

Abstract

Lamar Avenue in Memphis, TN serves as a hub for industry and a convergence point for air, rail and freight traffic. The presence of the Memphis International Airport, the national headquarters of Federal Express, as well as dozens of factories and industrial plants has resulted in both crippling congestion and high levels of toxic emissions. Our research has analyzed the implications of this industry on the five adjacent residential neighborhoods. In addition to designing an interactive website that allows users to explore specific factors contributing to pollution and livability, our research has also sought to contextualize the current environmental issues facing the Lamar Avenue Corridor by researching the complex history of the area. This paper explores the dynamic history of Memphis, with particular emphasis on the city's role in the civil rights and environmental justice movements.

Introduction

Over the last four decades, the rapid development of the freight and cargo industries in Memphis, Tennessee has earned the city the title of North America's Distribution Center. The city serves as a distribution hub, where shipping, freight and air industries converge. The Memphis International Airport was the world's busiest cargo airport from 1993-2009, and remains the busiest in the United States. This is largely attributable to the presence of the national headquarters of the Federal Express Corporation, which processes an average of 3.3 million packages every day in Memphis. Our research focuses on the Lamar Avenue Corridor, which is adversely affected by the presence of these industries. While Memphis as a whole benefits from the economic

activity of the industrial presence in the city, the five neighborhoods that comprise the Lamar Avenue Corridor are must shoulder a majority of the environmental burden produced by these industries. In conjunction with the Center of Freight and Infrastructure Research and Education (CFIRE) and the University of Memphis, our group will seek to contribute to a study of livability in the Lamar Avenue Corridor. Our project will design and program an interactive website that will display various metrics of livability. We will use GIS analysis to examine the long-term impact of freight and industrialization on these five neighborhoods. This website will be combined with a historical overview of environmental justice in Memphis to provide a comprehensive representation of the environmental challenges facing the Lamar Avenue Corridor.

Methodology

Together, HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets) form the basis of building web sites. HTML, the core language of nearly all Web content, provides the basic logical organizational structure of pages (HTML.

<https://developer.mozilla.org/en-US/docs/Web/HTML>. Last accessed on 17 December 2013). CSS describes the presentation of websites, allowing for changes in colors, graphic layout, and fonts. CSS can also determine how the site is viewed on different types of devices, such as when the user is working with a mobile device (CSS.

<https://developer.mozilla.org/en-US/docs/Web/CSS>. Last accessed on 17 December 2013).

The programming language Javascript (a scripting language, not to be confused with Java) allows for an object-oriented approach to website programming, which can be

embedded directly into HTML code (Thematic Cartography and Geovisualization, 2010). It allows for dynamic content, such as animation and interactive content (developer.mozilla.org/en-US/docs/Web/JavaScript). jQuery, a javascript library, allows programmers to easily include additional functionality and features in a site, and interactive widgets such as calendars and menus (jQuery UI. <http://jqueryui.com/> Last accessed on 17 December 2013). Leaflet, another JavaScript Library allows for the creation of interactive maps, with the programmer's choice of basemap. It also allows for popups, the inclusion of vector layers (e.g. polygons or circles), and image (raster) overlays (leafletjs.com). GeoJSON, a file format using JavaScript Object Notation, encodes geographical features so that they can be included in mapping applications and packages such as Leaflet (GeoJSON.org). Bootstrap, a collection of JS (JavaScript) tools, CSS stylesheets, and fonts for creating websites and web applications, allows for responsive website design. Building on the aforementioned languages and libraries, it provides a dynamic graphic layout based on the screen size and size and orientation of the browser window, and also can extend the functionality of interface elements such as input fields (getbootstrap.com). Bootleaf combines Bootstrap and Leaflet, creating a template for "simple and elegant web mapping applications" (github.com/bmcbride/bootleaf).

The dynamic part of our interactive map is a series of thematic maps that are going to present the attribute data overlaid on top of the spatial information to enable the exploration of the spatial patterns by the user, which will help visualize the environmental injustice in Memphis, TN. Users will be able to personalize the maps according to their needs and interests by selecting or deselecting, increasing or reducing

the amount of the information viewed at once. As a result of the screen size and resolution difference for every user, we decided to work with Bootstrap, an open-source front-end framework that adds the responsive functionality to the application (Bootstrap. <http://getbootstrap.com/about/>. Last accessed on 17 December 2013).

Creating an interactive thematic map constitutes of different forms in association with the three types of objects: points, lines, and polygons (Hacklay, p. 160). Depending on the type of information presented (quantitative, ordinal, qualitative, categorical), the decision about the use of a visual variable representing the attributes is made. The clustering technique called markerCluster is going to be used in order to avoid overcrowding of the map (Leaflet plugin.

<https://github.com/Leaflet/Leaflet.markercluster>. Last accessed on 17 December 2013).

Creating the interactive map, we focused on the potential user groups' characteristics and goals, spatial and domain knowledge, user's mental models of the system. Moreover, when creating the map we followed the design guidelines that can help increase usability of the map such as having direct access to the map, setting a proper map to non-map information ratio, providing a clear all button, and, overall, ensure aesthetics focus (Interacting with Geospatial Technologies, 2010).

