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Superfund and Society Benumbed: An In-Depth Look at Environmental Justice in South Carolina

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SUPERFUND AND SOCIETY BENUMBED: AN IN-DEPTH LOOK AT ENVIRONMENTAL JUSTICE IN SOUTH CAROLINA

By

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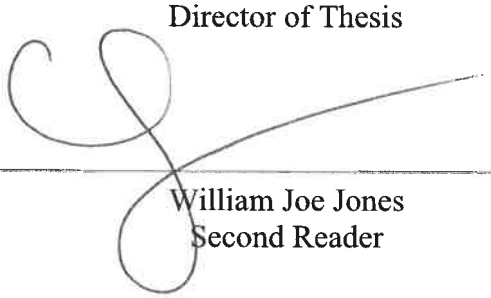

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Author's Note

Coming to South Carolina I'd never heard of Environmental Justice or considered it a topic of interest, let alone a viable career path for myself. As a Black woman majoring in Marine Science, this topic applies to me on both a personal and professional level. I am most interested in pursuing a career aiding vulnerable populations, and that includes communities subjected to environmental injustice. South Carolina, like many other southern states, is a perfect place to explore the interconnectedness between social and environmental issues encompassing the topic of this thesis.

I would like to acknowledge everyone who has contributed to my completion of this thesis through guidance, support, and insight in some capacity. First and foremost, I would like to thank Dr. Monica Barra, my thesis director, for providing me with an invaluable amount of knowledge regarding the Environmental Justice movement and helping me to develop my research and writing. She has dedicated many hours over the last couple of years aiding me with my project, and her constant assistance has shaped me into a much better researcher, analytical thinker, and writer.

I would also like to thank my second reader, Dr. Joe Jones, who has supported me not only throughout my completion of this thesis, but throughout my four years at the University of South Carolina. By providing me with his own insight regarding environmental and public health issues as well as connecting me to Rebecca Gillman, an alumna of the South Carolina Honors College, who has also served as an invaluable resource in the field of public health.

A final, but special thanks goes to Colleen Sullivan, who first introduced me to the topic of Environmental Justice. The many conversations over local and national Environmental Justice issues provided me with a necessary foundation for this thesis that without it may have prevented me from pursuing this topic.

Thesis Summary

This thesis investigates the relationship between superfund sites in minority communities and their public health through the lens of social vulnerability. Various demographic parameters were used to assess the risk associated with minority communities and exposure to hazardous waste. After investigating the history of the Environmental Justice movement, three superfund sites of interest in South Carolina, and demographic and public health data; each community was analyzed to determine association between exposure to hazardous waste and minority status. Each examined community exhibited characteristics contributing to heightened social vulnerability, potentially causing increased susceptibility to negative health outcomes from exposure to hazardous waste.

Introduction

Organized fights against environmental justice in the United States go back as far as the 1960s headed primarily by African Americans, Hispanic, Asians, Pacific Islanders, and Native Americans. The environmental justice movement addresses this fact and issue: people who live, work, and play in the most polluted environments in the United States are most commonly people of color and the poor (Palmer, 2016). The polluted environments that this research will focus on are superfund sites. Superfund sites are areas where hazardous waste has been dumped, and once tested and determined unsafe, is then designated by the Environmental Protection Agency for remediation funded either by the responsible party or the government.

There are negative effects associated with living, working, and recreating near such polluted environments. The most obvious of which, is physical health. For example, disparities in the health of African Americans in comparison to other racial communities has been investigated to be related to the environments of which most African-Americans can be found living in (Cummings, 2007). African Americans are not the only group of individuals experiencing such negative effects. Native American and other Indigenous populations often suffer from environmental racism as a result of settler colonialism and a disregard for their way of life. Hazardous waste and polluted environments have been determined to cause cancers, organ ailments, asthma, and birth defects among other health issues in Native Americans living near these sites (Brook, 1998). An inordinate concentration of hazardous waste sites is found in African American and Hispanic communities, which is not surprising considering that communities with greater minority percentages are likely to contain these sites (United Church of Christ, 1987).

Race isn't the only contributing factor to environmental injustice, it has been found that disability status combined with other social disadvantages such as race/ethnic minority, poverty, and elderly status amplified unequal proximity to sites on the national priorities list and treatment, storage, and disposal facilities (Chakraborty, 2020). To contextualize the way in which minority and low-income communities have become subjected to such unjust environmental circumstances, one must understand the social framework that makes them vulnerable. Various definitions of social vulnerability have been adapted through literature on climate change, environmental justice, and environmental hazards. As stated by Hendricks and Van Zandt: "social vulnerability is a multifaceted concept that includes dimensions of physical and constructed variables that help identify experiences of communities that may or may not support them during environmental hazard exposure" (2021). Cutter and Finch (2008) defined social vulnerability as "a measure of both the sensitivity of a population to natural hazards and its ability to respond to and recover from the impact of hazards" Wisner et al., defined social vulnerability more broadly as "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard" (2004).

For this thesis, I will be referring to social vulnerability under a definition that is a combination of those above. I define social vulnerability as a complex concept encompassing the physical and constructed variables characteristic of a person or group that help to both measure and identify the sensitivity of said person or group to natural hazards and their capacity to anticipate, cope with, resist, and recover from their impact.

The social determinants of vulnerability that will be used in this thesis include but are not limited to race/ethnicity, household income, educational attainment, poverty level, and rate of

unemployment. Recognizing the statistics of these determinants within the respective minority and low-income communities of interest and the state of South Carolina will help put into perspective how they may or may not exacerbate the negative environmental impacts associated with them. As such, it is important to note the environmental factors and social determinants of health that will be used to make such comparisons. The environmental factors include air quality, water quality, and food hygiene and safety. The social determinants of health I will be using include the incidence of respiratory disease, cardiovascular disease, and cancer.

Knowing and understanding how improper disposal of toxic waste and other harmful pollutants has been shown to disproportionately affect minority and low-income communities, I aim to research the negative health impacts associated with living, working, and recreating near superfund sites to shed light on these environmental inequities. This thesis seeks to investigate and compare the health outcomes across racial communities – African American, Hispanic, and Native American – in 3 South Carolina counties – Allendale, Beaufort, and York – in association with exposure and proximity to superfund sites. I hope to answer the question: is there a relationship between the disproportionate siting of superfund sites in minority communities and public health in South Carolina?

Background

To provide greater context for the purpose of this thesis as well as the circumstances under which the communities of interest have become subjected to these environmental inequities, I have provided some background for both the Environmental Protection Agency, the Superfund Program, and the specific superfund sites of interest.

History of the Environmental Protection Agency & Superfund Program

The tale of the Environmental Justice Movement and the founding of federal environmentally-focused agencies like the Environmental Protection Agency (EPA) and the Superfund Program cannot be told without acknowledging the outcries of jeopardized communities and public activists. The strength in community and activism for environmental justice has grown over the decades of activism within minority communities for social reform of other kinds. By understanding the local perspective of grassroots activism, we can both recognize "the way in which disenfranchised communities experience social and structural constraints that strengthens the environmental decision-making process," and examine the "dimensions of power struggles, the relationships of actors within these struggles, and the role of the legal and regulatory framework in structuring those relationships" (Cole and Foster, 2000).

Through the development of the United States and Canada, Native American people have experienced environmental injustice and struggles for self-determination through the degradation and exploitation of their lands, rights, and resources since their first encounters with Europeans. A large proportion of minorities, especially Hispanics, make up the documented and undocumented farm workforce, and as a result are disproportionately affected by pesticides and other agricultural chemicals. Likewise, in predominantly Hispanic communities where English is not the common language spoken, proper accommodations to language barriers necessary for community engagement in decision-making processes is not provided. Beginning in the 1950s and 1960s, African Americans spearheaded the Civil Rights Movement to reclaim what had been denied for so long under the chains of slavery. Each of these minority groups have endured long-lasting effects of environmental racism and injustice, and as a result their grassroots activism was ignited to create change within legal and political structures like the EPA.

During the same time as the Civil Rights Movement, there was a rise in public concern regarding the harmful effects of humans on the natural environment. As a result, a bill named the Resources and Conservation Act (RCA) was introduced to Congress in 1959 but did not pass (Bear, 1995). In the following years, the public's concern regarding the environment had not ceased or diminished. Publications like *Silent Spring*, written by Rachel Carson in 1962, continued to alert the public about detrimental toxic chemicals, pesticides, and other hazardous waste that could potentially affect both the environment and human health (Bear, 1995). Constant pressure by the public, scientific writers, and the medical community encouraged government representatives to continue discussing the state of the environment and come up with new ways to combat the potential hazards.

In 1969, around the same time that the Santa Barbara Oil Spill had occurred, Congress began to take environmental concerns more seriously, and drafted the National Environmental Policy Act (NEPA), which was put in place to promote the enhancement of the environment (Brockovich, 2020). Among many other drivers, public outrage and increased appreciation for the environment are what motivated the enactment of this law. On January 1, 1970, President Richard Nixon signed NEPA into law. In the signing of this law, the Council on Environmental Quality (CEQ) was also created in the Executive Office of the President to "gather, analyze, interpret and report timely and authoritative information concerning environmental conditions and trends" (Tunstall, 1979). This law required that a detailed statement of environmental impacts, later recognized as an environmental impact statement (EIS), be prepared for all major federal actions significantly affecting the environment. The responsibility of the CEQ was to help coordinate federal environmental action in the United States, and to cooperate with other

agencies and offices at various levels to develop environmental and energy policies and initiatives.

Growing attention towards the environmental hazards experienced in the workplace grew in the late 1960s and early 1970s via the Labor Movement. The struggle for self-determination experienced by farm-workers and others in the workplace mirrors that of Native Americans and African Americans looking for control over the decisions that affect their health and livelihood. On July 9, 1970, President Nixon proposed the creation of a designated federal agency that would be responsible for all environmental responsibilities of the federal government, known as the Environmental Protection Agency (Collin and Collin, 2006). After many hearings, the Senate and House of Representatives approved the proposal, and the doors of the EPA opened on December 2, 1970. With the opening of the EPA, there was a plethora of laws and policies that were put into place beginning in the 1970s.

In 1972, Congress proposed the Federal Water Pollution Control Act Amendments, also known as the Clean Water Act (CWA), which was later signed by President Gerald Ford in 1974 (Brockovich, 2020). The CWA set federal guidelines to address water quality and pollution control standards. The objectives of the CWA were to: (1) restore and maintain the chemical, physical, and biological integrity of the nation's waters; (2) recognize the responsibilities of the states in addressing pollution and aiding states to do so, including funding for publicly owned treatment works for the improvement of wastewater treatment; and (3) maintain the integrity of wetlands.

The waters designated for protection under the CWA include all with a "significant nexus" to "navigable waters". However, this terminology is quite general and remains open for

interpretation within the judicial system, which in turn makes it difficult to enforce laws against any who seem to be in violation.

