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INVESTIGATING PIGTOWN NEIGHBORHOOD RESIDENTS' EXPERIENCES

OF THE URBAN HEAT ISLAND EFFECT AND GREEN INFRASTRUCTURE

IMPLEMENTATION

by

Sydnie Trionfo

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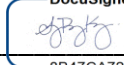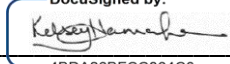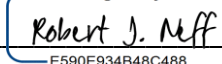
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(i.e., Doctor of Science)

	Sya Buryn Kedzior	12/02/21
Chairperson, Thesis Committee Signature	Printed Name	Date
	Kelsey Hanrahan	12/03/21
Committee Member 1 Signature	Printed Name	Date
	Robert J. Neff	12/03/21
Committee Member 2 Signature	Printed Name	Date

☒ Thesis has been submitted to Graduate Studies

	David R. Ownby	12/06/21
Dean of Graduate Studies Signature	Printed Name	Date

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ABSTRACT

INVESTIGATING PIGTOWN NEIGHBORHOOD RESIDENTS' EXPERIENCES OF THE URBAN HEAT ISLAND EFFECT AND GREEN INFRASTRUCTURE IMPLEMENTATION

Sydnie Trionfo

In urban areas with limited greenspace, temperatures are higher than in surrounding suburban areas, forming an urban heat island (UHI). Extreme heat and a lack of greenery act as a serious threat to public health as they stress the body physically by exacerbating pre-existing health conditions and emotionally by negatively impacting social cohesion. Baltimore City, Maryland, is one of many historically disenfranchised spaces plagued with environmental disamenities such as the UHI. In recent years, Baltimore has incorporated more sustainable development initiatives, such as implementing green infrastructure (GI) in an attempt to rectify these disamenities. Within the current sustainability planning literature, there is a gap in qualitative accounts of residents' lived experiences of the GI planning process, community outreach strategies, and implementation efforts utilized. This research project is focused on the Pigtown neighborhood of Baltimore City and aims to investigate socially vulnerable resident's experiences of the UHI and GI implementation.

Key words: urban heat island, extreme heat, green infrastructure, socially vulnerable

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CHAPTER ONE

INTRODUCTION

Extreme heat is the number one source of weather-related mortality in the United States (NOAA 2018). As rapid urbanization takes places, the global climate continues to change while urban areas become increasingly susceptible to heat related hazards. The population is expected to reach somewhere between 9.6 and 12.3 billion people by the year 2100 (Shaker et al. 2019). As of the year 2014, nearly 54 percent of the world's population reported living in urban areas. If this trend continues to increase, 6 billion people – roughly 66 percent of the population – will be living in urban areas by the year 2050 (UN 2014).

Natural vegetation is replaced with built materials, typically of low albedo[1], and impervious surfaces cover most of the open land area. This leads to higher temperatures in urban areas than in surrounding, more suburban or rural spaces (Mitchell and Chakraborty 2014). This phenomenon is referred to as the urban heat island (UHI) effect which can negatively impact residents of urbanized places (Kleerekoper et al. 2012). Certain groups tend to be more vulnerable to the adverse effects of extreme heat such as the elderly, young children, those of lower income, the socially isolated, and people of color (Voelkel et al. 2018; Vargo et al. 2016). The correlation between the negative

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[1] Albedo: the reflectivity of a surface; a surface that has a high albedo reflects more solar radiation from the sun back into the atmosphere, while a surface that has a low albedo reflects little solar radiation, absorbing it instead.

effects of extreme urban heat and socially vulnerable populations is a widely accepted theme in related fields of literature.

In the past, the city planning process has been incredibly problematic as it has incorporated a number of unjust strategies to produce landscapes inundated with inequitable environmental and social outcomes (Grove et al. 2018; McDonald 2008). The spatial concentration of socially vulnerable populations and the presence of environmental disamenities such as the UHI in these spaces is the product of legacies of racist and classist planning policies (Grove et al. 2018; Anderson 2020). These policies included offering loans to select groups during periods of capital switching, redlining initiatives, and urban renewal efforts. Thus, leaving behind structurally produced, historically disenfranchised cities. In an effort to bring life back into these spaces and create healthier living environments, policy makers engaged with a new style of city planning: sustainable development (Goodling et al. 2015).

In 1987, the Brundtland report of the World Commission on Environment and Development (WCED) defined sustainability as "development that meets the needs of the present without jeopardizing the ability of future generations to meet their own needs" (WCED, 1987). A world brimming with poverty and inequity will be continuously prone to ecological and social crises. Sustainable development requires fulfilling basic human needs and extending the opportunity to satisfy aspirations for a better life to all people (WCED, 1980).

Sustainability has recently taken shape as a triple bottom line or a three-legged stool focusing on people, planet, and prosperity (Wirtenberg 2014). This model represents a sustainability framework that examines a company's, organization's, or

policy's social, environment, and economic impact (Kraaijenbrink 2019). The people category considers all stakeholders involved in the planning process including employees, communities within which an organization operates, individuals throughout the supply chain, future generations, etc. (University of Wisconsin 2021). Social equity is also a part of the people leg of the stool as progress towards a more sustainable environment has been uneven (Brown and Rasmussen 2019). Planet refers to the environmental stewardship element of protecting our planet so we can support the needs of the present and future generations (UN 2015). Prosperity refers to economic prosperity which defined by the UN (2015a) "ensures all human beings can enjoy prosperous and fulfilling lives and that economic, social, and technological progress occurs in harmony with nature (2)."

Sustainable development initiatives can take many different forms. These include greenhouse gas emission reduction plans, renewable energy sources, alternative forms of transportation, climate preparedness plans, waste and recycling strategies, environmental literacy improvements, storm water reduction plans, environmentally friendly food systems, urban agriculture, healthier school environments, green business initiatives, creating healthy living environments, green infrastructure (GI) implementation, etc. (City of Santa Monica 2014; Harvard University 2015, CoS 2009; CoS 2019; City of Kirkland 2020). Adequate sustainability planning should equally include all three legs of sustainability to ensure that environmental, social, and economic needs are sufficiently being met.

But, who exactly is sustainable development intended to benefit? According to some experts, the sustainable community should be planned around positive economic

growth, active citizenship, accountable governance, diverse urban design, increased quality of life, and a sense of identity, belonging, and safety among community members; a sustainable community is one in which a "balance" of employment, mixed housing, and social facilities are present and available to a range of socioeconomic groups (Raco 2007).

One strategy that is commonly adapted in planning a sustainable city is the implementation of GI across many scales (Rigolon and Németh 2018; Schiappacasse and Müller 2015). GI is utilized for stormwater management, neighborhood beautification, increasing air quality, restoring natural habitats for wildlife, and UHI mitigation (EPA 2021). GI supports all three Ps of sustainability planning by providing urban forestry jobs to facilitate economic prosperity, mitigating environmental disamenities to improve the environment, and encouraging people to get outside and interact with their neighbors in safe, green spaces.

GI has been classified as a generalizing term as it refers to a wide array of benefits, goals, and functions. There are currently a host of definitions associated with GI but some of the core meanings are widely accepted (Schiappacasse and Müller 2015; Seiwert and Rößler 2020). From an ecological perspective, GI stresses multi-functionality, connectivity, and being "green", whether it be the color of resources or a more environmentally friendly approach to infrastructure development (Seiwert and Rößler 2020). GI describes an array of products, technologies, and practices that use natural or engineered systems that mimic natural processes in order to provide utility services while enhancing environmental quality (Kim and Miller 2019). The three main types of GI for UHI mitigation are urban trees and forests, parks and open greenspaces,

and building-integrated vegetation such as green roofs and walls (Kleerekoper et al. 2012; Trust for Public Land (TPL) 2016). There are costs and benefits to the community associated with each type of GI implementation, but large GI projects (LGIPs) in particular tend to be more disruptive to the existing community fabric (Rigolon and Németh 2018). Some of the negative outcomes associated with LGIPs include heightened amounts of green and environmental gentrification leading to resident displacement (Rigolon and Németh 2018; Anguelovski et al. 2019).

Recently, policy makers and community leaders have become more aware of these occurrences and have actively tried to reduce or avoid these outcomes completely by utilizing the 'Just Green Enough" (JGE) and 'Equitable Greening' (EG) approaches to GI implementation. The JGE approach calls for the planning process to be protective of socially vulnerable resident's needs and demands, creating small green spaces and affordable housing within close proximity, reducing the chances of green gentrification (Curran and Hamilton 2012). The EG approach calls for an advancement of the JGE approach by planning for low-income and affordable housing near new and redeveloped greenspaces along with including the voices of marginalized residents to ensure new parks fit their needs and reflect their culture rather than being designed as 'tourist-oriented parks' (Rigolon et al 2020). Both of these approaches rest on the assumption that when GI projects, large and small, are planned in a thoughtful manner with the help and insight of neighborhood residents, negative results such as displacement can be significantly reduced in the community.

This thesis investigates the impacts of GI implementation for UHI mitigation has on the residents of the Pigtown neighborhood in Baltimore City. This project analyzes

how Pigtown residents experience the effects of the UHI along with the GI policies created to alleviate the issue. The primary research question is:

1. In Baltimore City, how does the uneven distribution of the UHI differently affect socially vulnerable residents of the Pigtown neighborhood based on their level of involvement in the sustainability planning and implementation processes?

In order to answer my primary research question, I must also address the subordinate questions:

   a. How do residents in Baltimore City's Pigtown neighborhood experience the uneven distribution of the UHI and the policies created to alleviate the issue?

   b. What types of UHI mitigation and GI implementation policies do different stakeholders such as residents and city agencies want to see in their communities?

   c. What sort of approaches are utilized by Baltimore City's government and nonprofit organizations to involve the community in the sustainability/GI planning and implementation processes?

I chose Baltimore City as my area of study because it serves as an excellent example of the UHI. In the summer months, Baltimore experiences higher temperature than surrounding areas which greatly impacts residential quality of life (Grove et al. 2018). The City government, more specifically the Baltimore Office of Sustainability (BoS) is aware of the effects of UHI and policy implementation is well underway (BoS n.d). With the help of Pigtown Main Street and the Baltimore Tree Trust organizations, I

have been able to immerse myself in the field to design and conduct my research. Pigtown Main Street is a nonprofit organization dedicated to the revitalization of the Washington Boulevard commercial corridor that provides assistance to local businesses in planning, designing and managing their physical environment, specifically, vacant buildings, streetscapes, public facilities and open spaces (Pigtown Main Street n.d.). The Baltimore Tree Trust is also a nonprofit organization, working to restore the city's urban forests, green spaces, and corridors to provide clean air, encourage community engagement, and nourish an appreciation for Baltimore's environmental longevity (Baltimore Tree Trust n.d.).