Lamar Avenue Corridor Studies

As an arterial road for both interstate and local freight, Lamar Avenue is one of the region's most important and congested corridors (Memphis Regional Freight Infrastructure Plan Executive Summary, 2010). Lamar Avenue is approximately 7.5 miles long and consists of 30 intersections (Cambridge Systematics, 2011). Memphis International Airport, the Burlington Northern Santa Fe railyard, and several important

distribution centers are located along the corridor, making it a critically important thoroughfare for the city's commerce.

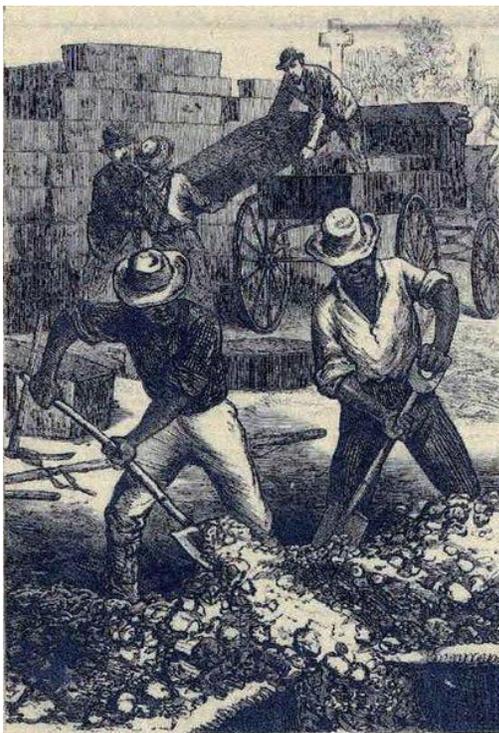
Several studies were conducted to identify necessary transportation improvements for decongestion along the Lamar Avenue Corridor, with one of the most important being commissioned by the Tennessee Department of Transportation and overseen by Cambridge Systematics in collaboration with the University of Memphis and Kimley-Horn & Associates (The Memphis Daily News, 2011). The Cambridge study focused on transportation improvements, and did not thoroughly examine other livability issues associated with water, air, and noise pollution (Cambridge Systematics, 2011). The paper stated that the monetary value for the recurrent delay for trucks is \$19.82 per hour and truck air pollution costs are \$0.039 per vehicle miles traveled. The study also offered multiple alternatives to decrease congestion along Lamar Avenue, including upgrading it to an interstate, adding lanes, and diverting traffic. The University of Memphis also conducted a study on the Lamar Avenue corridor and gave recommendations to reduce traffic congestion. In contrast to the Cambridge Systematics research, this study examined the impact of the heavy concentration of industry on the surrounding neighborhoods. The principal finding of the study was that these neighborhoods suffered from a high degree of air pollution as well as an overall lack of vegetation and green space.

These studies reflect the importance of Lamar Avenue as a critical artery for industry located in the area. While the University of Memphis study examines the impact of this industry on the surrounding neighborhoods, a broader context is necessary to understand the livability issues they face. Due to the intersectionality of racial and

finest agricultural districts in the western country. Already it is a place of considerable business, and is improving faster than any town in the state” (Crutchfield, 2009, 117).

This growth combined with racial tensions during the Civil War, causing violent conflict between the city’s white population and the growing number of African Americans who sought refuge and opportunity in the city after President Lincoln’s Emancipation Proclamation in 1863. Many black Baptists and Methodists formed societies in response to the violence, and rebuilt their churches, schools, and communities through these orders.

Memphis, unlike many southern cities, was not irreparably damaged by battles in the Civil War, and in fact experienced significant population growth. What Memphis lacked, however, was sufficient sanitation infrastructure. Memphis was not unique among industrial era cities for its lack of comprehensive sewer, water, and waste disposal systems, but its situation along the Mississippi River made it highly susceptible to



mosquito-borne diseases. Memphis suffered four debilitating yellow fever epidemics between 1867-1879, resulting in over 8,150 deaths (Rushing, 2009, 15). The third and worst outbreak occurred in 1878. Within ten days of the first casualty, “twenty-five thousand residents had fled Memphis, leaving about twenty thousand behind to take the brunt of the epidemic” (Crutchfield, 2009, 118). The epidemic was so widespread that “at one point in

September, two hundred people died each and every day” (Crutchfield, 2009, 120).

Between the years 1865 and 1890, black fraternal orders played a role in local politics; more than ten blacks served on the city council, and two were elected to the state legislature in 1881 (Goings, 1998, 229). The African American community had grown in Memphis with at least three distinct groups. “The talented tenth,” a group described by such writers as W.E.B Du Bois, included the individuals who had “...secured an education, made economic investments in the city, and achieved an elite status in the community. They utilized the political and judicial systems whenever they could, but believed...’character building’...would [create] a more positive perception of all African Americans [by whites]” (Goings, 1998, 228). A second group, the accommodationists, included “black professionals who refused to challenge segregation and racial discrimination in the city” and desired “harmony” between the races by accepting second-class citizenship for African Americans (Goings, 1998, 228). The third group “consisted of migrants who ignored attempts by the Memphis white community to keep blacks in their ‘place’” and publicly resisted everyday racial indignities (Goings, 1998, 228). These three groups sometimes had very different ideas about how to find solutions to issues of discrimination and at times conflicted with one another, but still represented progress within Memphis to no longer tolerate racial persecution.