The Safe Drinking Water Act (SDWA) was passed in 1974, as the principal federal law intended to ensure safe drinking water for United States citizens (Brockovich, 2020). The EPA is required by this law to set standards for drinking water quality and oversee that all states, localities, and water suppliers are adhering to these standards. This law specifically applies to all public water systems, but not private wells or bottled water, which may be regulated by other laws in other capacities. Primary federal drinking water standards are categorized into six groups under which there are more specific standards set by the EPA: (1) Microorganisms, (2) Disinfectants, (3) Disinfectant Byproducts, (4) Inorganic Chemicals, (5) Organic Chemicals, and (6) Radionuclides.

There are also secondary drinking water standards set by the EPA, which are non-regulatory guidelines for aesthetic characteristics including taste, color, and odor. If drinking water becomes unsafe, the EPA may issue a health advisory for certain contaminants, which provides information to public health officials about health effects and treatment methods among other topics. These advisories, however, are not enforceable (Brockovich, 2020). To ensure the safety of drinking water more properly, the EPA often enforces a maximum contaminant level (MCL) for certain contaminants such that the amount found in the water should not be harmful (Brockovich, 2020).

In 1976, Congress passed the Toxic Substances Control Act (TSCA), which gave the EPA the authority to regulate the introduction of new or preexisting chemicals in the United States. Through this law, the EPA may gather information about chemicals, require producers to test them, regulate chemical production and use, and create the national inventory listing of

chemicals (Brockovich, 2020). The three main objectives of the TSCA are to: (1) assess and regulate new commercial chemicals before they enter the market, (2) regulate chemicals already existing that pose an "unreasonable threat to health or the environment", and (3) regulate these chemicals' distribution and use.

Also in 1976, the Resource Conservation and Recovery Act (RCRA) was established as law by Congress to govern the disposal of solid waste and hazardous waste (Teets et al., 2003). This law was enacted as an amendment to the Solid Waste Disposal Act of 1965, which was put into place to improve waste disposal technology after the second industrial revolution (Teets et al., 2003). Through the RCRA, national goals were set for: (1) protecting human health and the natural environment from the potential hazards of waste disposal, (2) energy conservation and natural resources, (3) reducing the amount of waste generated through source reduction and recycling, and (4) ensuring the management of waste in an environmentally sound manner.

The laws above set in place to make positive change towards protecting the environment did not put a complete halt to pollution or toxic waste. In 1977, six people died and thirty-five were hospitalized due to a fire at a chemical waste treatment facility that ignited from chemical reactions. Love Canal, a city in Niagara Falls, New York, was declared to be in a state of emergency in 1978 by President Carter due to unregulated hazardous waste dumping in the community. This environmental disaster led to a drastic increase in skin rashes, miscarriages, and birth defects among other negative health effects throughout the community. As a result, there came an influx in the following and support of the Anti-Toxics Movement, which fought "to understand, and then restructure, the system of toxic waste production in the United States" and centered around the idea of "pollution prevention" (Cole and Foster, 2000).

The rising composite of declining public health relating to hazardous waste dumping and the infamous state of emergency at Niagara Falls, New York led Congress to pass the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), nicknamed "Superfund", in 1980 (Hoover, 2017). The Superfund Program was established to address the dangers of abandoned or uncontrolled hazardous waste dumps through emergency response, information gathering and analysis, liability for responsible parties, and site cleanup (Hoover, 2017). The term "Superfund" comes from the designated Trust Fund created by CERCLA to finance emergency responses and cleanups.

The first site that was successfully responded to and remediated by Superfund was the "Valley of Drums" site in Bullitt County, Kentucky in 1981. During their inspection, the EPA found leaking drums and pollution discharging into the Wilson Creek (Bullitt County Genealogical Society, 2020). The EPA responded by upgrading the site's treatment system and removing 4,200 drums of surface waste offsite for proper disposal (Bullitt County Genealogical Society, 2020). The funds for superfund site remediation originally stemmed from taxes on chemical and petroleum industries, however, beginning in the mid-1990s there was a decrease in revenue due to lobbying and efforts of a Republican Congress. Through sustained pressure, the Superfund Program's funds diminished, and as a result made it more difficult to offer help to communities in need. As of late, much funding comes from the "responsible parties" of the hazardous waste, which can only occur when those parties are located and held accountable (U.S. GAO, 2015).

To help organize the various hazardous or contaminated sites that needed support, the EPA developed the National Priorities List in 1983 (U.S. EPA, 2020). Superfund sites are commonly found within poor communities and communities of color. With that being said, the deallocation

of resources to this program further hurts minority communities. Regardless of funding, when it comes to remediation "white communities see faster action, better results, and stiffer penalties than communities where African Americans, Hispanics, and other minorities live" (Cole and Foster, 2000). In an effort to minimize these disparities, amendments are constantly being made to the RCRA and CERCLA such as the Emergency Planning and Community Right-to-Know Act, which was passed into law under the 1986 Superfund Amendments (U.S. EPA, 2020).

Superfund Sites Details

The following section focuses on the history of and contaminants within each superfund site of interest. In doing so, this information aids in contextualizing the dangers of volatile organic compounds and other chemical substances found at each site with respect to human health. Each site is located in a different demographic context; however, they all have their similarities when it comes to waste, pollutants, and exposure.

Helena Chemical Co. Landfill – Allendale County

This superfund site is a 13.5-acre lot located in Fairfax, Allendale County, SC, including a 4-acre former landfill in the northeast portion of the site, two warehouse buildings, and an office building. Agricultural and undeveloped land and several residences border the site to the west. A residential neighborhood and Fairfax Elementary School are located northeast of the site. Homes near the site include low-income and minority residents. A public water supply well is located 200 feet west of the site. Prior to the mid-1960s, Atlas Chemical Company owned and operated a pesticide formulation facility at the site. Two other companies also owned and operated pesticide facilities on this site: Blue Chemical Company (mid-1960s until 1971) and

Helena Chemical Company (1971-1979). Helena Chemical Company's operations included the formulation of both liquid and dry agricultural insecticides. This location was placed on the EPA Superfund Program's National Priorities List in 1990 due to contaminated debris, groundwater, sediment, and soil resulting from facility operations. During the site's third 5-year review in 2014, it was discovered that the cleanup was no longer protective of human health and the environment because of increasing soil contaminant concentrations. Likewise, the migration of contamination offsite in surface water or leaching of contamination to groundwater should be considered as new or expanding exposure pathways.

Kalama Specialty Chemicals – Beaufort County

This 50-acre superfund site is located on Highway 21, 4 miles from Beaufort in Beaufort County, SC. On this site are drainage ditches and concrete building sites associated with the Kalama Specialty Chemicals, Inc. facility and a former mobile home park. A drive-in movie theater and a residential area border this site to the north. A forested area and a cement plant border this site to the south. Commercial and industrial businesses and agricultural land are also located near the site. From 1973 to 1977, Vega Chemical produced a wide range of chemicals at this site. From 1977 until 1979, Kalama Specialty Chemicals, Inc. manufactured herbicides and plant-growth regulators at the site. Operations ended in 1979 after a reactor exploded, setting the facility on fire and spilling various organic chemicals. The EPA placed this location on the Superfund Program's National Priorities List in 1984 because of contaminated groundwater, sediment, and soil resulting from facility operations. It is estimated that this site will be ready for reuse and redevelopment beginning sometime between September and November of 2023, but this site has yet to be removed from the National Priorities List as of late.

Rock Hill Chemical Co. – York County

This 4.5-acre lot is a superfund site located in Rock Hill, York County, SC. Vegetation and woods cover the northern portion of the site, which includes a campsite area where people live. Residences and an unnamed stream border the site to the north. The site's border surroundings include residential and commercial land uses. The Leonard Chemical Company, Inc. Superfund Site is located northwest of this site. From 1960 to 1964, the Rock Hill Chemical Company operated a distilling and recovery facility for paint solvents and textile dye products. Operations stored paint sludges, textile dye products, still bottoms and other wastes generated during the reclamation process and placed these materials directly onto the ground. In 1964, a fire at the facility caused drums of oil and chemicals to explode and release their contents. The EPA placed this site on the Superfund Program's National Priorities List in 1990 due to contaminated groundwater resulting from waste handling processes at the site. Site contamination is said to not currently threaten people living or working near the site. A water line connects the site and residences and businesses near the site to the public water supply, so nearby residents are using water on or near the site for drinking purposes. It is estimated that this site will be ready for reuse and redevelopment beginning sometime between September and November of 2023, but this site is still currently on the National Priorities List.

Methodology

I began my research process by studying the concept of environmental racism and the history of the environmental justice movement, which set the foundation for the articles provided in my reference list. I also researched the history of superfund sites and community activism

surrounding the area. I utilized library archives and local newspapers to get a sense for important events relating to each of the superfund sites and attempt to get a better understanding for how members of the community felt about the toxic waste. I interviewed community involvement coordinators with the Environmental Protection Agency designated specifically for my superfund sites of interests to get a better understanding of the Superfund Program and the way in which the managing of hazardous waste sites has evolved. I then continued by reading case studies investigating negative environmental effects as a result of superfund sites. I kept a working document of all primary and secondary sources relating to these topics.

To begin my investigation into the effects of these hazardous waste sites on surrounding communities, I collected data on superfund sites from the United States Environmental Protection Agency. I utilized census data, PolicyMap, and Data Planet to get an idea of socioeconomic demography and determinants of vulnerability at various geographic scales, focusing on Allendale County, Beaufort County, and York County. The following demographics were of interest: race/ethnicity, household income, education level, poverty level, and unemployment rate.

To better understand the evolution of the hazardous waste sites within these demographic communities, I researched the history of each superfund site. After gathering the data from this research, further analysis was conducted to accurately determine whether an association could be found between exposure to hazardous waste sites and race/ethnicity, socioeconomic status, and/or general health of the community. This research paper details the findings of each case study, while comparing and integrating the research questions I intended to answer as well as the working document of primary and secondary resources. This will be used to generate further

discussion of the implications found from this study in relation to the environmental justice movement and previous research that has been conducted.

Case Studies

Preface

There are four major regions within the state of South Carolina which each harbor their own unique history that characterizes the social network found there. The Midlands region – where you will find Allendale County and York County – is mostly rural with a population generally more affluent and educated than the state at large (Cutter et al., 1996). The Low Country – where you will find Beaufort County – contains a large socioeconomic gradient with some of the wealthiest and poorest regions in the state existing near one another (Cutter et al., 1996). The Low Country contains one quarter of the state's population the majority of which reside near the coast with tourism being a dominating source of income, and the rest of the region being primarily rural with forestry being another dominating source of industry (Cutter et al., 1996). South Carolina is a very poor and rural state with a high population of minority residents and people of color. As such, it also contains the largest proportion of hazardous, toxic, and radioactive waste in the country (Cutter et al., 1996).