Research on historical planning processes have gained traction in urban geography as climate change and environmental justice have captured more scholarly attention in recent years. Historical planning processes have led to the formation of uneven landscapes inundated with environmental disamenities, coupled with the marginalization of socially vulnerable groups and inequitable opportunities to participate in change. There is an opportunity to inform the work of planners and policy makers who are working to now mitigate environmental disamenities such as the UHI. GI and green space provision are important aspects of these changes as equitable distribution of amenities is a key part of equitable sustainability planning processes. Equitable GI implementation and equitable access to public greenspace can reduce the effects of the UHI, increase the overall quality of life, and mitigate other environmental injustices that plague the physical and mental health of marginalized communities (Qin et al., 2013).

My position in this project required a large amount of critical reflexivity throughout the duration of the research process. As a white, middle-class, female

graduate student, it was imperative that I be mindful of my position in relation to the

agencies and residents I was worked with. While I have been studying the forces that

have formed the uneven distribution of the UHI over the past few years, I have never

lived in an area plagued by environmental disamenities such as the UHI or the structural

forces that have created them. My personal understanding of the UHI come from years of

academic research. The personal understandings of those I interviewed come from years,

sometimes lifetimes, full of living in Baltimore City and directly experiencing the

physical and emotional effects of the structural formation of the UHI. Critical reflexivity

was an important piece of understanding and conveying the residents' lived experience of

the UHI, the community outreach processes, and the policies created to alleviate the issue

within the Pigtown neighborhood of Baltimore City.

The goal of this study is to understand how residents experience the UHI, GI

implementation efforts, and what a greener, more equitable planning process consists of.

Chapter two provides background on the historical planning processes that have formed

the UHI in Baltimore City, the current UHI in Baltimore and how it effects socially

vulnerable residents, the 2009 and 2019 Baltimore Sustainability Plans, and the tree

planting project I worked on with the nonprofit organizations Pigtown Mainstreet and the

Baltimore Tree Trust. Chapter three reviews scholarly literature in related fields such as

the UHI as a threat to public health, GI for UHI mitigation, the positives and negatives of

GI implementation, and the Just Green Enough and Equitable Greening approaches to GI

planning. Chapter four presents the methods used for all steps of the research process for

this thesis project. Chapter five consists of a policy analysis of the 2009 and 2019

Baltimore City Sustainability Plans. Chapter six reflects begins the analysis process and

provides a brief synopsis of each interview conducted. Chapter seven discusses interview findings and key themes across the interviews. Chapter eight concludes this thesis project by presenting answers to the research questions.

CHAPTER TWO

BACKGROUND

This thesis project investigates resident experiences of the UHI effect and GI implementation in the Pigtown neighborhood of Baltimore City (See Figure 1 for site map). As a pressing environmental and social justice issue, the UHI, GI implementation, and adequate community engagement are at the forefront of sustainability planning. With the release of the 2019 Baltimore City Sustainability Plan, Baltimore City and City nonprofit organizations are taking a large step in addressing the long-term effects of historically inequitable planning practices such as redlining that have shaped the City's social and physical environments into what they are today. The city reinvented its sustainability framework by heavily focusing on equity within all steps of the planning process which ensures resident inclusion while targeting disenfranchised areas for sustainable development initiatives.

Baltimore City has a long history of inequitable planning that forms the backdrop against which the 2019 plan was drafted. Starting in the 1930s, the Federal Housing Administration (FHA) began producing maps used by relators, urban planners, and bankers. These maps included neighborhood risk ratings which ranked an areas' "perceived stability," by classifying them from high to low risk. Maps created by the Home Owners Loan Corporation (HOLC) were ranked using a color coordinated system: Green neighborhoods were considered ideal, blue were still desirable, yellow were declining, and red were deemed hazardous. These so-called "hazardous" areas were often

overwhelmingly populated by minorities. Areas were redlined based on numerous

attributes, "negro and minority encroachment" being one of them (Grove et al. 2018).

Figure 2 shows a redlining map of Baltimore City from 1937. Figure 3 focuses on

Pigtown where negro and foreign encroachment coupled with heavy obsolescence made

for the location to be graded as a hazardous and the space and redlined (DSL Richmond,

n.d.).

Areas within Baltimore that were previously redlined tend to suffer in

contemporary times from a multitude of challenges such as a high concentration of

socially vulnerable residents, a lack of tree canopy, environmental disamenities such as

the UHI, amongst other things (Grove et al. 2018; Voelkel et al. 2018). These spaces tend

to have a higher percentage of socially vulnerable populations based on race, income

levels, and preexisting health conditions (Klinenberg 1999). Figure 4 displays a DSL

Richmond graphic showing a redlining map (left) and a social vulnerability map (right);

there is a clear overlap between redlined neighborhoods and higher rates of social

vulnerability when compared to places that were greenlined. Figure 5 zooms in on

Pigtown to show how it falls close to the middle of the social vulnerability scale

provided.

A lack of tree canopy is an important environmental justice issue associated with

redlining and historical planning practices. The lack of tree canopy is partly responsible

for the production of the UHI as trees reduce temperatures through evapotranspiration

and through providing shade (Shickman and Rogers 2019). Looking at a map of

Baltimore City's tree canopy (Figure 6), the absence of trees in neighborhoods reflect the

HOLC's redlining practices. Trees and other green amenities were often distributed in

neighborhoods that were classifies as "best" as they were spaces that attracted the most investment, leaving a legacy of inequitable greening still visible in Baltimore today.

Pigtown is located in an area of Baltimore City ranked within the lowest percentile of tree canopy coverage making it a literal hotbed for UHI formation. A lack of trees means less shade that could cool the grounds beneath them, leaving asphalt to bake in the sun and retain heat throughout the night even in a relatively small geographic area such as Pigtown (Dance 2020). When comparing a map of the City's UHI (Figure 7) with the other figures shown, we can observe a large overlap between the presence of the UHI, higher amounts of socially vulnerable residents, a lack of tree canopy and past redlining practices. Neighborhoods with a history of redlining endure summer temperatures that are six or more degrees hotter than the citywide average (Dance 2020).

Income levels, one of the factors defining social vulnerability, mimic the presence of the UHI as well. Figure 8 displays a choropleth map of surface level temperatures (left) and income levels (right) within Baltimore City. The UHI has been getting increased amounts of attention within Baltimore City due to the negative effects it has on the community, particularly those of socially vulnerable populations. UHIs have been deemed a public health threat due to their ability to exacerbate preexisting health conditions (TPL 2014). From 2013 to 2018, Medicaid patients in Baltimore's hottest neighborhoods visited hospitals at higher rates than Medicaid patients in the City's coolest spaces. Low-income patients in Baltimore's hot spots visited more often presenting higher rates of exacerbated medical conditions such as chronic obstructive pulmonary disorder (COPD), heart disease and asthma (Anderson and McMinn 2019).

In the summer of 2018, Baltimore City experienced one of their hottest seasons in history. When the heat index reached 104 degrees, the threshold the National Weather Service deems dangerous, calls for EMS assistance increased dramatically citywide for potentially fatal heat strokes. Calls increased for other health conditions as well; calls for COPD increased by nearly 70 percent, calls for cardiac arrest rose by 80 percent, and for those with high blood pressure calls more than doubled. Other conditions such as psychiatric disorders, substance abuse, and dehydration, among others, spiked also. (Anderson and McMinn 2019).

It is important to acknowledge that the Baltimore City Government, Office of Sustainability, and City nonprofit organizations recognize the issues related to redlining and historic planning policies and the legacies they have left on the environment; the presence of the UHI, along with other environmental and social justice issues, have been detrimental to the community and the City is making a great effort to mitigate the issues. The 2019 Baltimore City Sustainability Plan states,

> "When talking about sustainability, we must address issues of race and place. Where we come from, where we live, who we are, and how we identify—these factors have a disproportionate impact on our lives and opportunities, because of social disparities rooted in generations of unfair policy and discrimination. Our focus on equity forces us to look at the systems that have prevented us from achieving sustainable outcomes for all of our residents and for our city as a whole. It acknowledges that the playing field is not level, the starting lines have been incorrectly drawn, and that in order for us to give people a fair shot, the way forward is to correct what's not working" (CoS 2019, 9).

The Commission on Sustainability, the authors of the plan, place a heavy emphasis on equity and including resident voices that have been pushed into the margins for far too long. They recognize the importance of a community planning approach, especially when it comes to addressing environmental inequities such as the presence of the UHI. Their community engagement efforts turned out to be a well-executed process that incorporated a variety of resident voices and opinions into the final plan.

In an attempt to mitigate the UHI phenomenon and rectify the structural injustices redlining and other historic planning policies created, greenspace and other forms of GI can be implemented across multiple scales in the community. Baltimore City has published two Sustainability Plans, the 2009 and 2019 plans, and both touch on GI implementation within the City. The 2019 Plan briefly addresses GI for UHI mitigation as they suggest planting trees to provide shade and installing green and cool roofs to reduce temperatures, but does not focus on GI implementation for heat mitigation (CoS 2019, 83). The Baltimore City Climate Action Plan suggests implementing cool roofs, street trees, and different types of vegetation in order to reduce temperatures, lessen health issues from air pollution and heat stress, and create a more enjoyable environment for people to live in (BOS 2012). While this is a meaningful note made by the city, this information was left out of the 2019 Sustainability Plan where it should have been included to address current, critical issues.

Local NGOs are completing a significant amount of work toward greening Baltimore's neighborhoods. The Pigtown Mainstreet organization recently partnered with the Baltimore Tree Trust to restore existing tree pits, remove old tree stumps, and plant roughly 200 trees in the neighborhood. Trees were planted for numerous reasons

including beautifying the neighborhood, promoting better air quality, and mitigating the

UHI. According to a conversation I had with the Director of Pigtown Mainstreet during

my time working with the organization, before the project began, Pigtown Mainstreet and

the Tree Trust felt it was important to reach out to homeowners and let them know the

project was going to take place and give them the opportunity to request a street tree in

front of their home, voice their concerns, or ask questions they may have had. After the

initial round of community outreach, the Tree Trust canvased the neighborhood with

flyers (Appendix A) to let the community know what was going on, giving them the

option to reach out to either organization to find out more about the project.