Despite this growing movement, Memphis continued to see segregation, lynchings, and other violence in an attempt by the city’s white population to create a fearful atmosphere to hold these resistance demonstrations in check (Goings, 1998, 227). Memphis was attractive to African Americans because it offered an urban community with strong ties to a rural economy and had an ever-changing black population due to its

location in the mid-South. More than half of the migrants were born in Mississippi, while at least one-fourth came from Arkansas, Alabama, and Louisiana. During the 1880s and 1890s, Memphis also saw an influx of white farmers. The consequent cultural mix included citizens on both sides of the racial tensions and from a variety of economic backgrounds. In 1900, Memphis was described as “...a strange paradox--a city modern in physical aspect but rural in background, rural in prejudice, and rural in habit” (Goings, 1998, 230). These attributes became evident as the twentieth century began and the Bluff City grew into the industrial age.

Expansion into the Twentieth Century

This strange Southern city continued to grow into the twentieth century, but not without complications. Its rural prejudices and habits contributed to its notoriety, with Memphians settling disputes with firearms and white Memphians lynching African American Memphians at alarming rates in an attempt to maintain their racial culture of fear within the city. In the first decade of the century, Memphis became the murder capital of the nation with a homicide rate almost seven times the national average, and by 1916 this figure had nearly doubled (Biles, 1986, 15). The city, during this tumultuous time, found itself under the leadership of Edward Hull Crump, a young businessman who ran for mayor on a platform of reform. Crump left office in 1915, but remained strongly involved in Memphis politics. He and his allies orchestrated and controlled every election in the city until his death in 1954, and while a certain level of order was maintained, so was the status quo. Crump introduced economic reforms and kept the Ku Klux Klan out

of the city's political system, but also ensured African Americans remained second-class citizens during his nearly fifty-year reign.

Under Crump's watchful eye, Memphis expanded steadily through the 1920s. At the start of the decade, it retained its title of being the nation's largest inland cotton market, but, as Biles states, "remained basically a one-crop town" (1986, 50-1). This economic model proved effective during World War I as cotton demand rose for war materials; but, after the war, market prices plummeted. They gradually recovered throughout the following decade, during which time the city diversified its commerce. The Memphis economy grew steadily as the Roaring Twenties rushed on with the emergence of several new banks and retailers. Office building construction soared, with one million square feet of commercial space becoming available between 1923 and 1929, and the city skyline grew accordingly with offices and hotels rising in rapid succession, including the iconic Hotel Peabody in 1925 (Sigafos, 1979, 158-9). Memphis Harbor saw a doubling in tonnage coming through its port during this decade, and many businesses, including Sears, Piggly Wiggly, and Kroger, opened locations in the city (Sigafos, 1979, 195). Memphis also made a crucial decision as it rapidly expanded, when in 1929, after suggestions by Charles Lindbergh and Eddie Rickenbacker, the Memphis Airport Commission secured the site for what would become Memphis International Airport.



The Stock Market Crash of 1929 and ensuing Depression took their tolls on Memphis in many of its business sectors. The cotton industry declined, but after two Agricultural Adjustment Acts passed by Congress in 1933 and 1938 that reimbursed farmers for losses, it began to recover. Sigafos describes how it “did not become a healthy industry, but those involved appeared to gain greater control over their future” (1979, 178). Behind the scenes of these and many subsequent attempts at revival stood E.H. Crump. Elected to the U.S. House of Representatives in 1931, the former mayor, along with veteran Tennessee Senator Kenneth McKellar, employed his political influence to bring federal funding and revival projects to Memphis. These included the Home Owners’ Loan Corporation, which was created by the Federal Home Loan Bank Board in 1933 and opened its Memphis office in July of that year. This represented one of the first efforts to assist homeowners in danger of mortgage foreclosure, and a federal loan insurance program and multiple public housing projects within Memphis quickly followed.

With public housing came segregation, and in 1940 Memphis’s African American population were forced to live in substandard housing while their white contemporaries were favored by city planning commissions. Planners stated that, “It would be advantageous to the city if the bulk of the Negro population could be confined to definite

districts that have already been established” (Sigafos, 184). A 1940 report by the Works Progress Administration stated that 46,753 of Memphis’s 83,540 homes were substandard, and it was in these established districts that city planners sought to place African Americans by controlling who received property rights as bids were made throughout the city (Miller, Pozzetta, 1988, 114-5). The onset of World War II stalled the few government programs designed to alleviate this issue, and primed Memphis for civil strife in the following decades.

Fortunately, the war rapidly rejuvenated the Memphis economy that had languished for over a decade. Multiple Memphis-based industries and plants overhauled their systems for wartime output and hired unemployed Memphians by the dozens. The DuPont owned Chicksaw Ordnance Works produced explosives; Ford focused solely on airplane engines; Firestone switched to rubber life rafts and tires for army vehicles only; and the Continental Can Company made shell casings. Each of these industries boosted the Memphis economy and prepared it for continued growth in the post-war economic boom driven primarily by the housing market.