As has been stated by Robert D. Bullard, "there is a direct correlation between the exploitation of land and the exploitation of people" (2001). Minority communities alike have historically become targets for harboring most of their communities' waste, and therefore experience a decreased quality of life. Native American communities have become prime targets for waste trading and housing nuclear power plants, with over three dozen Native American reservations today housing a plethora of landfills, incinerators, and other hazardous and toxic

industries (Bullard, 2001). The struggle that many Native American communities have faced with being recognized as sovereign nations has also been accompanied by economic plight, which forces them to turn to even the most undesirable sources of income to address other problems related to education, healthcare, and poverty among other issues (Bullard, 2001).

The challenges associated historically with minority communities having readily accessible resources to jobs, healthcare, education, and public transportation among many other things are inextricably linked to the risk level of these same communities to environmental hazards and toxicity. Segregation in southern states plays a very large role in the geographical and social evolution and structure of cities that we still see today, and South Carolina is no exception. Migration of minority populations from rural to urban areas led to white flight from urban areas to suburban communities (Cutter, 2012). As the white population fled to suburban communities, job opportunities often followed leaving minority populations in urban areas with little hope for economic prosperity. The increased migration of minority populations to urban areas caused an increased need for public housing, which was most often located in the most unfavorable regions – along transportation routes, near industrial facilities, or on reclaimed land (Cutter, 2012). This is just a small snapshot of how minority communities gradually became concentrate within a perpetual cycle of poverty with little to no access to quality education, employment opportunity, or hope for the future.

Each of the following case studies emphasizes a unique history that has been imposed on each racial communities – African American, Hispanic, and Native American – such that the increased risks they experience today are one of many lasting impacts. It is important to keep in mind the context in which these communities have become socially vulnerable and experience a greater difficulty to get away from environmental hazards.

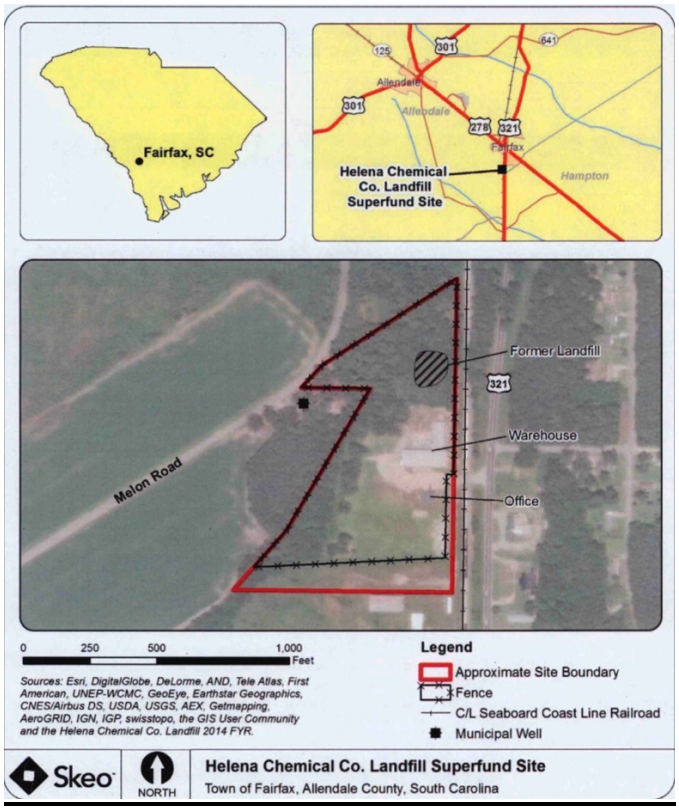

Figure 1: Helena Chemical Co. Superfund Site Vicinity Map (U.S. EPA, 2019)

Helena Chemical Co. – Fairfax, Allendale County, South Carolina

Historical Context

The geographic distribution of hazardous and toxic waste facilities is undoubtedly linked to minority communities, with race being the most significant factor (United Church of Christ, 1987). Alternative explanations to environmental racism have often suggested that the link between the two is not a result of environmental racism or injustice, and instead may be due to either the lifestyle choices of minorities or the operation of the "free market" (Cole and Foster, 2000). However, the constantly growing body of research showing the compounding effects of minority and low socioeconomic status (United Church of Christ, 1987; Cole and Foster, 2000;

Pulido, 2000; Bullard, 2008; Gutkowski, 2020) continually reinforces the idea that with the help of institutionalized discrimination, waste follows these communities and not the other way around. The history of our society including, but not limited to discrimination in housing and zoning, Jim Crow segregation, redlining, and political representation have paved the way for minority communities to bear the brunt of toxic waste so white communities don't have to.

The neighborhoods in which people live impact the availability and type of resources that are accessible to them and their exposure to poverty, crime, effective schools, social networks, and employment opportunities (Hayes and Adelman, 2010). African American communities still suffer greatly from institutionalized discrimination, which occurs within all levels of governmental organizations influencing the locations of polls, landfills, and toxic-waste facilities alike (Bullard, 2008). Racial segregation creates an unequal distribution of resources and negatively impacts the overall quality of life of individuals affected by it (Hayes and Adelman, 2010). It is between two distinct time periods – the end of the Civil War in 1865 and the passage of the Fair Housing act in 1968 – that we can begin to understand how racial segregation solidified the structure of environmental racism and other societal injustices that we continue to see today. During this time, various public and private processes including discriminatory real estate practices, exclusionary and expulsive zoning, redlining, and white flight limited the mobility of minorities (Cole and Foster, 2000). Thus, predominantly African American communities and other communities of color were disadvantaged when it came to education opportunity due to the lack of local taxes and income in comparison to white communities.

Racially segregated communities are isolated geographically, economically, socially, and culturally, which in turn leads to political marginalization (Cole and Foster, 2000). The lack of political representation in such segregated communities means that individuals have minimal

involvement in the decision-making process of situations regarding the community, and the concerns of individuals being most affected by injustices often go unheard. This lack of representation plays a distinct role in the siting of hazardous and toxic waste sites within minority communities, which often become "down-zoned" to industrial status as a result (Cole and Foster, 2000). When it comes to the siting of these sites, industries tend to target areas that are the "least likely to express opposition", also recognized as those with poorly educated residents and low socioeconomic status (Cole and Foster, 2000). As a result, minority communities often experience a decrease in property values and an outflow of economic opportunity leaving nothing but despair.

Background

Established in 1919, Allendale is the youngest county in the state of South Carolina. Today, it is also the poorest county in the state as well. This agricultural rural region covered in pine and forestry relies on wood, chemical, and textile products as its main source of income. Between the 1940s and the 1960s, the county's economy benefitted primarily from those traveling along US Highways 301 and 321, and the construction of the Savannah River Site, which was a nuclear weapons production plant (Edgar, 2012). However, this thriving economy entered a steep decline upon the construction of Interstate 95, the end of the cold war, and an agricultural depression. The building of the interstate led tourists out of the county rather than into it, the end of the cold war led to a decrease in demand from products created at the Savannah River Site, and many farmers ultimately went out of business due to the agricultural depression. By the end of the twentieth century, Allendale County had the lowest per-capita income and the lowest median household income in the state of South Carolina leaving more than one-third

(36%) of its individuals and more than forty percent (44%) of families with children in poverty (Edgar, 2012).

When it comes to superfund sites, brownfield sites, and other areas contaminated with hazardous waste Allendale County is no stranger. While this case study is primarily focused on the Helena Chemical Co. Superfund Site, it is important to contextualize the amount of land contaminated by industries and polluted waste and how this county has become subjected to such a disproportionality. Along with Helena Chemical Co., other hazardous waste sites within Allendale County include: the Corbett Plywood Site, which is directly adjacent to Helena Chemical Co., the old Fairfax Dimensions Site, the Newell Property, the former RRR Farms, the former Farmer's Grain Supply, and Billy Young's IGA (Allendale County, 2015). These sites range in sizes from 0.17 acres to 11.5 acres of land with varying types of contamination levels over the years. While this is merely a small list of previously assessed contaminated sites, there are still areas that have yet to be assessed, but are contributing to the plethora of soil, groundwater, runoff, air, and direct contact pollutants that Allendale County residents are exposed to (Allendale County, 2015).

Social Vulnerability

Outlining the historical context of racism, segregation, and other discriminatory laws that have carved the African American experience and other minority communities that we see today is just one way of understanding how these communities become subjected to environmental injustice. Using social vulnerability as a framework for analyzing the social and environmental characteristics of the African American community in Allendale County living, working, and

recreating near the Helena Chemical Co. Superfund Site is valuable in understanding the factors which put them at an increased risk for poor health outcomes.

As has been described, the social determinants of vulnerability that will be used in this case study include race/ethnicity, household income, educational attainment, poverty level, and rate of unemployment. Considering these aspects of a community – either individually or compounded – help to determine how susceptible a community is to hazards or disasters, and the likelihood that this same community will be able to recover from it. Likewise, an analysis under such a framework may offer a foundation for proper risk reduction in the future.

Burwell-Naney et al., has recognized that hazardous waste sites are geographically distributed in predominantly non-white and low-income communities, making superfund sites a controversial topic of discussion (2013). The racial makeup of Allendale County is much different than that of the state of South Carolina. More than half (75%) of individuals in the county are minorities. Much of this percentage are made up of African Americans at roughly 73% within the county – 3 times the African American population in the entire state – with 3% of county residents identifying as Hispanic, and the remaining 1% are either Asian, Native Hawaiian or Pacific Islander, American Indian or Alaska Native, or multiracial. That leaves just under 25% of county residents identifying as white.

The median household income in Allendale County is roughly $26,074, which is approximately half that of the state of South Carolina at roughly $56,200 (U.S. Census American Community Survey, 2020). During the years 2015-2019, more than half (67%) of households in Allendale County had an annual income of less than $50,000 compared to 47% of households in the state during this same time (U.S. Census American Community Survey, 2020). With Allendale County containing majority minority residents and a large portion of residents residing

in poverty, it is of considerable concern to understand how these communities are being negatively impacted. A factor that might contribute to this is that a large percentage of households consists only of a single female with children (39.7%) (U.S. Census American Community Survey, 2020). This percentage can potentially give context to households only earning one stream of income, and the overall economic difficulty encountered throughout the county. It is unlikely that these communities accidentally became inhabited predominantly with minority and low-income residents, or that these same communities consequently bore the brunt of the county's waste. There is a system that allows for the continued structural discrimination.

