend AB 32, such as the implementation of AB 617, suffered from a lack of enforceable measures against local air pollution and ultimately yielded minimal results. Despite its underperformance, AB

617 still produced valuable insight regarding improvements to environmental justice policy.

To begin with, AB 617 demonstrates the necessity of emission reduction plans to produce quantifiable and permanent results. Through AB 617, community members were able to identify local pollution hotspots and concerns, yet the state still needs to deliver solutions to these concerns. From this, a key component of environmental policy can be identified as enforcement, which, according to EPA guidelines, means providing violation definitions and abilities for the state to apply penalties and secure corrective actions.³⁰ Additionally, AB 617 illustrates how the crux of environmental justice solutions lies in community-driven efforts. Community monitoring and insight are critical in identifying target areas for remediation and provide valuable insight regarding policy impact. With community input, future legislation would be able to identify sectors that require rule development, leading to increased plan efficiency and effect. To gain valuable input, legislative action must be extended to include transparency and a focus on community input. Policymakers can identify location-centric priorities by educating community leaders and decision-makers about the climate action process.

The ideas of policies like AB 32 and their amendments push legislation regarding air pollution in the right direction: however, they demonstrate how the key to effective implementation lies in community-based action. Considering the racial and social divisions created by air pollution exposure, it becomes the role of policymakers to make changes to laws to adopt supervision against large contributors to the release of PM_{2.5} and other relevant pollutants. New ideas, such as switching to sustainable energy sources, green infrastructure, net zero carbon emission plans, the deindustrialization of large cities, and eliminating indoor and outdoor air pollution, must be brought to policymakers' attention.² These solutions can mitigate the effects of air pollution and help end the pressing issue of environmental racism destroying the quality of life for low-income communities and people of color. Beneficial community-centered actions to combat environmental injustice include identifying target areas for GHG reduction, monitoring air pollution fluctuations, and educating and involving community members in critical policy decisions. These solutions can mitigate the effects of air pollution and help bring an end to the environmental injustices that threaten the quality of life for low-income communities and people of color.

■ Conclusion

The findings of this study depict the historical and empirical relationship between previously implemented redlining policies and air pollution exposure. This study reveals unseen connections between the effects of racism, anti-immigrant sentiment, and poverty on current environmental inequalities and how government-mandated policies and private enterprises systematized environmental racism. Recent research highlighting the impact of systematic structural racism in studied low-income communities and communities of color reveals excess air pollution exposure to be prevalent and a signifi-

cant factor in the contraction and development of respiratory disease and forms of cardiovascular disease. In centering past policies as the contributing factor of environmental racism, we can reframe the discussion of possible solutions from the innovation of new technologies to policy-based solutions. Further discussion points may focus on healthcare inaccessibility, urban infrastructure efficiency, public transportation, and how perceptions of low-income minorities or environmental justice grassroots affect mitigation-related discussions. In addition to this, we may question how environmental racism continues to be propagated by current-day rising home prices.

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■ Authors

Sivani Ryali is a sophomore at Valley Christian High School in San Jose, California. She plans to study environmental engineering and has conducted past research on environmental equity and policy. She aims to create technology that supports an environmentally equitable future.

Paul Morrison is a high school junior attending the Texas Academy of Biomedical Sciences in Fort Worth, Texas. He plans on pursuing a career in the life sciences while concurrently studying music. He has conducted research projects on environmental catastrophes and the worldwide movement of eco-friendliness.

Sofia Sanchez is a senior at San Ysidro High School in San Diego, California. Her research interests include environmental and social policy. She is interested in studying policy impact from a historical perspective and has previously conducted related research.