Postwar Memphis

Soldiers returning from Europe and the Pacific Theater purchased new suburban homes that required appliances emerging in the growing technological era. Home construction greatly benefited the Memphis-based E.L. Bruce Company, which became the world’s leading producer of hardwood flooring during the 1950s. The growth of suburbs outside of cities to accommodate the housing demand necessitated a boom in

automobile sales, which increased traffic so heavily the Tennessee Highway Department could not keep up with resurfacing needs (Johnson, 1978, 113).

Amidst this economic growth, Memphis race politics once again returned to the forefront of the city's actions. Expansion of the suburbs accentuated socioeconomic and racial divides, and while residents of various backgrounds lived in close proximity prior to 1940, the city's expansion made demarcations between black and white neighborhoods more visible (Miller, Pozzetta, 1988, 94). Enter Henry Loeb III, Memphis native, Brown University graduate, and war veteran. Loeb quietly became involved in Memphis politics in the early 1950s through an appointment to the park commission, and was elected in 1955 to the city commission as an independent. Loeb quickly established a reputation for exposing scandals and corruption, helping him gain prominence in political circles.

At the same time in Memphis individuals like O.Z. Evers and Jesse H. Turner were disrupting the status quo. They, along with fellow African American activists staged protests calling for equality. In 1956, a federal judge ordered the first integration of a Tennessee school district but this decision was met with severe opposition from state leadership. Within a year the court order had been subverted by a law coordinated by the governor and members of the state legislature, further aggravating the divide between racial groups.

In June of 1959, Russell Sugarmon, a graduate of Rutgers University and Harvard Law School and a practicing attorney in Memphis, announced his candidacy for Henry Loeb's recently vacated city commission seat (Dowdy, 2010, 66-7). Loeb had declared he would oppose incumbent mayor Edmund Orgill in the upcoming mayoral election, and Sugarmon hoped to seize the opportunity and become the first African American elected

to office in Memphis in the twentieth century. Sugarmon planned to run against a divided white ticket, and this troubled Loeb who, among others, worried an African American victory would upset the racial order dominant in Memphis for generations. Loeb vigorously petitioned against Sugarmon's campaign, which inspired several other African Americans to run for positions and ultimately brought Martin Luther King, Jr., and Mahalia Jackson to Memphis in support in 1959.

Sugarmon and the other African American candidates lost their campaigns and Loeb was elected mayor, but civil rights activists were not dismayed. Loeb's first term saw a strong increase in protests and activist work as African Americans fought for integration in schools, restaurants, libraries, and parks in Memphis. These events enraged the mayor who saw them as unnecessary expenditures of time and resources, and his negative opinion became well known publicly. As the election process mounted in 1963, amidst multiple African American victories for improved civil rights in Memphis and national support stemming from the Kennedy administration, Loeb felt he had been "robbed of his greatest political issue" (Dowdy, 2010, 85). A disheartened shell of his former, reform seeking self, Loeb stepped down from his campaign and this city elected William B. Ingram as his successor.

Ingram created conflict throughout his term as mayor by challenging position appointments and strictly denying a motion to allow African Americans on the city commission. He also frequently butted heads with Claude Armour, the veteran fire and police commissioner. Loeb, sensing an opportunity to reenter the political sphere, openly challenged Ingram at the next election cycle, calling his administration a "five-headed, headless creature" (Dowdy, 2010, 115). Loeb defeated Ingram in the fall of 1967, and

once again took office as mayor of Memphis. He had made concessions towards civil rights groups, causing some to be hopeful for his second term, but Loeb quickly showed little had changed.

In February of 1968, Echol Cole and Robert Walker, Jr., both sanitation workers in Memphis, died when the hydraulic press of their garbage truck malfunctioned and crushed them. Their deaths reignited a strike movement initially attempted in 1963 by the primarily African American sanitation workers' union. For decades the workers had been subjected to poor wages and working conditions, including the alarmingly dangerous trucks they were forced to ride in, standing in the rear between the press and the truck's back wall. Loeb, who purchased the trucks as public works commissioner in 1957, found himself in the crosshairs of the strike.

The mayor refused to budge on the sanitation workers' demands, and for weeks the strike languished. The situation escalated in a brief riot between police and protesters that included arrests, Mace, and nightsticks. Martin Luther King, Jr., visited on March 18, 1968, to encourage the workers to continue their efforts and told them to "escalate the struggle" (Dowdy, 2010, 127). He then left the city for a time and returned on March 28th with the intention of leading a march, but after tensions rose amongst the waiting crowd, vandalism and looting broke out, prompting police retaliation. King fled the scene with several aides while protestors and looters were beaten and arrested. Police pursued one individual, sixteen-year-old Larry Payne, incorrectly suspecting he was with a gang of looters. The officers followed Payne into a basement and ordered him out, and as he exited one officer fired his shotgun, killing him instantly. Lawmakers in Nashville heard of the ensuing violence and hurriedly passed legislation allowing mayors to set a curfew

to combat civil unrest. Mayor Loeb quickly took advantage of this and declared martial law in the city of Memphis, with National Guard troops arriving to maintain it until April 1st.