Baltimore City and NGOs have focused on addressing the UHI, bringing much

needed investment into the area, and increasing the overall quality of life (BoS 2019;

Pigtown Main Street n.d.; The Baltimore Tree Trust n.d.). These changes can attract the

wrong kind of attention and lead to the displacement of current residents. The 2019

Baltimore City Sustainability Plan addresses initiatives and ideas specifically

implemented to avoid resident displacement while maintaining the delicate urban fabric.

Similar strategies have been used in Pigtown by nonprofit organizations to ensure the

community remains tightly knit while open to social and environmental change.

It is in this context that I staged my investigation into how residents of the

Pigtown neighborhood in Baltimore City experience the effects of the UHI and the GI

policies implemented to alleviate the issue. In the next chapter, I discuss relevant

scholarly literature showing research that has already been done, spaces where added

research is necessary, and how this research project contributes to the environmental and

social justice fields. There is a lot of room within the field of urban geography and

sustainability planning to incorporate resident voices and opinions into urban heat and GI

policy plans and projects. The literature review aims to shine light on the fields that have

been thoughtfully approached by geographers within the discipline. The next chapter will

highlight different fields within the geographical literature that can be amplified by this

project.

CHAPTER THREE

LITERATURE REVIEW

This literature review aims to bring forth a clear understanding of the structural production of the UHI, its effects on public health and social cohesion, and the ramifications of GI implementation on the community. In this context, the conceptual framework presented supports the structuring of this chapter. Each section builds off the last, highlighting the importance of community engagement, adequate communication, and equitable planning strategies from the beginning stages of the city planning process.

I have approached the topic of GI and urban greening using the critical realism lens. The goal of critical realism is to uncover structures and mechanisms behind an event (Shaw et al. 2010). Events that happen in the world, like the creation of policies that address the effects of the UHI or an increase in a group's social vulnerability, are fixed within larger structures. Critical realism also acknowledges that the relationship between social structures and their mechanisms differ depending on their context and scale. These relationships often require a comprehensive case study approach (Shaw et al. 2010). This is the best approach for my research because my topic is very context specific. I am researching the City of Baltimore and its UHI policies along with the effects this phenomenon has on city residents. In this scenario, the UHI policies are a part of the wider structure while the effects on social vulnerability and the people's attitudes are a part of their causal mechanism.

3.1 UHI and Social Vulnerability

Over developed, densely populated urban areas are prime locations for the formation of the UHI. Structures such as buildings and roads absorb and reemit the sun's heat more than natural landscapes such as forests and water bodies would. Urban areas, where structures are highly concentrated and greenery is limited, become "islands" of higher temperatures relative to surrounding suburban areas (Environmental Protection Agency 2020). These pockets of elevated urban temperatures are referred to as UHIs. UHIs can form from several factors such as the absorption of short-wave radiation in low albedo building materials trapping heat at the street surface, anthropogenic heat production, urban geometry and the dense concentration of buildings, and low rates of evapotranspiration due to high percentages of impervious surface and low percentages of vegetative covering (Kleerekoper et al. 2012).

The UHI and extreme temperatures are problems in overdeveloped nations all over the world. According to the National Oceanic and Atmospheric Association (NOAA), extreme heat is the number one source of weather-related mortality in the United States (NOAA 2018). A study by Voorhees et al. (2011) predicts an annual increase of 28,000-34,000 heat-related deaths in the United States by mid-century. Similar trends are emerging around the world. In a study by Dang et al. (2018) conducted in Ho Chi Ming City, China, it was found that 30% of deaths in Ho Chi Ming City could be attributed to the presence of the UHI effect. Heaviside et al. (2016) found that the UHI contributed to around 50% of the total heat mortalities during the 2003 heat wave in the West Midlands, United Kingdom. Extreme heat is an flagrant hazard to public health that

will continue to worsen over time if appropriate mitigation strategies are not promptly executed.

Urban heat has been studied in the United States since at least the 1930s (Mitchell and Chakraborty 2014) but gained significant traction after one of the most severe heat waves in the history of the country blanketed Chicago, Illinois in July of 1995. As temperatures soared to over 105ºF, public health workers reported over seven hundred heat related deaths in one week within Chicago's city limits (Klinenberg 1999). Klinenberg (ibid.) believed that "During the heat wave, geography was linked to destiny (250)." The disaster that claimed the lives of so many people was concentrated around certain population demographics: the elderly, those of low income, people of color, and neighborhoods with higher levels of violence. These demographics, along with other characteristics such as the presence of young children or isolation from the community, are attributed to high levels of social vulnerability (Voelkel et al. 2018; Vargo et al. 2016).

Vulnerability is commonly defined as a function of three interactive components: exposure, sensitivity, and adaptive capacity (Wilhelmi and Hayden 2010). *Exposure* refers to climate and synoptic weather conditions which are exacerbated by the characteristics of urban materials and the amount of vegetative cover in an area. *Sensitivity* refers to the extent to which the population can absorb impacts without enduring long-term damages. *Adaptive Capacity* refers to the potential of a population to modify its features and behavior to better cope with existing or predicted stressors (Wilhelmi and Hayden 2010). Socially vulnerable groups are disproportionately exposed and extraordinarily sensitive to extreme heat, while their access to resources and adaptive

capacity remains low. Low adaptive capacity and social vulnerability are both related to social inequality; the distribution of heat-related health risks on socially vulnerable populations poses the concern of the UHI effect as an environmental injustice problem (Hayden et al. 2017; Mitchell and Chakraborty 2014).

The presence of the UHI has become a serious environmental justice and social equity issue. Areas plagued by the UHI are often places that have experienced structural disadvantages with neighborhoods inundated with poverty, inequitable access to green space, health disparities, and few opportunities for economic and social advancement (Grove et al. 2018; Round et al. 2019; Anderson 2020). Particularly, cities that experienced periods of overtly racist and classist policies such as redlining and urban renewal efforts have created contemporary uneven spaces (see Chapter Two). 'Hazardous' spaces suffered from little investment activity which, over time, led to crumbling infrastructure, outdated and inefficient design layouts, and a host of environment and social disparities compared to spaces that were greenlined (Pearcy 2020). The HOLC maps described in chapter two prove that the urban fabric of a current day city was not formed by accident, it was intentionally planned around racially discriminatory practices that denied investment activity and opportunities for success (Grove 2018; Round et al. 2019).

Previously redlined spaces characterized by low rates of investment have become literal hotbeds for the presence of the UHI. The Environmental Protection Agency (EPA) recognizes this issue and declares urban heat not only as an environmental issue, but as an equity issue. The EPA states "A growing body of research points to "intra-urban" heat islands, or areas within a city that are hotter than others due to the uneven distribution of

heat-absorbing buildings and pavements, and cooler spaces with trees and greenery.

These differences can result from disparities in the way communities are planned,

developed, and maintained" (EPA 2019). Severe neglect and disinvestment coupled with

a history of racial and socioeconomic segregation practices have crafted uneven

landscapes where green space and UHIs have been inequitably distributed. In a study of

108 urban areas nationwide, neighborhoods that were formerly redlined were nearly 13

degrees hotter than those that were not (Anderson 2020). Cities such as Portland, Oregon,

Denver, Colorado, Minneapolis, Minnesota, and Jacksonville, Florida demonstrate some

of the highest variations in temperature when compared to neighborhoods that were rated

as more desirable during the redlining period (ibid.).

The connection between historically disenfranchised neighborhoods that went

through periods of redlining and increased levels of social vulnerability are highly

visible. Areas that were previously redlined tend to have higher percentages of socially

vulnerable populations that display numerous health disparities that may be exacerbated

by the presence of the UHI (TPL, 2016; Nowak et al. 2013). According to Digital

Scholarship Lab (DSL n.d.), there are strong correlations between previously redlined

spaces and contemporary indicators of social vulnerability including socioeconomic

status, housing and transportation, minority status and language, and household

composition[2]. Redlined neighborhoods are currently places with a higher concentration of

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[2] The website provides information on 202 cities across 38 states within the country. For each city, two maps are displayed: an HOLC redlining map delineating grades for each neighborhood within the city and a map made by the Center of Disease Control (CDC) displaying social vulnerability index (SVI) scores for census tracts today. The SVI index represents a number of factors including socioeconomic status, housing and transportation, minority status and language, household composition, etc. (Richmond University's Digital Scholarship Lab n.d.). These space are strongly associated with the presence of UHIs and experience more frequent and severe extreme heat events.

socially vulnerable residents that may lack the resources to adequately cope with heat stress and other environmental disamenities (Mitchell & Chakraborty, 2014; Klinenberg, 1999).

The research surrounding the negative effects of extreme heat on city residents focuses mainly on place-based discrepancies in social and environmental equity such as exacerbated public health issues, increased energy consumption and bill prices, and increased rates of social exclusion as people stay indoors (TPL, 2016; Kleerekoper et al., 2012). The UHI poses a serious threat to public health, particularly of those in disadvantaged neighborhoods. One of the most significant impacts of the UHI is elevated nighttime temperatures. During an extreme heat event, people need time to recover from the heat stress they endured during the day; the presence of the UHI does not always allow for the necessary recuperation to occur (TPL, 2016). The UHI stores and re-emits heat through the night, posing a variety of risks to human health including cardiovascular stress, thermal exhaustion and heat stroke, respiratory disease, kidney or liver failure, heat cramps, heat exhaustion, dehydration, and blood clots (Kleerekoper et al., 2012; Kravchenko, 2013). Socially vulnerable populations are at even greater risk for health problems related to the UHI as they may not have access to cooling mechanisms such as air conditioning or cooling centers (TPL, 2016; Voelkel et al., 2018). Decades of racist and classist planning policies have led to the structural production of UHIs all over the United States, disproportionately impacting the most vulnerable residents in a negative way.