While race alone is a valuable indicator for proximity to superfund sites and other hazardous waste, socioeconomic status plays a large role as well. Only about 9.2% of people living in Allendale County have attained a Bachelor's degree or higher, which is about one-third the rate of individuals in the entire state at roughly 29.6% (U.S. Census American Community Survey, 2020). The first and only available public college or university available for enrollment in Allendale County is the University of South Carolina – Salkehatchie. Considering that less than 75% of residents obtain a high school degree and barely 15% receive some sort of higher education this can only further perpetuate the cycle of low-paying jobs and an unstimulated economy. Of the total 4,379 African American residents over the age of 25, less than half (31.4%) have received some form of education past a high school diploma in Allendale County (SC Department of Employment and Workforce, 2022). Wealthier populations can prevent such hazards from entering their communities due to their access to money, education, and political power (Kramar et al., 2018). According to the US Census American Community Survey (2020), approximately 31.6% of people in Allendale County live in poverty. Much of this percentage consists of individuals under the age of 18 (41.7%) – which is double the poverty rate in the state

of South Carolina at roughly 13.8% – and those who identify as Black or African-American (31.8%) (U.S. Census American Community Survey, 2020).

According to the South Carolina Department of Employment and Workforce (2022), the unemployment rate in Allendale County has been almost double that of the state of South Carolina over the last ten years. One of the many reasons why Allendale County has not been able to progress economically is without a doubt related to the low rate of employment. While there may be enough jobs for everyone there is still not enough people working to aid an increase in production, which in turn would lead to more goods, less expensive goods, and a better standard of living (Gerena, 2005). Per Schlosberg et al., (2020), most residents would argue that there just aren't enough jobs in Allendale considering that most people travel up to 90 minutes to Hilton Head, Charleston, and Columbia for work. The lack of resources places both minority and low-income communities at a disadvantage for not only fighting back against such environmental injustice but being heard.

Helena Chemical Co.

Helena Chemical Co. manufactured a variety of herbicides, plant growth regulators, and other chemicals while in operation from 1971 to 1979. After the explosion of a reactor onsite, many of these chemicals were spilled into the environment. While the site is fenced off to limit access to the contaminated area, there are several methods of contamination and exposure to toxic chemicals that can occur at Helena Chemical Co. including debris, groundwater, sediment, and soil. Helena Chemical Co. was placed on the EPA Superfund Program's National Priorities List in 1990 due to this contamination. Currently, this site is still currently on the Superfund Program's National Priorities List.

The contaminants located in and around the Helena Chemical Co. Superfund Site that contribute to air quality via debris are as follows: aldrin, chlordane, dieldrin, disulfoton, endrin, and pesticides DDD, DDE, and DDT (US EPA, 2022). According to US News Data Explorer (2020), the airborne cancer risk in Allendale County – which represents the probability of contracting cancer over the course of a lifetime based on air toxics health risks per 1 million population, assuming continuous exposure – is approximately 38.01. The air quality hazard – which is an index score representing the potential risk of developing serious respiratory complications such as chronic obstructive pulmonary disease over the course of a lifetime, assuming continuous exposure – is approximately 0.61 (US News Data Explorer, 2020). Likewise, the air toxics exposure disparity index in the county – which reflects information about the relative difference or disparity in air pollution exposure across racial/ethnic groups (non-Hispanic white, Hispanic or Latino, Black or African American, and other races), with lower values indicating less disparity – is approximately 2.56 (US News Data Explorer, 2020). African Americans are more than three times more likely than whites to die from asthma, and the hospitalization rate for African Americans with asthma is three times that for whites (Checker, 2005).

While difficult to directly link contaminants associated with superfund sites to the negative health outcomes seen in nearby communities, research has shown how harmful volatile organic compounds are to health (Burwell-Naney et al., 2013). Exposure to volatile organic compounds can cause a plethora of health effects including but not limited to anemia, birth defects, eczema and skin conditions, speech and hearing difficulties in young children, diabetes, urinary tract disorders, and stroke (Burwell-Naney et al., 2013). The percentage of new cancer incidents within the county (9.02%) is higher than that seen within the state (8.4%), and while

difficult to make a direct correlation between this statistic and superfund sites or other hazardous waste, this fact along with the understanding of carcinogenic contamination throughout the county beg for further investigation (Allendale County, 2015). The cancer incidence rate in Allendale County – which reflects the average annual age-adjusted incidence rate of new cancer diagnoses per 100,000 population – is approximately 397.2 (US News Data Explorer, 2020).

A laboratory review of pesticides by Repetto and Baliga concluded that chlordane affects the human developing immune system by depressing the proliferation of immune system parent cells (1996). Williamson et al., has found that individuals living near superfund sites are more likely to have abnormal immunoglobulin test results in comparison to communities farther away from these sites or other environmental hazards (2006). This information suggests that abnormal immunoglobulin levels decrease immune function, impairing the body's adequate response to fight infection and disease (Williamson et al., 2006). Thus, populations in closer proximity to superfund sites and other environmental hazards may become susceptible to a larger amount of infectious and chronic diseases than they otherwise would without that exposure. According to US News Data Explorer, the heart disease prevalence in Allendale County – which reflects the percentage of adults who report ever being told by a health professional that they had angina or coronary heart disease – is approximately 8.4% (2020).

Groundwater contamination occurs beneath the site in two separate aquifers. A shallow aquifer up to 25 feet below ground, and a deeper aquifer up to 107 feet below ground (US EPA, 2019). The contaminants located in and around the Helena Chemical Co. Superfund Site that contribute to water quality via groundwater are as follows: aldrin, alpha-hexachlorocyclohexane, benzene, beta-hexachlorocyclohexane, chromium, delta-hexachlorocyclohexane, dieldrin, disulfoton, endosulfan II, endosulfan sulfate, endrin, endrin ketone, gamma-

hexachlorocyclohexane (lindane), lead, toxaphene, and pesticides DDD, DDE, and DDT (US EPA, 2022). According to US News Data Explorer (2020), the percentage of unsafe drinking water in Allendale County – which is defined as the share of the population living in a county served by a drinking water system that violated EPA standards – is approximately 22.3%.

In an area where there is little business and options for entertainment, fishing is a popular activity for many residents. However, fish advisories were advised by South Carolina Department of Health and Environmental Control (SCDHEC) for the Salkehatchie River, the Little Salkehatchie River (both of which dump into the Savannah River), and the Savannah River, which happen to be the most popular fishing and boating sites in the county (SC Department of Employment and Workforce, 2022). In this community, boating and fishing may be both a source of recreation and protein for some people. Limiting the access to the latter resource may have implications for the dietary health of those who use it most. Research has shown that African-Americans tend to have a diet that is lower in nutritious foods including fruits, vegetables, milk, and whole grain products in comparison to other populations, which in turn contributes to poor health outcomes (Kantor and Constantin, 2017). Oftentimes this may be a result of food deserts, economic reasons – healthier foods tend to be more expensive – as well as other cultural habits or traditions (Kantor and Constantin, 2017). According to US News Data Explorer (2020), the food environment index score in Allendale County – which reflects the share of food retailers that are considered healthy based on size and typical food offerings – is approximately 5.97.

Community Response

Citizens and county leaders in Allendale have worked together to create an economic and community development plan though the Allendale County ALIVE Enterprise Community Strategic Plan to improve their social conditions and quality of life. This organization has contributed to the reopening of the Allendale County Courthouse, the Town of Allendale's Downtown Park development, a pump for a new well for the Town of Ulmer, a startup County transportation system, and loans to small businesses that created and/or saved 10 to 15 jobs (Allendale County, 2015). Outside of this community group, it is difficult to locate and identify organizations within Allendale County dedicated specifically towards advocating for environmental justice. This does not mean, however, that they don't exist.

The beginning of the Environmental Justice Movement, especially with respect to the African American community, is one of several focuses related to the Civil Rights Movement. Special focus on environmental issues began in the early 1980s when African Americans began to recognize their exposure and subjection to environmental problems as a steppingstone to social justice (Bullard, 2008). For many small communities, the best way to fight environmental injustice was through social activism and gaining more control and decision-making capacity. Many of these communities turned to civil rights veterans and other social activists with experience in breaking down barriers including those that contribute to environmental injustice (Gutkowski, 2020).

It is also important to recognize that challenges to environmental activism may also be exacerbated by increased social vulnerability. Without access to resources or opportunity for political participation African American individuals have been found to exhibit lower levels of activism (Mohai, 1990). However, when these factors are controlled for, African American communities are found to exhibit higher levels of activism than white communities in similar

situations of environmental injustice (Mohai, 1990). There is a plethora of factors that may contribute to the differences in measuring or discerning the varying levels of activism within the African American community including but understanding the sacrifice of environmental health for economic improvement is one of many insights into characterizing the fight of the African American community against environmental injustice (Mohai, 1990).

Community involvement coordinators (CIC) from the EPA are assigned to several superfund sites, including Helena Chemical Co., to serve as a liaison between this federal agency and the community. Based on interviews with the CIC assigned to this superfund site, it is clear that the goal is to make sure that the community is included, educated, and empowered in the decision-making process and able to give their input throughout the remediation process. However, the CIC assigned to this site has never been to the area and voiced concerns about being currently overwhelmed with work. That being said, it is worth taking into consideration the difficulty of community members gaining support from the EPA when employees aren't able to provide the depth of aid necessary.

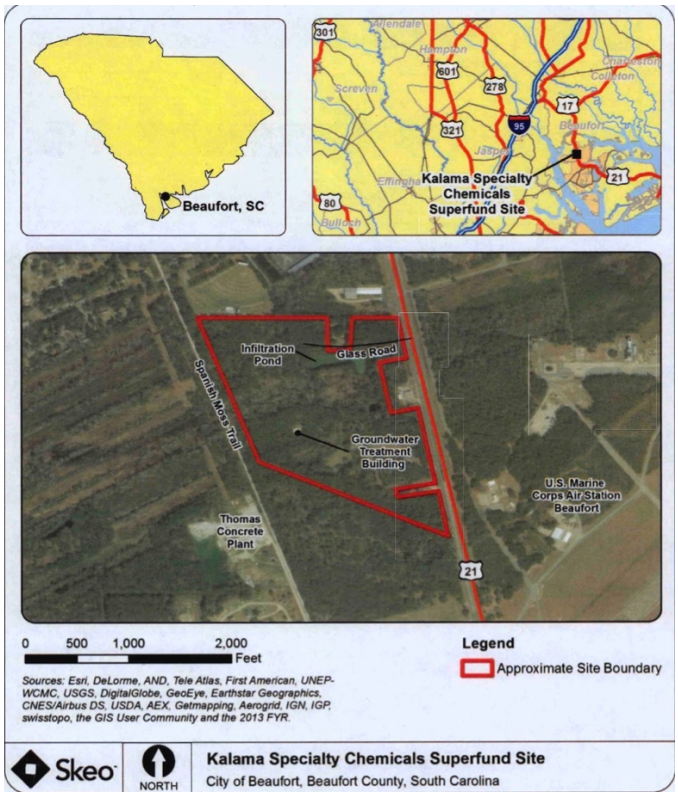

Figure 2: Kalama Specialty Chemicals Superfund Site Vicinity Map (U.S. EPA, 2018)

Kalama Specialty Chemicals – Beaufort, Beaufort County, South Carolina

Historical Context

Presenting the issue of environmental racism through the lens of the Hispanic community in South Carolina comes with its own challenges considering that these individuals do not fit into one perfect box labeled by the United States. However, Hispanic individuals cannot solely exist within this country based on their ethnicity or nationality. As of today, hostile anti-immigrant policies continue to aid in the "racialization" of many individuals to fit into one rigid group – Hispanic or Latino (Gallagher and Lippard, 2010). This racialization is a precursor to developing and maintaining systematic institutions that determine modes of oppression (Gallagher and Lippard, 2010). The increased immigration of the Hispanic community into southern states like

South Carolina also contributes to the rigid American racial hierarchy that defines and allows for an increased protection over perceived entitlements and privileges such as jobs, housing, and education (Gallagher and Lippard, 2010). Thus, it is easier to understand and recognize through basic nativist ideologies how Hispanic immigration can "threaten" social order and lead to increased prejudice in southern communities (Gallagher and Lippard, 2010).