The chaos of the march brought King a great deal of humiliation, and he left the city. Members of his staff convinced him to return, and on April 3rd he gave an impassioned speech before a crowd at Mason Temple, telling those gathered, “We’ve got



to see it through” (Dowdy, 2010, 130). The next day, April 4, 1968, King was assassinated standing on the balcony of the Lorraine Motel. Violence once again rocked the city, and the National Guard returned for a time. Mayor Loeb then received pressure from throughout the nation to settle the

dispute, and he looked on as the nation decried Memphis’s complacency towards civil rights.

During the 1960s, the Bluff City’s economy continued to capitalize on the influx of businesses from the postwar boom, and many large corporations, such as Du Pont, Kellogg, and Kimberly-Clark employed thousands of Memphians. The city attracted a number of Fortune 500 companies due to its “pivotal position geographically within one of the nation’s most productive agricultural regions” (Sigafos, 1979, 295). The E.L. Bruce Company that rapidly expanded into the world’s leading hardwood flooring producer in the postwar years began to decline after the Federal Housing Administration included wall-to-wall carpeting in its basic home loan in 1966 and inadvertently made

hardwood less desirable, but many of the city's other homegrown industries began expanding in the 1970s (Sigafos, 1979, 298).

Kemmons Wilson opened his first Holiday Inn in 1952 in Memphis, and in just eighteen years, after a merger with Wallace E. Johnson to form Holiday Inns, Incorporated, the company grew tremendously. There were 1,713 Holiday Inns throughout the nation by 1970, and this successful growth model was shared by many other Memphis-based organizations. Companies like Guardsmark, Orgill Brothers & Company, and Dunavant Enterprises all boomed in industries ranging from security services to cotton brokerage, and all were based in Memphis. Malone & Hyde, a wholesale and retail food firm, more than tripled its annual sales between 1970 and 1978 reaching nearly \$1.4 billion (Sigafos, 303). Many Memphis industries were expanding, and the city experienced a large influx of goods and revenue.

One of the most notable corporations to come out of this era proved to be the Federal Express Corporation founded in 1972 by Frederick Smith. Smith, still a year shy of thirty, provided the nation with a simple and fast package service that quickly caught on. In just six years the corporation boasted a \$20 million net income, and Memphis served as its central hub. Over the following decades, Memphis International Airport grew to become the busiest cargo airport in the world.

The New Memphis

With the rise of globalization, the city of cotton trade became North America's distribution center. The airport, highways and rail yards of East Memphis soon attracted dozens of white, multi-story warehouses adorned with the stubs of truck-loading docks

instead of Art Deco flourishes. “Just as sitting at the center of the delta had made Memphis a nexus for the exchange and the barges and railroads carrying away cotton, so did sitting in a sweet spot of climate and time zones make the city irresistible” for companies looking to move freight around the country (Kasarda and Lindsay, 2011, 60). Memphis’s most valuable commodity was not cotton but speed, with shipping employees working around the clock to load “jets [that] could sprint from the coasts and back by daybreak.” Today, FedEx carries 75 percent of all U.S. air cargo, despite prices three or four times higher than its rivals (Kasarda and Lindsay, 2011, 60-61).

Being a center of international shipping, Memphis International Airport sees three hundred planes at its gates daily, carrying more than 3.3 million packages. It was the busiest cargo airport in the world for eighteen years running and 95 percent of its title is due to FedEx. As John D. Kasarda (2011) writes in *Aerotropolis: The Way We’ll Live Next*,

The city’s iconic export now is a white box barely larger than a laptop, or a man’s shirt, or a stack of DVDs, all of which arrive here along with stacks of overnight envelopes and then leave again on flights costing thousands of dollars per hour in flight time and fuel. Regardless of these contents’ retail price, these packages are priceless to their owners, and they pour from the bellies of wide-body planes here by the millions each and every night.

Its trucks, planes, and trailers – not to mention its purple logo – permeate Memphis. In 2008, University of Memphis researchers sought to measure the airport’s impact on the city. They discovered that it was indirectly responsible for nearly half of the local economy, worth \$28.6 billion, and for 220,154 jobs – one out of every three in the region. Not only is it the largest private employer in a metropolitan area of more than a million people, it sits in a center of warehouses, trucking firms, factories, and office parks with roots that stretch back to its not-so-far-gone cotton days.

More telling are the companies that have moved to town since then just to take shelter in the shadow of FedEx. The airport, built on the edges of the city in the days when even Graceland was still a country home (now it sits only a few miles from the fence), has turned the city inside out. It is the de facto center of Memphis as well, with the hub at its core. It transformed the city into “America’s Aerotropolis,” as the Greater Memphis Chamber of Commerce has dubbed it. Historically, cities exist to exchange goods between each other from their hinterlands, and in Memphis’s case that meant Mississippi cotton. FedEx revolutionized this notion with a hub capable of serving every city in the United States overnight, every night, turning the entire country into one big hinterland. An airport and FedEx jets were all any city needed to trade with another, and Memphis became the crossroads for many of America’s goods, not just cotton. Boosters still crow about the city’s rail lines and trucking fleets, but they’re only a piece of a larger network. FedEx was revolutionary because it created a new network, limited only by the size and reach of its planes.