3.2 Green Infrastructure Implementation for Urban Heat Island Mitigation

Policies for mitigating environmental disamenities such as the UHI have been at the forefront of sustainability planning. Sustainable development initiatives in numerous cities aim to rectify the inequitable distribution of greenspace and UHIs that have formed as an overt reflection of severe disinvestment and periods of racist and classist policy implementation in urban spaces. To rectify this phenomenon and mitigate the UHI, greenspace and other forms of GI can be implemented across multiple scales. (TPL, 2016; EPA, 2014). Implementing various forms of GI have been increasingly popular way to bring life back into neighborhoods as a mechanism for beautification and UHI mitigation. Vegetation has an average cooling effect of 1-4.7°C that may spread 100-1000 meters into an urban area but is highly dependent on the amount of water the plant or tree has available (Schmidt, 2006). Vegetation cools the environment actively through evapotranspiration, the process where vegetation cools the surrounding air as it transpires and converts water from a liquid to a vapor. Vegetation cools the environment passively by shading surrounding impervious surfaces that would have otherwise absorbed short-wave radiation (Shickman & Rogers, 2019).

The three main types of GI for UHI mitigation are urban trees and forests, parks and open greenspaces, and building-integrated vegetation such as green roofs and walls (Kleerekoper et al., 2012; TPL, 2016). In the urban setting, tree canopy can drastically reduce temperatures through both shading and evapotranspiration. Shaded surfaces may be 11-25°C cooler than the peak temperatures of unshaded materials. Evapotranspiration, alone or in combination with shade, can reduce extreme summer temperatures by 1-5°C (EPA, 2019). Loughner et al. (2012) found that planting trees in downtown urban

canyons can reduce air temperatures by as much as 3.8°C through a combination of shading and evapotranspiration, making for a more comfortable living environment. Sung (2013) focused his study on the northern Houston metropolitan area in Texas. He examined the efficacy of a local tree protection policy adopted to mitigate the UHI at the neighborhood scale. Results showed how effective trees were in reducing temperatures and mitigating the UHI, but the findings were not related to social vulnerability or human health.

Parks and open greenspaces are most often characterized by a mix of turf, shrubs, and trees that can yield important cooling benefits to the environment (TPL, 2016). Park composition plays a large role in the cooling capacity of open greenspace. Areas where trees are integrated into park design show enhanced cooling capabilities when compared to greenspaces that only include grass (Wang et al., 2016). The 'park cool island' (PCI) phenomenon, open green areas where air and surface temperatures are lower than the surrounding spaces, have been observed in parks and open greenspaces all over (Kleerekoper et al., 2012; Doick et al., 2014; Algretawee et al., 2019). The magnitude of this effect ranges from 1-4°C and can extend beyond the park's boundary (TPL, 2016). While cooling effects have been found to sharply decrease as you move further away from the park, cooling has been observed to extend as far as 0.46 miles from the park boundary (Doick et al, 2014; Algretawee et al., 2019).

Building-integrated vegetation such as green roofs and green walls can yield significant reductions in building surface temperatures and mitigate the effects of the UHI. Through direct shading and increased albedo, green roofs and green walls can significantly lower rooftop and overall building temperatures within the UHI. The albedo

of a green roof may range from 0.7 to 0.85, which is more reflective than the typical

roofing material of tar and gravel. The higher albedo decreases the amount of short-wave

radiation absorbed by the building, lowering reemission rates and temperatures (TPL,

2016). Increased evapotranspiration of green roofs and green walls also contributed to a

significant decrease in temperatures. In some cases, green roofs can decrease surface

temperatures by 30-60°C and ambient temperatures by 5°C compared to the standard

black roof (Foster et al., 2011).

3.2.1 Positive Impacts of Green Infrastructure on the Community

GI implemented in cities not only has the potential to mitigate the UHI, but it can

be a great asset to the area as it yields a range of additional ecological and human-health

related benefits to surrounding communities (TPL, 2016). Urban greenspace plays an

important role in the everyday lives of the community as it benefits residents

physiologically and psychologically by offering settings for physical activities and

general relaxation (Björk et al., 2008). Residents can benefit from access to greenspace as

it provides space for physical activity and can aid in short term recovery from stress or

mental fatigue, providing faster physical recovery from illness, and eventually long-term

overall improvement on people's health and well-being (Qin et al., 2013). Physical

activity has been shown to reduce stress levels, the risk of obesity, cardiovascular disease,

hypertension, diabetes, stroke, and certain kinds of cancer (EPA, 2017). A study

conducted in China examined the role urban parks played in improving physical activity

and its effects on mental health. The results show people felt higher rates of self-

confidence, increased energy levels, greater mental health, and feeling healthier, and high

rates of relaxation (Liu et al., 2017). Providing the community with opportunities for

physical activity plays an important role in the increase of satisfaction with the living environment and personal health (Kilic & Polat, 2019).

GI can greatly benefit resident health in the urban environment as trees lower ambient air temperatures and filter fine toxic particulate matter from the atmosphere, consequently improving air quality and human health (Nowak et al., 2013). Decreased temperatures and the removal of particulate matter from trees is directly linked to reduced mortality and morbidity rates as well as reduced respiratory symptoms. Health benefits per hectare have an estimated value of $1,600 in Portland, Oregon where lower pollution levels caused by urban greening drastically reduced respiratory issues, offering a total monetary benefit of nearly $7 million per year. Urban greening that causes a one percent improvement in air quality may save 850 deaths per year and about 670,000 incidents of acute respiratory problems that would be exacerbated by the UHI effect (Santamouris & Osmond, 2020).

GI can positively impact public health in more ways than just reducing mortality, morbidity, and respiratory symptoms. Street trees in particular play a large role in enhancing public safety as the inclusion of trees and other streetscape features may reduce crashes and injuries on urban roadways (Dumbaugh, 2005). Urban street trees create vertical walls that frame streets, providing vehicles a defined edge that helps motorists guide their movement and assess their speed, leading to overall speed reductions. Street trees also create safer walking environments for pedestrians by forming visual walls that provide distinct edges to sidewalks so that motorists can better distinguish between the driving and walking environment. If a driver were to veer off the

road, street trees can deflect of fully stop a motorist from taking an innocent human life (Burden, 2006).

There is a strong link between heightened levels of mental health and different forms of urban greening. Areas with higher percentages of vegetation and biodiversity show a positive relationship on the rate in which antidepressants are prescribed. A study in Leipzig, Germany shows that for individuals of low socioeconomic status, a high density of street trees within 100 meters of the home significantly reduced the probability of being prescribed antidepressants (Marselle et al., 2020). South et al. (2018) set out to evaluate whether interventions to green vacant urban land could improve the self-reported mental health of adults in Philadelphia, Pennsylvania. Results show that self-reported feelings of worthlessness and depression were significantly decreased for those living near greened vacant lots.

Street trees and urban greening can have a positive impact on residents' sense of place, their lived experiences and their emotional ties to their neighborhood (Lecompte et al., 2017). Urban parks can create community harmony by enabling residents to forge relationships with one another, deepening their connection with each other and their environment. Greenery can create a more pleasant walking environment, bringing increased foot travel, conversation with neighbors, pride in the neighborhood, and greater levels of community cohesion. During the community engagement process of creating the 2019 Baltimore City Sustainability Plan, the Baltimore Commission on Sustainability (CoS) surveyed 1,200 residents asking about their ideas, needs, and visions for the future. The first question was "What do you like most about your neighborhood?" Across all races and age groups, the most overwhelming response features "neighbors," appearing

in 36 percent of responses. The next two most frequent responses included "proximity" to amenities and "nature in the city," referring to greenspace (CoS 2019, 25). Neighborly relationships and a sense of community cohesion are important parts in residents forming positive ties with their environment. Proximity to amenities and nature in the city encourages residents to strengthen those relationships by providing aesthetically pleasing and safe spaces to do so.

Greenspace can provide people with common areas to gather for leisure, social activities, and recreation they might not have access to otherwise (Jennings & Omoshalewa, 2019). Francis et al. (2012) found that proximity to quality parks were positively associated with a stronger sense of community cohesion. In their examination of park-based social capital[3]Mowen and Rung (2016) found that frequent visits, longer visits, living a sedentary life, and being non-white generally led to higher levels of park-based social capital and community cohesion. Thus, improving the quality and quantity of greenspace in urban neighborhoods can be of great benefit to the community by knitting a tight urban fabric amongst residents.

Access to nature has the potential to increase community surveillance and mitigate potentially dangerous psychological conditions such as aggression and hostile behavior (Burden, 2006; Engemann et al., 2019). Exposure to violence has been deemed a public health epidemic due to its negative impact on mental health and well-being, particularly in neighborhoods where the rates of violent crimes are high (Burley, 2018). With more residents spending time outdoors enjoying newly greened environments,

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[3] Mowen and Rung (2016) define social capital as "anything that facilitated individual or collective action, generated by networks of relationships, reciprocity, trust, and social norms" (299).

neighborhoods should experience higher levels of community surveillance of homes, businesses, and other civic spaces, leading to a drastic decrease in crime and exposure to violence (Burden, 2006). This effect is especially present in neighborhoods with lower median household incomes (Burley, 2018).

Several GI projects have been linked to a decrease in violent crimes and creating safer environments for underserved communities. In Youngstown, Ohio, the Youngstown Neighborhood Development Corporation's created the 'Lots of Green' program, a community reuse project where local community groups maintained vacant lots mostly by creating community gardens. There was a significant reduction in burglaries, assaults, and motor vehicle theft around lots that had been greened (Kondo et al., 2016). Philadelphia also noticed a decrease in crime rates upon the establishment of its Green Stormwater Infrastructure Program. In neighborhoods within a half mile of implementation sites, there were substantial reductions in narcotics possession, manufacturing, and burglaries (Kondo et al., 2015).

Trees and other vegetation contribute to reduced energy consumption, particularly during the summer months when the UHI is most prevalent. In some United States cities, heat from energy consumption has been estimated to account for nearly one-third of the UHI effect (TPL, 2016). Decreased energy consumption can lower monthly energy bills which benefits all residents, but particularly those in socioeconomically disadvantaged neighborhoods. Shading reduces solar heat absorption on windows, walls, and roofs; a properly shaded neighborhood, particularly from urban street trees, can reduce energy bills for a household anywhere from 15-35 percent (Burden, 2006; TPL, 2006). Green

roofs can reduce rooftop surface temperatures, directly reducing building energy consumption by up to 60 percent depending on building insulation (Berardi et al., 2014).