Outside of the stereotypes surrounding Hispanic communities that have evaded societal conception, states do not make it easier with policies and laws that prevent these individuals from thriving on their own. Many governments have sought to pass anti-illegal immigrant ordinances, which often include provisions such as "making English an official language, eliminating gathering places for day laborers, penalizing employers for hiring unauthorized immigrants, restricting unauthorized immigrants' access to public benefits, and preventing unauthorized immigrants from renting housing" (Gallagher and Lippard, 2010). As has been mentioned previously, barriers such as these lead to social, economic, educational, and residential immobility and threatens their health and safety.

The majority (63%) of South Carolina's Hispanic population is of Mexican origin, which began in the 1980s because of globalization and neoliberal policies and Mexico's periodic economic crises (Lacy, 2009). Research done by Logan et al., on the settlement and immigration patterns of Hispanics has emphasized that a large portion of these individuals are first- and second-generation Americans (2004). A large contributor to the residential segregation of Hispanic residents is attributed to both the impacts of immigration and adaptation to a new environment (Logan et al., 2004). Logan et al., has also found that individuals who have higher incomes, greater fluency in English, or are born in the United States are more likely to experience lower levels of segregation (2004). Like in African American communities,

residential segregation leads to isolation and political marginalization. This lack of political representation is part of the perpetual cycle that implements policies and laws like the anti-illegal immigration policies mentioned above.

Background

Beaufort County lies in the far south of the state of South Carolina. This coastal region is bordered by the Atlantic Ocean, the New River, the Coosawhatchie River, and the Combahee River. This county also consists of lowland plans and around 65 islands separated by bays, rivers, and other waterways. While there is ample agriculture conducted in this county, tourism and recreation remain the primary contribution to its economy. As of 2010, the county population rests just over 160,000 people.

During the early eighteenth century, Beaufort County's economy was primarily funded via cattle, rice, and indigo along with the labor of Africans slaves (Edgar, 2012). Years after the Civil War ended moving into the Reconstruction era, the county relied upon phosphate mining, cotton, timber, and the completion of the Port Royal and Augusta Railroad to provide jobs and opportunity for much of its citizens (Edgar, 2012). By the 1890s, the county began to see a downturn. A hurricane killed nearly two-thousand residents and inflicted severe property damage in 1893, the phosphate industry moved out of South Carolina in search of richer beds in Florida, and in 1899 the Port Royal Naval Station moved to Charleston (Edgar, 2012). The combination of these events was detrimental to the economy in Beaufort County. By the first half of the twentieth century, the county had declined to one of the poorest places in America.

A large contribution to keeping the county afloat was the U.S. Marine Corps, whose recruit depot provided jobs and income to the Beaufort economy. Military presence increased

with the establishment of the Naval Air Station – later known as the U.S. Marine Corps Air Station, Beaufort – which in due time has become and remained the largest employer in Beaufort County. By the end of the twentieth century, Beaufort County became the fastest growing county in South Carolina. Uncoincidentally, the U.S. Marine Corps Air Station borders the superfund site of interest in this case study: Kalama Specialty Chemicals.

Social Vulnerability

Using the lens of social vulnerability as a framework to understand how the Hispanic community in Beaufort County is negatively impacted by environmental injustice and contamination from Kalama Specialty Chemicals proves to be useful in a variety of ways. In addition to the parameters of social vulnerability that have been defined in this thesis for analysis – race/ethnicity, household income, educational attainment, poverty level, and rate of unemployment – it is useful to also consider the unique compounded experience of a first- or second-generation immigrant in South Carolina.

One of the many challenges that Hispanic immigrants face, especially in South Carolina, is that there exists no large, multigenerational Hispanic community that could provide social, emotional, political, or economic resources necessary for success (Lacy, 2009). Likewise, the existing language barrier for those individuals who lack fluency in English suffer an added stress of not being able to communicate with law enforcement officials, medical staff, courtroom employees, and educators (Lacy, 2009). The state's inadequate public transportation system is no help to this issue either as it limits the ability of immigrants to access employment opportunities and health care given that South Carolina like many other states requires proof of legal residence to acquire a driver's license (Lacy, 2009).

Considering the various factors that contribute to the social vulnerability of the Hispanic community in Beaufort County aids in understanding how they affect the ability of members of the community to respond to and recover from various hazards and toxic events. The characteristics and situational experiences mentioned here are not an exhaustive list and will be covered in more depth below, however recognizing the impact of these measures of social vulnerability can aid in risk reduction for the future.

The makeup of Beaufort County is unique in attempting to understand the effects of hazardous waste and superfund site contaminants on the local community. While predominantly white, with roughly 75% of the population identifying as such, 11.09% of Beaufort County's residents are Hispanic, which is just over double that which is seen in the entire state (5.69%). South Carolina ranks #1 in the growth of Hispanic residents as can be seen by the 300% increase in the number of Hispanics in Beaufort County between the years 2000 and 2015 (McElveen and Washington, 2015). This large fluctuation in growth is attributed to an increase in immigration rates from Latin America since the 1990s, and future increases may be attributed to the growth of second-generation Hispanic and Latino residents (Young, 2005). This may be an underestimate as Hispanic residents are less likely to fill out census forms or share information for a plethora of reasons including documentation (McElveen and Washington, 2015). It is important to acknowledge the shift in demographic populations occurring like that in Beaufort County to predict and prevent excessive challenges and increased risk of vulnerability relating to education, employment, and health like that which will be outlined in the rest of this case study.

For the county of Beaufort, the median household income is roughly $74,127, which is higher than that of the state of South Carolina at roughly $56,227 (U.S. Census American Community Survey, 2020). Though this can be misleading, as the subregion in which Kalama

Specialty Chemicals is located has a median income for the city of Beaufort is roughly $54,873 (U.S. Census, 2020). Likewise, during the years 2015-2020, just over 72% of households within the same zip code tabulation as this superfund site earned an annual income of less than $50,000 (U.S. Census American Community Survey, 2020). In a study conducted by Elaine Lacy at the University of South Carolina on Hispanic residents in Beaufort, 99% of respondents were employed, and the average income was about $1,200 per month (2009).

Beaufort County is one of the many states with a large Hispanic population, and this can be attributed to the availability of jobs – construction, restaurant, hospitality, landscaping, and agriculture – of which Hispanic residents are most likely to fill (Lacy, 2009). Lacy (2009) found that employers were often eager to hire Hispanic employees because they tend to be highly productive, are willing to work for low wages, tend to shun unions, and eagerly work overtime. The top 3 areas of employment by industry in Beaufort County are accommodation and food services, retail trade, and health care and social assistance (SC Department of Employment and Workforce, 2022). The average annual wage of these same occupations is $27,768, $34,632, and $53,352 respectively (SC Department of Employment and Workforce, 2022). Accommodation and food services has both the highest number of workers in the county and the lowest annual wages. Of the total 8,879 Hispanic working citizens in Beaufort County, almost half (48.5%) work in the sectors of accommodation and food services or health care and social assistance (U.S. Census American Community Survey, 2020).

Of the total 11,079 Hispanic citizens over the age of 25, less than half (38.1%) have received some form of education past a high school diploma in Beaufort County (U.S. Census American Community Survey, 2019). In a study conducted by Lacy (2009), it was recorded that the median educational level of participants was nine years for both males and females, 36% of

respondents received six years or less of schooling, and that even literacy in Spanish was variable. One important contextualization to be made with respect to the Hispanic community and education is the language barrier that exists. The Pew Hispanic Center found that in 1990 roughly 18,000 school aged Hispanic children spoke limited English, and in 2000 that number had increased to roughly 64,000 – or by 261% (2005). The two public institutions available for study in Beaufort County include the Technical College of the Lowcountry and University of South Carolina – Beaufort (SC Department of Employment and Workforce, 2022). Both campuses are relatively small enrolling just under 2,000 full-time students. The former is a community college only offering associates degrees, and the latter is a 4-year institution with the highest earning degree being a bachelors. The lack of proficiency in the language of which you are being taught likely has significant effects on the comprehension and understanding of material, not to mention the mental and emotional impact on students' confidence in their ability to complete their education. This can be supported by a study conducted by Fleischman and Hopstock, in which immigrant teens suffered extremely high dropout rates due to both the recent shift in their education and the difficulty in speaking and comprehending instruction in English (1993). Not to mention, for schools that do have and implement programs for students whom English is their second language, they tend to be underfunded and understaffed among other issues (Ad Hoc Committee, 2003).

Roughly 10.3% of people live in poverty in Beaufort County in comparison to 13.8% in the entire state (U.S. Census American Community Survey, 2020). The poverty level for Hispanics in Beaufort County is around 17.7% (U.S. Census American Community Survey, 2020). The National Council of La Raza has found that not only are Hispanics in South Carolina particularly vulnerable to economic downturns and poverty, but that this is especially true for

Hispanic families with children (2003). Unemployment rates in Beaufort County have been very similar to those within the entire state of South Carolina over the last ten years, which for the state has ranged from 3% to 11% (SC Department of Employment and Workforce, 2022).

Kalama Specialty Chemicals

How the above measures of vulnerability compounded with environmental contaminants have created negative health outcomes for the neighboring residents to the Kalama Specialty Chemicals Superfund Site is important. One of the largest challenges for Hispanic residents in America – documented and undocumented alike – is healthcare, and language barriers are one important reason why. Thus, exposure to toxic chemicals and other contaminants can be extremely dangerous.