FedEx, has continued to drive Memphis ever since its founding in 1972. The city, born of its strategic location along the Great American Waterway, continues to use the river, with barges perpetually passing through its harbor. Simultaneously, rail and ground transport bring commerce into and out of the city, connecting Chicago, New Orleans, New York, and the West. Lastly, the founders of the Bluff City did not know at the time, but the location they chose is optimal for air traffic. Memphis lies within a trapezoid in the central U.S. regarded by freight corporations as ideal for servicing the rest of the nation as the crow flies. Without this advantage, FedEx would surely have found an alternative central hub.

Memphis's strong dependence on industry and its history of racial division still influence the city today. The Lamar Avenue Corridor began as primarily white suburban housing, then substandard African American developments, and now is impoverished and surrounded by the pollution of air, rail, and ground transport. Still tied to its past, Memphis now faces the challenge of balancing industry's historically integral role with the relatively new emphasis on rights and equality for all citizens. The Bluff City must determine how to provide for its entire citizenry, while also bringing a high quality of life to those living near and working for its largest providers.

Environmental Justice

Environmental Justice represents the intersection of environmental and civil rights movements (Newton, 18). From the 19th to mid-20th century, environmental issues were concentrated within the conservationist and preservationist movements, which were primarily concerned with the use of natural resources. The movement began to change in the 1960s as Americans became increasingly aware of the extent of environmental damage wrought by industry, commercial interests, and human activity. Rachel Carson's *Silent Spring*, which describes the deleterious effect of the indiscriminate use of pesticides, marked the beginning of newfound concern for the environmental problems caused by modern use of chemicals and other toxins. The environmental movement soon included groups dedicated to addressing problems such as acid rain, hazardous waste disposal, and land use. These groups usually failed to address the challenges faced by poor, minority, and urban communities. When asked in the 1970s and 1980s, members of the Sierra Club declined to address the conservation problems of special groups such as the urban poor

and ethnic minorities, with a defeat of about three to one in the mid-80s. Some began to express concern that the mainstream environmental movement was in fact overshadowing troubles faced by minorities, or in some cases actually causing greater problems. For example, new regulations for the use of pesticides in agriculture decreased risk for the general population, but increased health impacts on farm workers (Newton, 20-21).

In 1982 residents of Warren County, North Carolina attempted to protect their community from a waste disposal dump by using tactics championed by the civil rights movement, including civil disobedience and nonviolent protest. Four years earlier, the Ward Transformer Company of Raleigh “illegally and surreptitiously dumped 31,000 gallons of toxic polychlorinated biphenyls (PCBs) along 240 miles of roadways [by dripping it] in 14 North Carolina counties. Once discovered, the North Carolina state government was responsible for digging up and relocating 40,000 cubic yards of contaminated soil” (Newton, 1). In violation of EPA regulations, the state dumped the toxic waste in Warren County, where the soil was susceptible to leaching and the water table was only about 7 feet below the landfill, a full 43 feet shallower than required. Residents immediately contested the proposal of disposing this hazardous waste in their community. Warren County ranked 97th in North Carolina’s 100 counties in per capita income, and 75 percent of residents were African American. The community made public appeals to national leaders of civil rights and environmental groups, but lacked resources to fight a legal battle against state. The EPA ultimately ignored the objections of the residents, and granted North Carolina a permit for the landfill after waving the environmental requirements. After arresting 523 protesters, 7,223 truckloads of contaminated soil were deposited in Warren County. The site leached contaminants for

the next 20 years, permanently damaging local environment, including streams, lakes, and rivers (Newton, 1-3).

After the events in Warren County, a 1983 study revealed that three out of four of the largest landfills in the Southeast were located in predominantly poor and African American communities. In 1987, the Commission on Racial Justice of the United Church of Christ analyzed the entire United States and found similar results. According to the study, three out of five of the largest hazardous waste sites in the US were located in predominantly African American or Latino communities. It also showed that 15 million African Americans and 8 million Hispanic Americans live in communities with one or more hazardous waste sites (Newton, 23-26).

The mid-1990s saw a new wave of environmental reform. President Clinton's administration achieved significant progress for the environmental justice movement, establishing the Office of Environmental Justice within the EPA and the National Environmental Justice Advisory Council (NEJAC). A number of new organizations were formed representing African American, Native American, and Hispanic communities and were able to appeal to the resources created in the Clinton Administration. While these organizations applied Title VI of the Civil Rights Act of 1964 which states that "no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance," over 75% of cases were rejected by the EPA before 2003. Organizations that sought to protect communities from contamination found further hardship over the eight-year period of President Bush's administration with such actions as reinterpreting the meaning of

environmental justice to exclude low-income and minority populations, with a quote from a 2002 memo to the employees of the EPA reading “...the environmental justice program is not...designed specifically to address the concerns of minority communities and/or low-income communities” (Newton, 2009, 67). Additionally, the EPA did not “provide regional or program offices with standards for what constitutes a minority or low-income community.” Among other concerns, this prevented the EPA’s compliance with President Clinton’s Executive Order 12898 protecting those impacted by environmental concerns. Furthermore, no environmental justice bills proposed by the federal government even were able to become close to passage; “such bills often do not [leave] the committees to which they are assigned” (Newton, 27-31).