Another positive economic benefit of GI is reflected in property values. Property value can be influenced by the proximity and quality of parks and green areas. Houses close and adjacent to parks and open areas have approximately 8-20 percent higher prices than those in neighborhoods without access to such greenspaces (Kilic and Polat 2019). Greenspace and vegetation add value to nearby homes, businesses, and the municipal tax base. Neighborhoods with street trees can see a $15-25,000 increase in home or business value compared to streets without trees. This can add to a city's tax base, increasing the availability of services provided to the community (Burden, 2006). In Portland, Oregon, street trees added $8,870 to the sales price of homes and reduced their time on the market by an average of 1.7 days (Donovan & Butry ,2010). The same study found that monetary benefits can also spill over into neighboring communities (ibid.)

Within the literature surrounding GI implementation, there are numerous examples of the positive impacts increased greening can have on the community. Areas can benefit ecologically, economically, and socially from GI when it is implemented in an equitable and thoughtful manner. While GI can bring lots of good to the area, it can also negatively impact the community and the residents it was originally intended to benefit.

3.2.2 Negative Impacts of Green Infrastructure on the Community

While it has been proven that GI implementation can greatly benefit cities and their residents, there is the possibility it can bring adverse effects, negatively impacting socially vulnerable residents. Within the environmental justice literature pertaining to community greening, there are issues related to disparities between targeted areas for greening projects, access to equitable parks, residents feeling excluded from the area and the planning process, and green gentrification fostering the displacement of native residents (Wolch et al., 2014; Rigolon, 2016; Anguelovski et al., 2019). Scholars in urban geography have suggested that community greening projects can create enclaves of environmental privilege and green gentrification, excluding minority and lower-income residents from the intended benefits (Anguelovski et al., 2019). GI implementation can unintentionally create such privilege, but some argue that community greening is part of a clear strategy to attract commercial and residential investment, bringing in more economically affluent and socially privileged residents, particularly when native residents are left out of the planning process (Dooling 2009; Checker 2011; Carmichael and McDonough 2018).

Anguelovski et al. (2019) use the term green gentrification to describe this "new or intensified urban socio-spatial inequities produced by urban greening agendas and interventions, such as greenways, parks, community gardens, ecological corridors, or green infrastructure (1065)." Around the world, cities are developing large green infrastructure projects (LGIPs) such as parks and greenways in historically disenfranchised neighborhoods in hopes of providing social, health, and environmental benefits to their residents. In some cases, the installation of these spaces may lead to

increased housing prices in nearby areas, resulting in an influx of affluent newcomers and the displacement of low-income residents (Rigolon et al., 2020). It may also lead to native residents feeling unwelcome in these spaces, furthering social, economic, and racial divides (Rigolon, 2016).

Anguelovski et al. (2018) evaluated the effects of creating 18 greenspaces in Barcelona, Spain. They found that over the course of their study, the percentage of residents holding a bachelor's degree or higher increased by nearly 28 percent on average around a new local park versus only 7.6 percent increase for the district as a whole. In contrast, the most economically depressed, working-class areas with less desirable housing further away from the city center gained vulnerable residents as they became greener. This suggests a possible redistribution of vulnerable populations as more desirable locations with superior housing choice and increased city proximity experienced green gentrification.

Byrne et al.'s survey of visitors to Los Angeles' Santa Monica Mountains National Recreation Area, the United States' largest urban national park, found that park visitors were predominantly white, affluent, and lived nearby. Visitors of color traveled further, were less likely to return, and were less inclined to use the park for active recreation purposes. The study concludes that the park "fails to meet the needs of the disadvantaged urban communities for whom it was created, a problem that may also affect other parks in the United States" (ibid.). This indicates that residents of a higher socioeconomic class were attracted to the areas surrounding the park after it opened, leading to a shift in demographics in neighboring communities, facilitating green gentrification and displacement.

Community greening plans tend to come to fruition in urban areas that are guaranteed to bring a heavy flow of investment into the local economy. These green development schemes are often central to entrepreneurial efforts that will attract affluent, well-educated, environmentally likeminded residents and businesses to the area (Goodling et al., 2015). The greening of public spaces generates the displacement and segregation of the most economically vulnerable populations from access to the benefits of localized ecosystem services; greening strategies have been implemented as market-driven strategies that target higher income groups and the exclusion of less privileged residents (Gould & Lewis, 2018; Amorim Maia et al., 2020). As green gentrification and displacement occur, the demographics of those with the most access to greened areas become predominantly white and wealthy. Inequitable access to greenspace and the provision of GI projects in marginalized communities has become a prevalent issue within the environmental justice literature.

Disparities between spaces targeted for Greening projects are visible all over the world. In Detroit, Michigan planners have attempted to mitigate the UHI by implementing green roofs into affected neighborhoods. Analysis of the spatial distribution of green roofs within the city showed that while low-income communities of color were within walking distance of cooling centers, green roofs were being installed in wealthy sections of the city where the population is predominantly white (Sanchez & Reames, 2019). Ferguson et al. (2018) found that in Bradford, United Kingdom, a city characterized by high levels of inequality, GI density was highest in low socioeconomic regions, but accessibility to GI projects such as large-scale parks was highest in more affluent, predominantly white regions of the city. Majekodunmi et al.'s (2020) study in

Glassgow, Scotland inventoried GI implementation and its effects on mitigating the UHI

in vulnerable regions finding that communal gardens, parkland for recreational sports

use, green corridors, and functional greenspace are more densely concentrated outside of

the Scottish Index of Multiple Deprivation areas, an index identifying the most deprived

areas in Scotland. GI for UHI mitigation is not equitably distributed among the most

socioeconomically deprived areas leaving vulnerable populations at risk against extreme

heat waves.

 Rigolon (2016) suggests there are clear discrepancies in equitable access to park

acreage and park quality. In a review of 49 empirical studies focusing on cities in

developed countries, they found that ethnic minorities and those of a lower

socioeconomic class have access to fewer park acres, few park acres per person, and to

parks with lower quality amenities and safety levels compared to those of higher

socioeconomic standing. Boone et al. (2009) found that in Baltimore, when compared to

white residents, a higher percentage of African American residents live within walking

distance[4] of a park. The study found that white residents have access to more park

acreage within walking distance than African American residents.

 Issues associated with inequitable GI implementation can occur when projects are

designed without consulting native community members on the design of newly greened

space. Community greening without proper outreach or against resident wishes can foster

feelings of unwelcomeness and ostracization among native community members. It can

also lead to feelings of frustration and distrust from residents towards policy makers that

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[4] Defined as 400 meters.

claim these greening projects will benefit the community (Rigolon & Nemeth, 2018; Carmichael & McDonough, 2018). Rigolon et al. (2020) suggests that in order to the achieve the most equitable outcomes during GI implementation, community outreach initiatives should adequately engage people of different races/ethnicities, ages, and incomes, and prepare the most marginalized people to meaningfully participate. They also stress the importance of how new and renovated park recreation programs should welcome and engage longtime residents, and not just wealthier newcomers.

Carmichael and McDonough (2018) document resident unhappiness in Detroit with a local non-profit organization responsible for planting trees on city owned property in urban neighborhoods. The organization received "no-tree requests" from 24 percent of residents between 2001 and 2014, reflecting a barrier to improving urban tree canopy levels. After conducting interviews with residents and members of the non-profit, their study showed that many residents felt like they "lost" with the tree planting programs. Negative experiences with implementation and upkeep of street trees in the past led to negative views on future street tree implementation programs. One resident was quoted saying "I think when they planted the tree they should have asked me, gave me a choice, do you want this one, this kind or this kind? If there's two different kinds or however many... Even though it's the city property, we're gonna end up having to care for it and raking leaves and God knows whatever else we might have to do" (ibid.).

In Chicago, residents living near an abandoned rail line expressed feeling unwelcome in their community when it was turned into *The 606*, a park consisting of 3 miles of greenspace that connected 4 neighborhoods in Chicago's northwest side (Rigolon & Nemeth, 2018). The 606 is located in an area that was previously redlined

and plagued by urban renewal efforts and community displacement. It is also

predominantly populated by African American residents (Rigolon & Németh, 2018). This

project attracted high paying employers and a new class of workers to the area; as new,

affluent residents made their way into the neighborhoods, affordable housing options

vanished to make room for more expensive single-family homes. The 606 facilitated the

displacement of low-income residents while also making long-term community members

feel as if the park and trails were not intended for them to use. An interview conducted

with community youth noted "This [The 606] wasn't a secret, but no one was out here

talking to us [Latinx youth], asking what we wanted…it was like one day we were up

here chillin' and the next day it was like "naw, you ain't welcome"… They [White

individuals, policymakers] still don't care what we want. If we're down there

[Bucktown/Wicker Park area], they call the cops on us. What are we supposed to do?"

(ibid.).

A similar situation took place in Atlanta, Georgia when the Atlanta BeltLine

(ABL), a $2.8 billion-dollar urban regeneration project that plans to build a network of

parks, multi-use trails, and a new transit system along a 22-mile loop of abandoned

railway corridors encircling the city's core. Residents have expressed immense

frustration with the planning process and policy makers as the city's attempt at public

engagement did not reflect the wants and needs of the diverse demographics of the area

surrounding the ABL (Rigolon et al., 2020). While the ABL did engage in community

outreach, planners were selective during the community participation process. One

resident explained that their preferred method of communication was through already

established community associations which did not include residents that were unable to

attend meetings. The ABL also used email as a method of communication, which could not reach those in socioeconomically disadvantaged neighborhoods without internet access. The ABL planning process neatly avoided creating a truly equitable space for community engagement by ensuring the exclusion of disadvantages groups who might raise questions about GI implementation issues such as the creation of affordable housing, the potential for gentrification, and community displacement (Roy, 2015).

This section shows that not all GI projects are created equally or distributed equitably. It is important to recognize while GI can be a great asset to the community, GI projects have the potential to further inequities when they are improperly planned and implemented.