Kalama Specialty Chemicals manufactured herbicides and pesticides on site, and within a short distance from this site were agricultural lands and other industrial and commercial businesses. Operations ended in 1979 after a reactor exploded, setting the facility on fire, and spilling various organic chemicals. Kalama Specialty Chemicals was placed on the EPA Superfund Program's National Priorities List in 1984 due to contaminated groundwater, sediment, and soil. As of today, this site is still currently on the Superfund Program's National Priorities List. The contaminants located in and around the Kalama Specialty Chemicals Superfund Site that contribute to water quality via groundwater are as follows: 1,1-dichloroethene, 1,2-dichloroethane, benzene, dichloromethane, ethylbenzene, and xylene (U.S. EPA, 2022). Benzene has been identified by the US EPA and the Department of Health and Human Services as a known human carcinogen, and while the other contaminants on this list such as ethylbenzene and xylene have not been proven or recognized as such, they still have

been acknowledged as contributing to negative health outcomes when in close contact (Wilson et al., 2013). The cancer incidence rate in Beaufort County – which reflects the average annual age-adjusted incidence rate of new cancer diagnoses per 100,000 population – is approximately 407.1 (U.S. News Data Explorer, 2022). The airborne cancer risk in Beaufort County – which represents the probability of contracting cancer over the course of a lifetime based on air toxics health risks per 1 million population, assuming continuous exposure – is approximately 31.67 (U.S. News Data Explorer, 2022).

According to the American Cancer Society, one-third of all cancer-related deaths can be attributed to poor dietary habits (2000). The food environment index score in Beaufort County – which reflects the share of food retailers that are considered healthy based on size and typical food offerings – is approximately 10.24 (U.S. News Data Explorer, 2022). Thinking back to the primary source of employment for many Hispanics in Beaufort County is that in the field of accommodation and food services. Hispanics make up approximately 80% of migrant workers in the United States (Mines et al., 1993), and many of them experience some level of food insecurity meaning a lack of access to nutritional and affordable foods. So, compounded exposure to toxic agricultural hazards and pesticides in places of work combined with food insecurity in addition to residing near superfund sites like Kalama Specialty Chemicals leaves no room for a satisfactory quality of life.

The air quality hazard in Beaufort County – which is an index score representing the potential risk of developing serious respiratory complications such as chronic obstructive pulmonary disease over the course of a lifetime, assuming continuous exposure – is approximately 0.47 (U.S. News Data Explorer, 2022). In a 2018 study conducted by Woo et al., it was found that both African American and Hispanic individuals reside in communities with

2% to 40% higher concentrations of air pollutants compared to whites. The air toxics exposure disparity index in the county – which reflects information about the relative difference or disparity in air pollution exposure across racial/ethnic groups (non-Hispanic white, Hispanic of Latino, Black or African American, and other races), with lower values indicating less disparity – is approximately 2.60 (U.S. News Data Explorer, 2022).

According to McElligott et al., (2014) studies conducted by the Hispanic Health and Nutrition Examination Survey (HHANES) and the National Health and Nutrition Examination Study (NHANES), compared to the general US population, risk factors for cardiovascular disease are higher in the Hispanic population. McElligott et al., reports that similar studies have also shown that less than 10% of hypertensive Hispanic men have their blood pressure under proper control, and Mexican-American men and women have higher rates of hypertension than non-Hispanic whites (2014). According to US News Data Explorer, the heart disease prevalence in Beaufort County – which reflects the percentage of adults who report ever being told by a health professional that they had angina or coronary heart disease – is approximately 5.4% (2022).

Community Response

Some of the barriers listed that contribute to social vulnerability for the Hispanic community may also contribute to the ability for them to collectively respond to environmental injustice. One of these barriers being language. Residents in Beaufort County and other communities with large Hispanic communities may be at a disadvantage at all stages of decision-making processes related to toxic-waste facilities and landfills due to not being fluent in English. When notices are sent by mail without translations to other languages including Spanish, this

leaves room for residents not fully understanding the challenges they are facing. Likewise, when it comes to town hall meetings and other gatherings meant for policymakers to engage with the community on relevant decisions, not being fluent in English takes away from the ability to properly communicate concerns about and understand the process.

Another barrier linking the environment and ethnic identity highlights the complex structure Hispanic people in the fight against environmental injustice. Like other minority communities, the deeply ingrained history of colonization and the compounding complexity of mixed-race identity creates a space for confusion and concern regarding land ownership and rights (Anguiano et al., 2012). Where this becomes important is in the strategies by which minority communities use to fight against environmental injustice. Hispanic communities vary greatly in the identity they encompass with members identifying with and exhibiting a variety of races, colors, immigration statuses, countries of origin, socioeconomic background, and other variables that limit the ability of the community to attack environmental injustice issues from the sole standard of race (Johnson, 1995). Nevertheless, regardless of identity or status as a first- or second-generation American, or any other in between, Hispanic residents like many others advocate for a health environment to live and recreate in.

Like in Allendale County, there is a CIC assigned to the superfund site in Beaufort, and it happens to be the same person. So, as mentioned previously, the CIC assigned to this site has never been to the area and voiced concerns about being currently overwhelmed with work. This could be a potential contributing factor to the difficulties of the Hispanic community in Beaufort to voice their concerns regarding existing toxic waste or even difficulties with language barriers regarding documentation if the CIC responsible for the site is not often around.

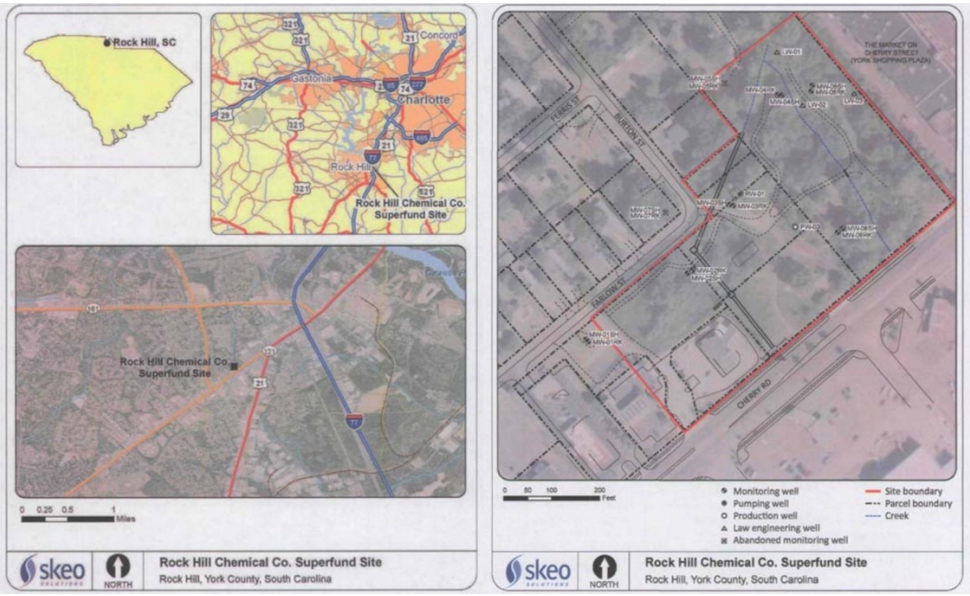

Figure 3: Rock Hill Chemical Co. Superfund Site Vicinity Map (U.S. EPA, 2011)

Rock Hill Chemical Co. – Rock Hill, York County, South Carolina

Historical Context

Upon first contact with Europeans in the Carolinas, Native Americans were met with a fight against illness and greed for land, which ended up wiping our most Native Americans from the area (Winberry and Stine, 2008). Prior to the 1700s the Catawba Nation existed with a population of approximately 4,600, but by 1775 these numbers had declined to roughly 400 (Winberry and Stine, 2008). Being one of the first victims of environmental racism, Native Americans bring an important perspective and conceptual understanding to the environmental justice movement. Native American activists have been fighting for land-use rights, self-determination, and sovereignty since their first interactions with Europeans centuries ago. This has maintained an important focus for Native American activists over time with most of the struggles contributing to this movement being land and environmental exploitation (Cole and Foster, 2000).

The Catawba Indian Nation fought alongside English settlers protecting the western frontier of South Carolina from Indian attack for nearly 200 years (Blumer, 2007). While records are scarce, the Catawba Indian Nation is understood to have fought for many a battle in South Carolina until much of the population moved north to Virginia (Blumer, 2007). The Treaty of Nations Ford, or the Treaty of 1840, was the beginning of a long debate between the Catawba Nation and South Carolina legislature over land and ownership rights. A 144,000-acre reservation in North Carolina had been agreed upon via the Treaty of Augusta (1763) upon cession of land by the Catawba Indians (Blumer, 2007), however, this treaty was neither ratified by the United States Senate nor deemed permissible by the state of North Carolina (McCulloch, 2016) and therefore was considered illegal. With no land, money, or education, the Catawba Nation returned from North Carolina to claim the entitled funds from South Carolina for failing to provide lands under the Treaty of Augusta (1763), but the state withheld on their promise because the Catawbas had returned to ceded land (McCulloch, 2016). With the help of South Carolina Indian agent Joseph White, the Catawba Indian Nation was able to secure 630 acres of land near their "Old Reservation" in 1843 (McCulloch, 2016).

In the late 1980s, it was common for industries to approach Native communities with proposals for hosting toxic waste dumps, incinerators, and other industrial facilities on their lands (Cole and Foster, 2000). The problem being that if placed on Native lands these industries are not held to the same environmental regulatory authority that they would be should they exist on federal lands since state law does not apply to Native lands (Cole and Foster, 2000). Thus, many Native Americans living on a reservation may be subjected to unwanted environmental injustice due to economic incentives for Tribal leaders and deception on behalf of industry executives.

Background

Established in 1785 as one of seven counties from the judicial district of Camden, York County exists on the northern border of South Carolina with the Catawba River to the east and the Broad River to the west. Resting on a primarily hilly piedmont region of the state, the eastern portion of the county is urban, while the western portion remains rural. At the time of establishment, the Catawba Nation was the dominant Native American group in the region (Edgar, 2012). During the 17th century, Catawba and Cherokee Indians agreed to make the region a neutral one between their tribal lands where both could hunt in peace (Encyclopedia Britannica, 1998).

In the southeast portion of the county rests the Catawba Indian Reservation, which is a 740-acre tract of rocky, wooded land along the Catawba River (Stevenson, 1982). Prior to the colonization of South Carolina, the land where the Catawbas inhabited had significant importance to the tribe including that of the Catawbas Path. This trail, which began at the James River and divided upon reaching the Catawba Nation, was recognized as both a trading and warpath to the Catawba people (Stevenson, 1982). Beginning in the 1930s, the Catawba numbers were dwindling until there were only roughly 240 left in the state of South Carolina, 177 of which lived on the reservation (Stevenson, 1982). There were several factors that impeded the ability of the Catawbas to progress including: a depleted forest resulting in diminished firewood, being considered wards of the state rather than citizens, unable to receive federal aid, inability to attend public schools, and inability to work in nearby mills (Stevenson, 1982). Catawbas had been recognized as citizens in 1944, roughly 20 years after citizenship had been granted to all Native Americans.