The principle of NIMBY, or Not In My BackYard, has also exacerbated the disproportionate presence of hazard materials in lower-income communities. The NIMBY concept explains organized opposition to hazardous or polluting facilities in middle and upper class communities, where residents tend to have more political and social capital than low-income neighborhoods. These industries, hazardous waste dumps, and radioactive sites apply to be located in a city, resistance from minority and low-income neighborhoods often goes unheard. Governmental bodies such as city councils, planning departments, and zoning committees, who are responsible for granting permits to these facilities often overlook the objections of lower income communities because they lack the financial resources to fight drawn-out legal battles. In many cases there is also an information deficit, in which communities that would be directly impacted by proposed facilities are not aware of the health risks (Newton, 43-46).

Recent studies revealed that opinions within African American and other minority communities on the environment are often misrepresented. One survey of five largely African American communities showed that more than half the respondents had participated in environmental activism such as writing a letter or telephoning an official about an issue. In fact, one analysis showed that African American legislators are significantly more likely to support environmental legislation than their white counterparts: 75 to 85 percent of African American legislators supported environmental legislation as compared to 60 to 80 percent of white Democrats and 20 to 40 percent of white Republicans. Another study showed that environmental activism in the African American community often occurred through other organizations such as churches instead of mainstream environmental groups. In many ways, African Americans are also more likely to make lifestyle choices that are better for the environment when considering such topics as a reduced consumption of meat and higher use of public transportation. After analyzing more than 20 years of data, Paul Mohai of the University of Michigan noted that, “environmental issues are not ‘luxury’ issues to African Americans. Survey results...demonstrate that environmental quality issues are a priority on many different levels” (Newton, 44-45).

Looking at the six cities with the largest number of hazardous waste sites in the 1983 national study of US communities, Memphis ranked as the highest percentage of African Americans (43.3%), but also had the highest number of hazardous waste sites at 173 (Newton, 24). An example of these sites is the Defense Distribution Depot of Memphis, located about a mile northwest of the Memphis International Airport. Built in the late 1940's for storage of numerous chemicals and munitions, it remained active until

1989. During this time, the 64-acre parcel of land was used for hazardous waste disposal, as well as maintaining or destroying extremely toxic chemical warfare materials, including several thousand pounds of mustard gas-filled German bombs and the potentially deadly blistering agent lewisite. Additional hazardous waste included organic chlorinating agents, food stocks, paints, acids, herbicides, volatile organic solvents, and medical waste. In 1992 the site was placed on the EPA's National Priority List and became a superfund site, a list reserved for only the most serious uncontrolled or abandoned hazardous waste sites throughout the United States. Astonishingly, neither the Department of Defense nor the responsible contractors reportedly know all of the burial locations; a 2006 study attempted to use aerial photographs and historical documentation to discern where these locations might be. The community living next to the Defense Depot consistently voiced concern regarding health effects likely from neighborhood contamination from the site, with significant anxiety related to the fears of the community due to their lack of direct participation in the remediation and evacuation plans. In spite of anecdotal evidence of numerous cancers, deaths, birth defects, and miscarriages, the community's requests for testing were regarded as "unwarranted" based on previous exposure assessments. Upon investigation, it was found these previous exposure assessments were not based on actual testing of soil, water, and air, but rather historical records. Members of the community also expressed concern about disturbing the soil at the site, worried that their neighbors could become sick or die. In 2006, after receiving requests from local residents, professors from Howard University tested the soil for contaminants. Test sites included a creek that had been used to dispose of chemicals and waste, which currently runs directly underneath the primary air-intake ducts of a local

high school and which flows through the entire community, easily accessible to children and animals. Residents complained that the creek still maintains a distinct and pungent odor, which was confirmed by the researchers even at an ambient temperature in the range of 45-55 degrees Fahrenheit. Results of the study revealed significant amounts of organic compounds, an unidentified anion, and heavy metals. The average concentration of chromium, a compound known to cause cancer, observed in all but one site contained levels at triple the EPA limit (Greene, et al, 247-250).

In 2000, the Sierra Club began environmental justice programs in Memphis. Concerns addressed by the Memphis chapter include the surreptitious dumping of nuclear waste in two local landfills over the Memphis Sands aquifer. Prior to the group's activism, most elected officials and residents were unaware of the dumping. The group currently works to inform residents of the various risks involved with nuclear waste. Some facts noted by the group include that Shelby County, the county in which Memphis is located, received more than 1.6 million pounds of nuclear waste from around the country in 2006 alone. This nuclear waste has been dumped into landfills designed to handle household garbage, not hazardous toxic waste and radioactive materials (for example, the landfills are lined with a material that lasts only 30 years in the best conditions, but that deteriorates from chemicals). On a 2006 "toxic tour" conducted by an environmental justice Sierra Club organizer, participants witnessed smoke from the previous day's explosion and fire at an agricultural chemical plant. As described on the tour, Memphis has a long history of the production of agricultural chemicals, where the facilities to produce, transport, and dispose of the chemicals form a ring around the historically black neighborhoods of Memphis. However, black residents were historically

excluded from jobs that produced agricultural chemicals while black neighborhoods were heavily impacted by emissions and waste from these chemicals; concerns over chemical spills and accidents were present. Other topics addressed by the chapter include such concerns as chemical plants, oil refineries, and hazardous Superfund sites emitting dangerous pollutants in or near neighborhoods, elementary schools, and parks.