3.3 The 'Just Green Enough' and 'Equitable Greening' Approaches to Green Infrastructure Planning

Among the environmental justice and green gentrification literature, there has been the suggestion of adopting a "just green enough" (JGE) or "equitable greening" EG approaches to development. The JGE approach calls for the planning process to be protective of socially vulnerable resident's needs and demands, creating small green spaces and affordable housing within close proximity, reducing the chances of green gentrification (Curran & Hamilton, 2012). The EG approach suggests that planners need to advance the JGE approach to achieve even more environmentally just outcomes when working on new or renovated parks in marginalized communities through four methods. First, park agencies need to partner with urban planners to establish or preserve a sufficient number of affordable housing units close to new or renovated parks. Second, park agencies need to ensure that leadership personnel and staff reflect the ethnoracial

diversity of the communities around new or renovated greenspaces. Third, community outreach processes when creating new greenspaces or renovating old ones should adequately engage people of different race/ethnicities, age groups, incomes, and should encourage and prepare the most marginalized, vulnerable residents to participate. Finally, new and renovated greenspaces and associated greenspaces should welcome and engage long-term residents, not just more affluent newcomers (Rigolon & Németh, 2020).

Focusing more on the JGE and EG approaches to GI implementation provides more opportunities for affordable housing, numerous methods of community engagement, and overall improved access to greenspace without compromising socially vulnerable communities (Rigolon & Németh, 2018). The addition of greenspace in a city is not a predetermined recipe for gentrification; but if it is not conducted in a thoughtful manner, it may lead to a host of issues for socially vulnerable residents. Access to these environmental amenities improves resident physical and mental health while enhancing community morale, thus improving their overall quality of life. Although an influx of capital will naturally be drawn into the community, it is a contained amount that alleviates some of the environmental injustices felt in socially vulnerable areas. Striving for community participation in the planning process, an even distribution of amenities, equal access to those spaces, and the preservation and creation of affordable housing are the building blocks of an evenly developed, inclusive community.

GI projects are typically implemented with the wants and needs of the socially vulnerable in mind, but they are often compromised by the overall bigger picture of capitalist growth and environmental greening. Within the literature there is room for a qualitative analysis on resident satisfaction with currently implemented policy, greening

initiatives, GI expansion, and other areas of urban development at the city level. The

concept of community-led development should be adopted as it advocates for state actors

and experts to no longer carry the entire weight of development programs; there should

be a collaboration between state and the citizens to produce socially desirable outcomes

for people in all socioeconomic standings (Raco, 2007). The environmental justice and

social vulnerability fields could benefit greatly from hearing the voices of those

disproportionately affected by extreme heat and the UHI effect. In the next chapter, I

explain the research methods used in all stages of this project.

CHAPTER FOUR

METHODS

This chapter explains the methodological approach employed in this project and details each of the data collection and data analysis methods used over the course of this project. Data collection methods included a policy analysis of the 2009 and 2019 Baltimore City Sustainability Plans and semi-structured interviews with Baltimore City government employees, representatives from Pigtown Main Street and the Baltimore Tree Trust, and Pigtown residents. Data analysis methods involved numerous rounds of coding interview transcriptions and creating a codebook to organize and make sense of the codes. Subsections explain each method in this project. Since this is a project involving research on human subjects, the Internal Review Board (IRB) application process will also be discussed. Finally, a justification will be provided in order to defend each method's use and importance within the project.

Using mostly inductive reasoning, which is gathering data and evidence first and then creating a theory to explain my conclusions, I will be able to provide answers to my research questions (Heit & Feeney, 2007). Starting out with a strong set of research questions sets the foundation for the research process to begin. Interviews with Pigtown residents, nonprofit organizations, and City policy makers will be conducted in order to gather the data and evidence that will allow me to form a solid theory explaining my conclusions The table below shows which methods will help answer which questions.

Table 1: Research methods and corresponding questions

Research Questions	Corresponding Methods
Main Research Question	
In Baltimore City, how does the uneven distribution of the UHI differently affect socially vulnerable populations and those in positions of power based on their level of involvement in the sustainability planning and implementation processes?	All methods? All methods will answer pieces of this question: textual, content, and critical policy discourse analysis to create policy analysis, resident interviews, nonprofit interviews, Baltimore Office of Sustainability (BOS) interviews, and general analysis when gathering of data is complete
Sub Questions	
How do socially vulnerable residents in Baltimore City's Washington Village/Pigtown neighborhood experience the uneven distribution of the UHI and the policies created to alleviate the issue?	Policy analysis, resident interviews, BOS interviews (sort of… to hear their piece on how the UHI is unevenly distributed and how it differently affects residents based on social vulnerability)
What sort of approaches are utilized by Baltimore City's government and nonprofit organizations to involve the community in the sustainability/GI planning and implementation processes?	BOS interviews, policy analysis, nonprofit interviews
What do UHI mitigation and GI implementation policies look like to socially vulnerable residents versus those with the power to implement change such as the Baltimore Office of Sustainability and non-profit organizations?	BOS interviews, nonprofit interviews, resident interviews, policy analysis: comparing answer across all three groups of interviews and findings from policy analysis

4.1 Policy Analysis

Before embarking on this project, it was necessary to conduct a policy analysis (please see the next chapter) on the 2009 and 2019 Baltimore City Sustainability Plans to better understand how and why the concept of sustainability has changed over the 10-year time period between the release of the plans. In order to do so, a range of methods such as textual, content, and critical policy discourse analysis were used to analyze the plans to situate the research questions within the larger context of sustainability planning, specifically in Baltimore City. Both policy documents are examples of a text that signifies something for something for someone. These policy documents are more than just words on paper, they have multiple underlying meanings and can say a lot about the social and political climate in which they were written. To view these documents as a 'text' allows us to understand the cultural values of the community and the authors that wrote the policy and how they have changed over time. We can compare what the authors are trying to convey with the ideas and values the community holds, both in 2009 and 2019. By analyzing what is in the 2009 plan versus the 2019 plan, those patterns were evident, allowing me to better understand the deeper meaning behind the written words, situated in the sociocultural context they were written.

Content analysis builds on the findings of textual analysis by allowing the research to make generalizations based on the frequency of certain words, phrases, ideas, or codes within a text. Some major themes at the heart of this research project are the presence of the UHI as an environmental justice issue, GI implementation and distribution, and social equity. Content analysis was used to determine how frequently these themes and codes came up between the two plans to make for a proper comparison.

Generalizations can be drawn in relation to both documents, particularly when one document mentions a theme more than the other or when one document does not mention a theme at all. Counting the codes for frequency allows the researcher to infer how relevant an idea may be during a certain time and make comparisons with past texts, such as equity, community engagement, and environmental justice during the policy creation process.

A critical policy discourse analysis was the next step on building off the content and textual analyses. To perform a critical policy discourse analysis, I started with a theoretically informed research question within reasonable limits of the social context under examination (Keller, 2006). I looked for things such as target group labels, the use of stylistic devices and the way the text is written, how the policy is framed, and the narrative depicted within the document to better understand the underlying themes and goals of the policy document. The comparative portion of the critical policy discourse analyses between the 2009 and 2019 Baltimore City Sustainability Plans plays an important piece in how dominant discourses around sustainability planning in Baltimore City come to fruition. Understanding the clear shifts in the political, economic, and social contexts of the times in which these documents were written made for more well-informed research techniques, interview questions, and finally, data analysis during this research project.

4.1.1 Textual Analysis

A text is something that signifies something for someone or other. It is anything with a signifying structure that leads one into decoding, interpretation, and explanation (Doel, 2016). A text can take shape in multiple different ways such as films, television programs, magazines, advertisements, scripts, graffiti, architecture, social media, spoken words, etc. Texts are material traces we can analyze to make sense of how other people view the world (McKee, 2003). Everything around us may be treated as a text as its existence must mean something and matter in some way (Doel 2016, 218)

Textual analysis is a broad term for various research methods used to describe, interpret, and understand texts (McKee, 2003). It attempts to show how social categories and representations are created, used, and debated by the people that make up the interacting world (Motzafi-Haller, 1998). A plethora of information may be gathered from analyzing a text, from its literal meaning to the subtext, symbolism, assumptions, and values it reveals. When doing textual analysis, we are investigating who produced the text, why they produced it, how they produced it, and whom they produced it for (Doel, 2016). Textual analysis allows us to make sense of the way a culture views the world around them at a particular time while also understanding the values and limitations of the way our own cultures make sense of the world (McKee, 2003). We may make educated guesses at some of the most likely interpretations of the text. A text is something that can be folded, unfolded, and refolded over and over again. Textual analysis can be completed indefinitely; things can always be retextualized as the times change (Doel, 2016).

Researchers do textual analysis so they can better understand the meaning of a text in relation to its cultural surroundings. Textual analysis allows for the understanding of the ways in which members of different cultures and subcultures make sense of who they are and how they fit into the world in which they live (McKee, 2003). There isn't a single true account of any event or reason behind being, but textual analysis helps us figure out what would be reasonable in a given culture at a given time (Doel, 2016). Analyzing a text allow you to better understand the values and ideas of a culture situated in the time period the text was produced.

4.1.2 Content Analysis

Content analysis is referring to the manner in which meaning is expressed by a signifier: a word, image, or practice that can convey meaning (Dixon, 2010). It can be either a quantitative or qualitative method of meaning making. When used as a quantitative method, the goal of content analysis is summarizing any form of content by counting various aspects of the content, making for a more objective evaluation. It is simplifying the detection of trends over time (Know Your Audience, 2012). Content analysis is a research technique for making replicable and valid references from data to their context. It is another way of understanding the symbolic qualities of texts as texts always refer to the broader cultural context they are a part of (Rose, 2016). When used as a qualitative method, the goal of content analysis is to systematically transform a large amount of text into a highly organized and concise summary of key results (Erlingsson & Brysiewicz, 2017). Relying heavily on the coding process, codes are generated based on the content being analyzed and grouped into categories in an effort to understand what

the codes say about the producers of a text, its message, and its audience (Castree et al., 2013).

Content analysis allows the researcher to form objective, replicable, and valid references from data to their context (Rose, 2016). By quantifying the frequency of certain signifiers within the content under analysis, the researcher can make links between cause and effect (Ex: policy content and its intended audience) (Know Your Audience, 2012.). Content analysis is best performed when content can be considered at length. A book, magazine, or some kind of material object may be analyzed again and again as times changes, allowing the researcher to make compare frequency patterns over time (Dixon, 2010). Ideas may become more or less prevalent over time; content analysis recognizes that and aims to quantify the ways those ideas are expressed. Content analysis allows the researcher to focus on content and its messages, make intermedia comparisons of messages, examine the logic of messages situating them in contemporary times, and examine message effects on a given audience (Weare and Lin, 2000).