Today, York County's economy still benefits primarily from lumbering and agriculture, with manufacturing playing a large role as well. The population of York County sits at roughly 230,000 people with the Catawba Indian Nation holding steady at about 3,300 individuals. There are still many challenges that the Catawba Indian Nation faces, including but not limited to: financial resources, community facilities and housing, and education (Stevenson, 1982).

Social Vulnerability

Many Native Americans in the United States lacked the acknowledgement by legislature as citizens, and consequently lacked the right to vote and the Catawba Indian Nation of South Carolina was no different. All Native Americans in the United States who fought in World War I were granted the right to vote on November 6, 1919 (Blumer, 2007). Despite this recognition, requests on behalf of the Catawba Indian Nation to be considered citizens of the United States were continually denied. It wasn't until after a Memorandum of Understanding was signed by the Catawba Nation, the state of South Carolina, and the U.S. Department of the Interior that the tribe was officially recognized as citizens of the United States in 1943 (Blumer, 2007).

In settling upon their newly claimed land, much of it was considered nonarable, but this did not discourage the Catawba Nation from establishing homes for themselves. Many rehabilitated homes, but few were able to attain electricity and running water, and those who did have water obtained it from one of the five wells on the "Old Reservation" (Brown, 1966). The Bureau of Indian Affairs, the state of South Carolina, and York County cooperated in providing services to the Catawba Nation to assist with land problems, provide better roads, educational facilities, and law enforcement, develop an arts and crafts program for making and marketing

pottery, and urge members of the tribe to seek employment in nearby industrial plants (Brown, 1966).

Understanding the vulnerability of residents in York County, especially Native American populations is a bit unique considering how small their community is and the specifications surrounding their citizenship and rights. On the reservation, the Catawbas have their own education system, environmental department, social services, senior program, and housing program (Peters et al., 2015), but the historical context surrounding their citizenship and ability to establish and maintain wealth for themselves allows this social vulnerability to persist. This next section will characterize the resources available to the Catawba Indian Nation and how that translates to their resultant vulnerability to environmental hazards.

Less than 1% of residents in York County identify as American Indian or Alaska Native, but there are double the amount of individual identifying as such than in the entire state. However, there are currently over 3,300 enrolled members of the Catawba Indian Nation residing on tribal lands inside the county. The median household income in York County is approximately $66,949 (U.S. Census American Community Survey, 2020). The median income for South Carolinians identifying as American Indian or Alaska Native alone is approximately $33,486 (Carter and Hayden, 2019). In South Carolina, Native Americans make approximately 67 cents for every household dollar made by the state's majority population (Carter and Hayden, 2019). Like local and state governments, tribal governments recognized by the federal government do not have to pay federal income taxes and can raise revenues to provide services for their citizens (Peters et al., 2015). However, unlike state and local governments tribal governments are unable to impose property or income taxes on their citizens leaving them to find otherwise to source revenue (Peters et al., 2015).

There are 3 educational institutions located in York County for study. These include Clinton College, Winthrop University, and York Technical College. Of those who identify in York County as American Indian or Alaska Native, a vast majority (83.9%) have completed a high school education, but a much smaller percentage (10%) have received a bachelor's degree or higher (U.S. Census American Community Survey, 2020). According to the 1990 census, a smaller percentage of American Indian or Alaska Natives had completed a high school (65.5%) or college (9.3%) education in comparison to the U.S. white population (77.9% and 21.5%) (Bell et al., 1997).

The poverty rate in York County is approximately 8.2%, and for American Indians and Alaska Natives this number is roughly the same at 7.9% (U.S. Census American Community Survey, 2020). American Indians and Alaska Natives living on reservations are especially prone to poverty, with the prevalence in 1990 (32%) being twice that of the U.S population (13.1%) and three times that of the U.S. white population (9.8%) (Bell et al., 1997). The unemployment rate in York County has remained relatively similar to that of the state of South Carolina fluctuating between 3% and 12% over the last 10 years (SC Department of Employment and Workforce, 2022). The top 3 areas of employment by industry in York County are retail trade, manufacturing, and accommodation and food services (SC Department of Employment and Workforce, 2022). The average annual wage of these same occupations is $35,360, $65,572, and $19,032 respectively (SC Department of Employment and Workforce, 2022).

Rock Hill Chemical Co.

Understanding the factors that contribute to increased vulnerability within a community pave the way for making connections to environmental hazards and negative health outcomes.

Members of the Catawba Indian Nation are in a unique position when it comes to resources given their recognition as an independent land. As such, general vulnerabilities are compounded and responses to environmental hazards may have increased effects. Compared to all other racial groups in the United States, American Indians and Alaska Natives are disproportionately affected by diabetes (Costacou et al., 2000).

The Rock Hill Chemical Co. existed in this area as a distilling and recovery facility for paint solvents and textile dye products from 1960 to 1964. This superfund site was contaminated by oils and chemicals released by spills due to the explosion of drums from a fire at the facility in 1964. This superfund site was placed on the EPA Superfund Program's National Priorities List in 1990 due to groundwater contamination. Rock Hill Chemical Co. is not the only superfund site within this area, as another superfund site – Leonard Chemical Company – borders Rock Hill Chemical Co. in the northwest direction. Leonard Chemical Company was hazardous waste treatment facility and operated from the late 1960s until 1982 separating wastes through boiling. Both of these sites are still currently on the Superfund Program's National Priorities List.

The contaminants located in and around the Rock Hill Chemical Company Superfund Site that contribute to water quality via groundwater are as follows: chloroethene, cis-1,2-dichloroethene, manganese, and trichloroethene (U.S. EPA, 2022). Manganese is a neurotoxin when exposed at high levels, and this has been studied extensively since its discovery in relation to exposed workers (Lucchini et al., 2018). Being increasingly present in the environment because of anthropogenic sources, manganese is found in abundance within the brain, however in excess can cause neurodegeneration and neurodevelopmental effects (Lucchini et al., 2018). Concentrations of manganese via dust or fumes is one of several ways that someone can be exposed. The air toxics exposure disparity index score in York County – which reflects

information about the relative difference or disparity in air pollution exposure across racial/ethnic groups – is approximately 2.92 (U.S. News Data Explorer, 2022). The air quality hazard in York County – which is an index score representing the potential risk of developing serious respiratory complications over the course of a lifetime, assuming continuous exposure – is approximately 0.55 (U.S. News Data Explorer, 2022).

A study conducted by Levin et al., (2001) concluded that "the substantial variations in the prevalence of cardiovascular disease and its risk factors among Tribal Nations suggests that distinct cultural norms, historic conditions, and important health issues for each American Indian community must be recognized and incorporated into all health promotion programs and policies." The heart disease prevalence in York County – which reflects the percentage of adults who report being told by a health professional that they had angina or coronary heart disease – is approximately 5.7% (U.S. News Data Explorer, 2022).

Data from a study by Costacou et al., suggests that modern day diets of Native Americans are high in fats and low in fruits and vegetables, especially for the Catawba Indians (2000). The food environment index score – which reflects the share of food retailers that are considered healthy based on size and typical food offerings – is approximately 11.15 (U.S. News Data Explorer, 2022). The prevalence of diabetes, poor health, and poor diet among Catawba adults are higher than that seen among all other adults in the state of South Carolina (Levin et al., 2001). However, the differences between health outcomes were more pronounced between Catawbas and whites than was seen between Catawbas and African Americans (Levin et al., 2001). This may be a result of tribes attempting to acculturate and implementing a diet higher in fat and calories and lower in fiber, which in turn has caused for an increase in prevalence of obesity, diabetes, heart disease, and cancer (Bell et al., 1997).

While American Indians and Alaska Natives typically have lower cancer mortality rates in comparison to other minority groups, cancer is the third leading cause of death among these same individuals (Bell et al., 1997). The cancer incidence rate in York County – which reflects the average annual age-adjusted incidence rate of new cancer diagnoses per 100,000 population – is approximately 469.2 (U.S. News Data Explorer, 2022). The airborne cancer risk – which represents the probability of contracting cancer over the course of a lifetime per 1 million population, assuming continuous exposure – is approximately 39.74 (U.S. News Data Explorer, 2022). Cancer mortality rates and other health indicators vary greatly by tribal and geographic region, which may be attributed to both a lack of reporting and racial misclassification leading to lower levels than truly exist (Bell et al., 1997).

Community Response

An important factor contributing to the lack of meaningful conversation with Native American communities regarding the environment and sustainability can be attributed to the idea of the "ecological Indian" as noted by Smithers (2015). This racial stereotype depicts Native Americans as always living in harmony with nature and existing to maintain "traditional" uses of land and water while being minimally destructive (Smithers, 2015). As such, any derivation from this stereotypical perception of Native Americans allows for others to deem them as "inauthentic" and lacking true ecological knowledge or awareness. The ecological awareness of Native Americans stems from a long history of Indigenous knowledge that is both spiritual and political in nature (Smithers, 2015). Blatantly ignoring this source of Indigenous knowledge by those outside of the Native American community reinforces and accepts the inhibition of Native American voices in the fight against environmental justice.

As in the other counties, there is a CIC assigned to Rock Hill Chemical Co. and from speaking with her, she acknowledged that she is a newer employee and is still getting the hang of things. She mentioned being assigned this site due to it being older and not requiring as much work as other active superfund sites. With respect to possible questions from the community, she again responded in terms of how old the site was and mentioned that many of the questions being asked she could likely refer someone to their website for previously asked questions, and if there was no answer to the question, the likely response would be, "I don't know, but I'll get back to you". Similarly with the other superfund sites, there seems to be very little interaction with members of the EPA and members of the community, and this should not be the case. Having confidence in your representatives is one way that members of the community will feel more open about asking questions and being part of the remediation process for these sites.

Discussion & Analysis

Comparisons Across Case Studies

Out of the three counties that were studied, Allendale was the poorest and contained the highest minority population. This is an important feature to identify because within each of the respective counties, the resources that are available to residents and which contribute to the increased risk associated with social vulnerability can and will be affected by what the county has to offer. Economic opportunity throughout the county is scarce meaning residents suffer from a lack of jobs, and therefore means to support and mobilize themselves. This county is a perfect example of the perpetuating cycle of environmental racism where communities and residents are poor because of the lack of income flow, and as a result property values decline, and entrepreneurs take their business elsewhere leaving residents stuck. This includes

educational institutions, which would provide for a better means for residents to pull themselves out of this plight. The limited number of residents in the county who have successfully completed their education further highlights how younger generations are at a heightened disadvantage before they can even realize it. Lack of proper educational tools for children leads to adults who have limited skills to provide for jobs that would give them a better standing in society or at least a means to get there.