Environmental Justice is a convergence of civil rights and environmental movements, founded on the principle of providing a voice to underrepresented communities (Bullard, p. 25). Minority communities often argue that lack of assistance from public health organizations and businesses is an example of environmental racism. Numerous studies have shown that people of color are more likely to have greater health and environmental risks, no matter what the income levels are (Institute of Medicine). According to the National Law Journal, white communities are more likely to get better results for toxic waste cleanup, as well as tougher punishments than communities of color do. Moreover, the majority of the nation's environmental policies are beneficial to individuals with the higher education and income levels (Bullard, p. 27). In fact, the research conducted by the Associated Press in 2005 indicated that African American population is 79 percent more likely to live in neighborhoods with industrial pollution (AP).

The environmental justice framework may refer to unequal distribution to the harmful environmental exposures, as well as differentials in communities abilities to resist the harmful practices in land use and industrial planning (Bullard, 2007, p.26). Proximity to wide spectrum of the hazards such as exposures to waste sites, industrial facilities, ambient air pollution, transportation thoroughfares have adverse effects on

human health (Lee, p. 177). Moreover, the social factors such as employment status, access to health insurance, language ability, and access to social capital can also play a major role on the ability to oppose the environmental threats. Lack of healthcare can play a major role, because poor nutrition, poverty, and stress can exacerbate the health problems (Lee, p. 181-182).

Impacts of Transportation

Transportation systems pollute the air and make considerable extents of land unsuitable for human habitation (Balbus, Triola, p. 414). The transportation sector currently accounts for 28 percent of the green house gases emission and 30-40 percent of air pollutants such as carbon monoxide and the ozone precursors nitrogen oxides and VOCs (Balbus, Triola, 2005, 426).

Air quality is a major concern to people of color since they are disproportionately concentrated across the nation: 65 percent of African Americans and 80 percent of Hispanics live in the counties with inadequate air qualities (Bullard, p. 41). Low-income residential areas situated in close proximity to the roadways between major ports and urban or distribution centers are more likely to have high concentration of diesel exhaust emissions, because almost all large trucks burn diesel fuel (Balbus, Triola, p. 42). In addition to that, the communities that located close to the transportation infrastructures such as railway stations, airports, and subway terminals (Balbus, Triola, p. 428).

Transportation-related air pollutants exacerbate asthma and other respiratory illnesses (Bullard, p. 42). Studies have shown correlations between living near roads with high traffic and being diagnosed with asthma, being hospitalized for asthma, and having

outpatient visits for asthma. Moreover, heavy truck traffic increases the respiratory health, which includes asthma symptoms and reduced lung functions (Balbus, Triola, p. 429). Also noteworthy is that for the period of 2007-2009 according to the CDC webpage, the mortality rate per 1,000 persons with asthma is 75 percent higher for black people than white, and blacks had a higher asthma Emergency Room visit rate and a higher asthma hospitalization rate than whites (Haklay, 2010, 160).

In addition to asthma, traffic-related fine particles are linked to increased mortality from cardiovascular complications. Long-term average concentrations of black smoke, NO₂, and PM_{2.5} were significantly related to mortality (Brunekreef et al, 2009) and nearly twofold increase of cardiovascular mortality associated with living near a roadway (Balbus, Triola, p. 430). Furthermore, air toxins and particulates from transportation systems increase the cancer risk among people who live in roadway vicinity. Several studies have indicated that primary source of cancer risk from air toxics in diesel particulates (Balbus, Triola, p. 431). Diesel PM contributes to 125,000 cancers in the United States (Bullard, p. 42). A study in Denver has shown that children residing in the area with high traffic concentration are six times increased risk of all types of cancers and eight times increased risk of leukemia (Balbus, Triola, p. 430).

In the same way noise pollution has a tremendous effect on the urban environments. Long-term exposure to the noise levels above 70 dB can seriously damage hearing and affects human well being (Rodrigue, 2013). According to the Federal Highway Administration, at a distance of 50 feet a medium truck travelling 50 miles per hour emits 80 dB of noise and a pickup truck emits 70 dB of noise (Balbus, Triola, p. 437). The greater number of vehicles, the greater is the number of noise pollution, hence

crowded and busy roads are producing more noise pollution. Airplanes and airports typically have noise levels between 80 and 100 dB, which can affect people that live near them (Balbus, Triola, p. 438). Noise from transportation such as railyards, airports, ports can cause cardiovascular disease, as well as increased blood pressure, heart disease, changes in hormonal levels, and circulatory problems (Balbus, Triola, p. 438). Noise pollution has been proven to affect academic performance, leading to poor classroom behavior, irritation, and decreased reading comprehension (Balbus, Triola, p. 439).

Finally, transportation negatively affects the water quality. Runoff from roads, parking lots, and other surfaces can pollute drinking water and degrade the urban environment (Surface transportation policy project). Fuel, antifreeze, engine oil, rubber, metal deposits, and other hazardous particulates from aircraft, cars, trucks, and trains can impact the hydrological conditions (Rodrigue, 2013).

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