4.1.3 Critical Policy Discourse Analysis

Discourse refers to a group of statements which structure the way a thing is thought, and the way we act on the basis of thinking; it is a particular knowledge about the world which shapes how we understand our surroundings and how things are done in it. It is a particular form of language with its own rules and conventions. Discourses may be articulated through all sorts of visual and verbal images and texts, specialized or not, and through the practices that those languages permit (Rose, 2016). Discourse can be thought of as the conversation around a topic that shapes our ideas, understandings, and views of said topic.

As a methodology, discourse analysis is far more flexible than content analysis (Rose, 2016). Discourse analysis is concerned with the power struggle or struggle for truth, for symbolic and material ordering of social practices; particularly how historically "truthful" power/knowledge regimes come to be (Keller, 2006). Discourse analysis pays attention to the various kinds of visual images, verbal texts, and practices involved in a certain discourse or idea. It explores how specific views or accounts are constructed as real, truthful, or natural through regimes of truth. It addresses the questions of power and knowledge by paying close attention to images and their social production and effects (Rose, 2016). Discourse analysis attempts to link the social dimensions of knowledge production and circulation with the symbolic order or social hierarchy that it achieves (Keller, 2006).

The goal of critical policy analysis is to contextualize policy within its historical and political landscape, positioning policy as reflective of a group or individual's vision of an ideal society. To start the critical policy analysis, I began with my theoretically informed research question, "How have Baltimore's sustainability planning priorities changed over the 10-year period between when they were released?" When analyzing these policies, I looked for the formulation and use of concepts such as repeated use of target group labels, the use of stylistic devices such as metaphors, how the policy was framed, and the story and narrative the policy is depicting (Apthorpe & Gasper, 1996). It is important to focus on the basic entities whose existence is recognized or reconstructed through policy, assumptions about natural relationships between entities, key agents and their motives, and the key metaphors or other rhetorical devices within the discourse. Once analysis is completed, the next step was to produce interpretations of the discourse.

This is where I produced an account of the discursive structures, practices, and sites of production in order to question the policy making process, how dialogue takes place, and how power relations produce dominant discourses that trump others (ibid.). Upon the completion of the policy analysis, the next method of research collection was conducting interviews. The next section details the interview process.

4.2 Interviews

The policy analysis offered an agency-centric account of sustainability planning and GI implementation in Baltimore as a whole; when thinking about my research questions, the only way to figure out how people in different positions feel about the green infrastructure planning and the community outreach processes at the neighborhood scale was to ask them about it. This project utilized one-on-one, semi-structured interviews as a mean of the data collection processes. Considering we are still in a time of a global pandemic, access to participants was a large concern from the beginning of this project. I thought about what types of participant selection methods would be the most appropriate given the constraints of social distancing and personal safety protocols. Criterion sampling, selecting participants that meet some criterion, and convenience sampling, selecting participants based on access, seemed like the most logical methods to utilize (Stratford & Bradshaw, 2005).

4.2.1 The Internal Review Board (IRB) Process

This project involves working directly with human subjects, conducting interviews, and analyzing their responses, therefore an Internal Review Board (IRB) application must be submitted. As the principal investigator, I filled out the application which was reviewed by my faculty advisor and approved by the IRB[5] (See Appendix B). Upon approval, I was granted permission to start soliciting interviews and conducting research. This is an important step in ensuring personal safety and the safety of the research subjects while making sure the research project adheres to ethical guidelines. Along with the IRB application, I was responsible for completing CITI Human Subjects Certification Training, a remote consent process outline, the return to research form, and Covid screening questionnaires if in-person interviews were to be conducted.

4.2.2 Semi-Structured Interviews

In order to participate, the interview participants needed to meet certain criteria. Interviews were recruited from three study populations: the Baltimore City government, local non-government organizations (NGOs) Pigtown Main Street and the Baltimore Tree Trust, and Pigtown residents. Participants also needed to be at least 18 years of age. I conducted eight interviews, the majority of which the participants were recruited via email. Having already established rapport with Pigtown Main Street and the Tree Trust, interviews were easily set up with Kim Lane, the Director of Pigtown Main Street, and Bryant Smith, Chief Executive Officer of the Tree Trust. Baltimore City Employees were selected either based on their employee biographies available online or through a

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[5] IRB: #1428 Investigating Pigtown Neighborhood Residents' Experiences of Green Infrastructure and Urban Heat Island Effect

recommendation. I recruited both City Government employees via email. I first read

Aubrey Germ's employee profile on the Baltimore Office of Sustainability's website and

reached out to her for an interview. As a Climate and Resilience Planner for the

Baltimore Office of Sustainability (BoS), I felt she would be able to speak the presence of

the UHI in Baltimore and would be a good fit for this project. Upon speaking, she

recommended that I speak with Megan Hazer, Planner 1, with Baltimore City's

Department of Public Works who specializes in GI implementation in the city. I found

Megan's email address online and invited her to participate in an interview, which she

accepted.

For the resident interviews, the Tree Trust provided me with access to a list of

Pigtown residents that had previously requested a tree be planted in front of their home.

The list contained names and email addresses which allowed me to reach out to multiple

people via email. I interviewed two residents from the list that was given to me by the

Tree Trust. I also conducted two interviews with residents that were not on the list

provided by the Tree Trust. I came into contact with the participants through a mutual

friend that also lives in Baltimore City.

For the sake of anonymity, the Pigtown residents that participated in this research

project will be referred to as a single letter. Residents selected for interviews varied in all

categories such as age, race, gender, and socioeconomic status. S and R are both white,

middle-class women in their early 30s. Both women have worked and lived in Baltimore

City between five and ten years. B is a black woman in her mid-20s who is just

establishing herself in her career. She has lived in Baltimore City her whole life and

discussed with me some of the challenges she experienced growing up. For the majority

of her later teenage and early adult years, she worked two jobs while she was going to school to make ends meet. The final resident I spoke with J, was an elderly black man who has lived in Baltimore City his entire life. J's family has been in Baltimore for generations, and he is very proud of where his family comes from. At some points in his life, J was homeless and experienced a lot of difficult situations. J has overcome so much adversity and is incredibly excited to now be living with his son and grandchildren in Pigtown.

In terms of social vulnerability, J is the only resident that could be considered somewhat socially vulnerable. As an elderly, black man with a pre-existing health condition, he meets some of the criteria of what defines a socially vulnerable population. Aside from J, the other three residents that were interviewed are not considered to be socially vulnerable as they were all healthy adults that live a middle-class lifestyle. However, the UHI effects everyone that lives within its parameters regardless of social vulnerability levels.

All participants were emailed the informed consent sheet and asked to sign and return it to me before the interview started. All informed consent sheets were collected and stored on a secure server on my computer. Each interview was conducted via zoom given the current state of the pandemic and everyone's time schedule. I developed questions that were applicable to each participant category: resident, city employee, and nonprofit agency. For each interview, I started out using primary questions that are used to initiate discussion, followed by secondary questions that encourage the informant to follow up or expand on an issue already discussed (Dunn, 2005). All interviews were semi-structured as I wanted them to feel more like a conversation rather than a strict and

formal interview. I decided to use a mixture of descriptive, storytelling, and opinion-based questions (See Appendix C for interview script/questions). Unscripted follow up questions were asked as needed. After each interview, I wrote an analytic memo to myself, documenting notes, key ideas, and overall thoughts about the interview process. The interviews and their content will be discussed in greater detail in the following section. After each interview was completed, I created interview transcripts using Zoom's transcription feature. I then went through and cleaned the transcripts up to correct any errors that may have occurred during the autogenerated transcription process. Interview transcripts were also stored on my computer.

4.2.3 Coding and Analysis

After all interviews were completed, I began the coding process. I coded each interview three times. Once for descriptive codes, in-vivo codes, and process codes. Descriptive codes reflect themes and patterns that are obvious on the surface (Cope, 2005). I used coding here in a more explanatory, inductive way using grounded theory, where the purpose of coding is to generate theories from empirical data (Cope, 2005). In-vivo codes are descriptive codes that come directly from the statements of the participants (Cope, 2005). Since I had interview transcripts, it was the perfect opportunity to use in-vivo codes to capture exactly what my participants said to emphasize their statements. Process coding is appropriate when searching for the routines and rituals of human life; searching for consequences of action/interaction is also a part of process coding (Saldana, 2016). This form of coding was helpful in determining the actions and activities that were or were not going on. This was helpful in identifying activity patterns for dealing with extreme urban heat, the community outreach process, and the level of

communication between residents and the different city agencies. Once each round of coding was complete, I created an analytic memo for each interview to write down my initial thoughts and brainstorm some potential themes for the coding structures.

I created coding structures for each type of coding for each of the interview categories. For each coding structure, I took all the codes within that category and put them into tables where I could see them side by side. The table below shows what codes were used to code each round of coding (descriptive, in-vivo, and process) for each interview category (resident, city employee, nonprofit agency).

Table 2: List of codes used for data analysis

Group	Descriptive Codes	Process Codes	In-vivo Codes
Residents	Symptoms of a lack of GI Beating the heat Positive and negative community engagement Resident's wants for GI Extreme heat General activities Vulnerability Effects on the community Effects on the individual Maintenance issues Negatives and positives associated with GI Places and other neighborhoods	Avoidance Vulnerability Interacting with the community Resident wants Mitigation strategies Positive and negative community engagement General activity Maintenance issues A lack of communication Negative GI consequences	Extreme heat Vulnerability Positive and negative community engagement Maintenance issues Residents' wants Positive and negative GI consequences Beating the hear Effects on the community/social cohesion Symptoms of a lack of trees
Non-government Organizations (NGOs)	Positive and negative community reactions Community outreach strategies Green infrastructure implementation Extreme heat	Community engagement Equity Positive and negative community feedback Effects of greening on the community	Positive and negative community feedback Covid Project priorities Equity Extreme heat and its effects

	Vulnerability Side effects of greening Scope of work Neighborhood characteristics Equity Benefiting the community Relationships across agencies	Neighborhood characteristics Agency relationships The implementation process Scope of work General activities	Green infrastructure implementation and outcomes Community outreach Neighborhood characteristics Agency partnerships
Baltimore City Government Employees	Positive and negative community engagement Sustainability The planning process Obstacles Green infrastructure Effects of GI on neighborhoods Extreme heat/the presence of the UHI Mitigation strategies Equity Vulnerability	Positive and negative community engagement Vulnerability Extreme heat and its effects Equity Obstacles The planning process Mitigation strategies Sustainability	Positive and negative community engagement Sustainability Obstacles The planning process Effects of GI on the neighborhoods Equity Acknowledging urban heat Green infrastructure Vulnerability

After each coding structure was completed, I created analytic memos where I discussed the major themes and ideas that came out of the coding process (Appendix D). The decision to code based on societal position allowed me to form conclusions for each interview category, resident, nonprofit organization, and Baltimore City government employee. This way, I could compare and contrast coding structures for each group to see the similarities and differences that came up between them.