Beaufort County on the other hand is dominated by tourism, so residents have a bit more flexibility when it comes to economic opportunity, but this county also contains the highest rate of immigration out of the three counties, which harbors its own challenges. While there may be ample job and education opportunities for residents in this county, status as a first- or second-generation immigrant may play a serious role in access to these resources that native-born Americans don't have to think about. Policies and laws that make it more difficult for foreign-born residents to become accustomed to the community and make a place for themselves are no stranger in the south. Likewise, as has been mentioned, the language barrier that exists for Hispanic and Latino residents can also hinder access to necessary resources for success in the community. Fluency in English may limit the types of jobs that a resident is able to apply for, success in educational settings, and the overall network that a resident can build upon members of the community. Each of which can then transfer over into economic downturn, unemployment, and/or poverty, thus contributing again to that perpetuating cycle of environmental racism and injustice.

York County is unique in that it is almost contains a mixture of the characteristics of the above two counties mentioned. There is a much smaller percentage of Native American or American Indian identifying residents within the county, but there is also the existence of the

Catawba Indian Nation, which is what makes this situation so unique. Residents living on the reservation may encounter difficulties with access to resources given that the tribe has been battling with a lack of economic flow into their community for decades. Being recognized as a sovereign nation provides independence to residents on the reservation when it comes to policies, laws, education, and other resources. However, it also means that these resources may be underfunded. Without help from the federal government and limitations on how they can source income, the Catawba Indian Nation – like many other Native American tribes – are stuck between a rock and a hard place. Many individuals who are considered members of the tribe don't live on the reservation, and therefore are able to find better economic and educational opportunities.

Each of the superfund sites located in either of these three counties became contaminated by the spillage of hazardous chemicals either stemming from pesticides, herbicides, paint solvents, textile products, or some combination of them all. While nearly impossible to make a direct connection between the exposure to such chemicals and the public health of the surrounding communities, the association between such exposure over time and how the community seems to be affected by it cannot be ignored. At the very least, exposure to volatile organic compounds can contribute to a weakened immune system. Therefore, the tiniest exposure to hazardous waste or toxic chemicals that may not pose a threat to the healthiest individual could be fatal to someone with an increased risk for chronic disease.

Limitations

This study aimed to understand environmental injustice to various minority groups through the lens of social vulnerability. Doing so, however, allows for certain limitations that

must be addressed. Social vulnerability alone cannot bridge the cause-and-effect relationship between minority communities and environmental injustice. Though explained briefly at the beginning of each case study, analyzing environmental justice through this lens does not account for the broader historical, societal, political, and economic contexts that have allowed for and exacerbated the effects of toxic waste and other environmental injustices on minority communities. Analyzing the social vulnerability of these communities can only provide a current snapshot of how minorities in each of these respective counties are existing with respect to health, income, education, poverty, etc. in comparison to the white population and/or similar populations at the county, state, or federal level.

An additional limitation to this study is the use of demographic and public health data at the county level. While easier to make connections to the policies and laws that exist within governments on a larger scale to the public health data that exists, it is also more difficult to make direct connections to the community of interest. However, aiming for data on a smaller scale would provide more difficulties, especially in poorer counties with less resources where there is likely an underrepresentation of community members on public health profiles. A final, minor limitation to this study includes the inability to visit the superfund sites and neighboring areas. It was difficult to contact and build connections with those familiar with the site to interview them and see their side of things.

Key Findings

Literature on environmental justice exists in two large ways: (1) addressing the disproportionate geographic siting of landfills, hazardous waste, and other toxic chemicals in relationship to minority and low-income communities, and (2) the power of community activism

in communities battling these very injustices. The biggest takeaway from this study is the difference in community activism that was expected in comparison to what was seen. Following the latter method of Environmental Justice literature, much of what exists surrounds a community with organized groups fighting against toxicity in some capacity that has existed for generations. This includes the coverage of Hyde Park, Georgia by Melissa Checker (2005), Buttonwillow, California and Kettleman City, California by Cole and Foster (2001), the Mohawk community Akwesasne by Elizabeth Hoover (2017), Skull Valley, Utah by Ishiyama (2003), Spartanburg, South Carolina by Gutkowski (2020), and countless others that have contributed to the vast array of Environmental Justice literature that exists today.

Each of these above listed texts and others that have been published highlight the plight of a particular community, and the ways in which they have articulated and advocated for their rights over time, the success they've achieved, and the hard battles lost. What this literature has not spoken to is the communities where injustices are experienced – and have been for decades – but who lack the resources to mobilize in the same way to fight back against it. This is not to say that the literature which has focused on such powerful movements within minority communities is not beneficial or useful in any way, but that it contorted the expectation of the communities which were addressed in this study. None of the communities highlighted in this thesis exhibited large amounts of community activism comparable to those seen largely in Environmental Justice literature.

Another large takeaway from this study is just how complex Environmental Justice truly is, and how deeply interconnected it is to social justice. There was no question regarding whether the two were related. However, after looking at the compounding effects of social barriers that minorities and low-income communities experience on a daily basis with that of hazardous waste

you begin to understand how difficult it is for one to escape such a reality. Some of the individuals in these communities are simply struggling just to make ends meet, and don't have the time or the resources to try and combat environmental hazards. Though, this is simply another example of why no one – people in disadvantaged communities especially – should be subjected to these issues in the first place. No one should have to choose between fighting for their right to quality funded education, access to healthcare, or not being exposed to toxic chemicals.

The final takeaway from this study relates to the relationship between the Environmental Protection Agency and the communities exposed to hazardous waste. From interviews with community involvement coordinators for each of the selected sites, individuals are given several sites to manage at once and have a minimal connection with the site and/or the community. Though their job is to bridge the gap between the community and the EPA, neither of the community involvement coordinators for the superfund sites of interest reside in the same state, and when asked about the community itself or the history of the site they could not provide any additional detail outside of what was listed on the government website. This seems indicative of a surface-level relationship between the EPA and communities, which could potentially hinder the ability of communities to seek and maintain proper help and guidance on the regulation and remediation of toxic waste.

Broader Implications to the EJ Movement

This thesis contributes to a large body of research regarding Environmental Justice and the disproportionate effects of hazardous waste on minority and low-income communities, especially in regard to public health. This thesis has identified several communities in South

Carolina where there exists a disparity between race or socioeconomic status and exposure to hazardous waste. The communities in this thesis vary between rural and urban communities with differing levels of tourism and economic inflow and opportunity.

This research is essential to the progress of the environmental justice movement everywhere, but especially within the state of South Carolina and neighboring states. By investigating the relationship between hazardous waste exposure and the health of surrounding communities, this becomes much more than a social issue, but a public health issue as well. With this research I most importantly hoped to highlight the severity in the disproportionality of environmental hazards and how deeply these effects can resonate within minority and low-income communities.

Conclusion

This thesis aimed to delve deeper into the relationship within specific minority communities in South Carolina between their exposure and health. While difficult to make any definitive relationship between exposure to toxic waste and negative health outcomes, it is still important to investigate how the two interact. Minority and low-income communities tend to be disproportionately affected by hazardous waste, and a great deal of literature has supported the disparate geographic siting of these sites within these communities. This thesis contributed to ongoing Environmental Justice research and can be useful in aiding and informing those advocating for social and policy reform relating to Environmental Justice.

Maps

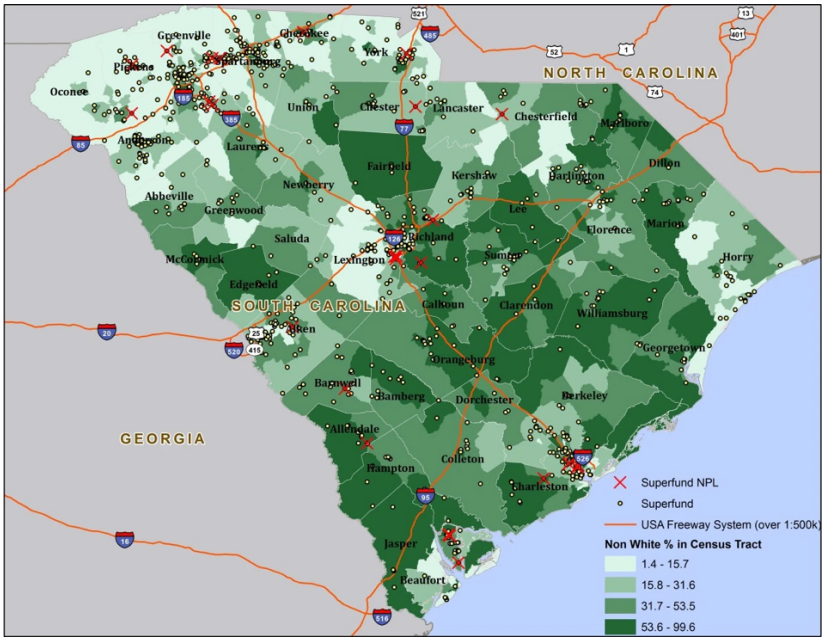

Figure 4: Superfund Sites and NPL Sites in South Carolina by Percent Non-White (U.S. Census, 2000; Burwell-Naney et al., 2013)

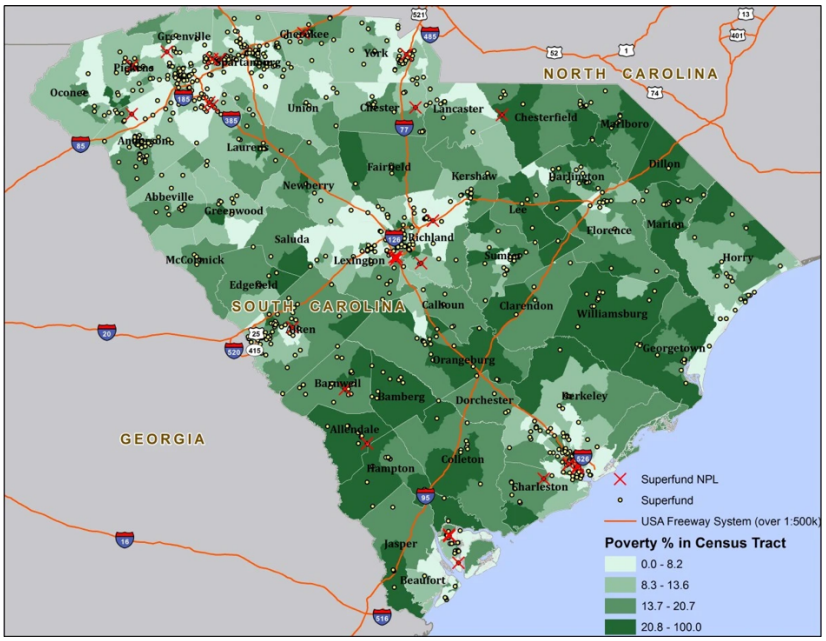

Figure 5: Superfund Sites and NPL Sites in South Carolina by Percent Poverty (U.S. Census, 2000; Burwell-Naney et al., 2013)

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