Creating coding structures for each coding method was helpful in picking out reoccurring themes and ideas from the interviews. There were clear similarities between all interviews in their respective categories. In the resident interviews, a lot of the same ideas and themes were discussed by the participants. The same thing was true for the Baltimore City employee interviews and the nonprofit organization interviews. Each interview participant of the same category shared similar thoughts regarding the interview topic and questions. The major differences came about between the interview categories and the participant's places within society and the planning process, which was to be expected.

The remaining chapters detail the policy analysis, interviews, and present a discussion of findings. The next chapter presents the completed policy analysis and major findings from this portion of the project.

CHAPTER FIVE

POLICY ANALYSIS – BALTIMORE CITY 2009 AND 2019 SUSTAINABILITY PLANS

Sustainability planning has gained significant traction in recent years as our physical and social climates continue to change. Cities have started creating sustainability plans, outlining their strategies to meet their future sustainability goals in order to preserve the environment and keep their citizens healthy. Baltimore City has designed two sustainability plans in the past twelve years: one in 2009 and an updated version in 2019. Both plans seek to address sustainability planning in Baltimore in two very different ways.

In the 1980s, the term sustainable development was coined in an effort to preserve natural resources for future generations and alleviate social and environmental injustices for those particularly in the urban setting. Both the 2009 and 2019 Baltimore Sustainability Plans have adopted the widely accepted WCED definition of sustainability, "development that meets the needs of the present without jeopardizing the ability of future generations to meet their own needs" (WCED, 1987). Both plans illustrate sustainability as a three-legged stool, comprised of social equity (people), economic health (prosperity), and environmental stewardship (planet) (Baltimore Commission on Sustainability (CoS), 2009; CoS, 2019). Even though both plans define sustainability in the same way, they approach sustainability planning from two very different angles. This chapter attempts to analyze the similarities and differences between the two documents to

contextualize how Baltimore's sustainability planning priorities have changed over the 10-year period between when they were released.

5.1 Overview of the 2009 Baltimore Sustainability Plan

In 2006, Baltimore City released a Comprehensive Plan designed to position Baltimore as a world class city. It was organized into four themes: Live, Earn, Play, and Learn based on fundamental aspects of life in Baltimore. A year later, Baltimore City was tasked with taking a more sustainable approach to planning; the Commission on Sustainability (CoS) website states, "In 2007, legislation was enacted to create the Baltimore Office of Sustainability (BOS) and the CoS. The Commission, together with the Office, is tasked with engaging the public to develop and implement a Sustainability Plan for the broader Baltimore community" (CoS, n.d.).

The 2009 Sustainability Plan (2009SP) was adopted as an element of the Comprehensive Plan but also functions as a stand-alone document that expands upon and complements the goals and recommendations in the Comprehensive Plan. The 2009SP highlights seven key themes: cleanliness, pollution prevention, resource conservation, greening, transportation, environmental education and awareness, and the green economy (CoS, 2009). This plan aims to inform the reader on how Baltimore's ability to offer healthy air and water, varied transportation options, job opportunities with good growth potential, and clean, safe recreational spaces will improve over time. This document establishes priorities for how Baltimore can grow and prosper in ways that meet the current environmental, social, and economic needs of our community without compromising the ability of future generations to meet these needs. This plan lays out 29 priority goals within its 7 chapters. Some goals set very specific targets and ambitious

time frames within strategies while metrics for other goals are still under development

(CoS, 2009).

The 2009SP was created and authored by multiple parties including: the CoS,

BOS staff, the Sustainability Plan Project Manager, BOS interns, and Sustainability

Community Ambassadors (See Appendix E for a full list of names). The audience of the

plan is primarily the Baltimore City community. The plan states, "Early on the

commission adopted three operating principles for how we would conduct the planning

process, including commitments to engage a wide scope of our community, use an

inclusive definition of the environment, and translate language and jargon to thoughts and

ideas that are commonly used by regular people" (CoS, 2009). The authors had regular

community members in mind when creating this policy document because it is written in

a way that makes it accessible to everyday people, not just policy professionals.

5.1.1 Analysis of the 2009 Baltimore Sustainability Plan

While the 2009SP envisions integrating all three elements of sustainability

equality into its procedures, it focuses strictly on the environmental stewardship aspect of

sustainability, claiming that it "has too often been excluded from conventional decision

making" (CoS, 2009). Within this document, there is a large emphasis on environmental

climate change and climate policy. The majority of the goals outlined in the plan refer to

mitigating the effects of anthropogenic climate change and the future of Baltimore City's

physical environment.

The 2009SP also places a large amount of responsibility on the citizens of

Baltimore to address issues outlined in the document. The plan states "The shifting

landscape presents both challenges to which we, as a community, need to respond and opportunities on which we want to capitalize" (CoS, 2009) and "Individual citizens, community groups, institutions, and businesses must recognize how their decisions impact the sustainability of the community and take responsibility for responding appropriately. Each and every one of us can choose to be part of the problem or part of the solution, and collectively, we can hold one another accountable for our efforts and the ultimate outcomes" (CoS, 2009). The plan frames current environmental and societal conditions as a product of the citizens choices. To an extent, surely the community plays a large role is creating and maintaining a sustainable community, but the language of the plan places a certain level of blame on the individual for current conditions, not on existing power structures such as the City government.

The 2009SP describes attracting investment and new residents as one of their main goals while addressing the unmet needs of the current community goes largely unnoticed. The plan states, "If Baltimore wants to attract and retain more residents, businesses, and investment, we need to offer a city with healthy air and water, varied transportation options, job opportunities with growth potential, and clean, safe recreational spaces" (CoS, 2009). The usage of the word 'we' suggests that it is largely the community's responsibility to create and sustain healthy environments that will attract investment and opportunities for outsiders of the current community. Objectives for job opportunities, healthy air and water, and varied transportation options are things generally out of the resident's hands, yet the CoS addresses a communal responsibility.

The plan starts out with a public engagement section that documents the community outreach process conducted by the CoS. The plan states, "The desire to

include the voices of all segments of Baltimore motivated the BOS and CoS to engage

the community in a planning process to shape Baltimore's Sustainability Plan, a process

designed to give all citizens, businesses, and institutions multiple ways to participate and

provide input to the Plan (CoS, 2009). During the engagement process, the CoS engaged

with over 1,000 average citizens, City agency personnel, environmental activists, and

sustainability experts over an eight-month period. To reach these people, the public

engagement process utilized working groups, community conversations, a youth strategy,

and a sustainability forum. Working groups were staffed by individuals from City

agencies including Planning, Transportation, Parks and Recreation, etc. in order to

identify goals, benchmarks, and establish programmatic priorities. The groups convened

18 public meetings that engaged with over 300 citizens (CoS, 2009).

A community advisory team made up of 20 citizens was asked for advice on how

to address traditional environmental issues within the community such as greenhouse gas

emissions and green infrastructure. The BOS also recruited over 30 sustainability

ambassadors, a diverse mix of interested citizens, who attended 35 community meetings

during the engagement process. Ambassadors met with over 550 people from across

Baltimore to enhance the framework of the plan (CoS, 2009).

The CoS youth strategy recognized that young people play an essential role in the

definition of sustainability. The BOS and the CoS formed a youth advisory group of 15-

20 young people and a few adult leaders of youth developmental organizations to involve

them in the plan's development. The advisory group hosted a one-day event at Baltimore

Polytechnic Institute in order to generate interest in sustainability and give young people

a time and place to share their ideas; the event was attended by over 150 young people

ages 3-24, plus volunteers from public and private schools within the city (CoS, 2009). Finally, a sustainability forum held in a local high school cafeteria brought together over 100 community stakeholders. The purpose was to hear the results of the engagement process thus far and seek feedback and recommendations (CoS, 2009).

The engagement process carried out for the 2009SP no doubt came from a good place, but there was a clear lack of representation of marginalized voices. The CoS claims, "The public engagement process was a significant step in ensuring accessibility and equity in what will be an ongoing effort to make Baltimore a sustainable city (CoS, 2009, p. 22). Average citizens that were engaged were already interested in sustainability or had some sort of previous vestment with the community. There is no discussion of socially vulnerable populations or of those who have been historically left out of the planning process. The plan states, "The public engagement process affirmed and enhanced the goals, strategies, and short-term priorities that had been developed by the BOS, CoS, and its Working Groups…" (CoS, 2009, p. 22). The CoS engaged with more likeminded residents who echoed their concerns, excluding the voices of the Baltimore's population that may have had other ideas and priorities they wanted addressed.

Moving on from the public engagement section, the purpose and structure of the plan is discussed. The general goal of the plan is to "strengthen all three legs of our sustainability stool – people, planet, and prosperity – en route to helping Baltimore thrive for generations to come" (CoS, 2009, p. 24). This suggests that social equity and economic health will play an equally important role in the plan, yet it largely fails to address such issues. By design, this plan primarily focuses on the environmental stewardship (planet) element, thus neglecting the people and prosperity aspects of

sustainability it claims to strengthen. Equity is briefly discussed later in the plan in the transportation section as it frames measuring and improving the equity of transportation as a key issue. Aside from this, equity is largely ignored.

As a strictly environmental plan, it succeeds in outlining strategies for maintaining community cleanliness, pollution prevention, resource conservation, community greening, cleaner methods of transportation, and greening Baltimore's business and manufacturing sectors. I would like to draw particular attention to the greening section of the 2009SP. As a city that has went through significant periods of structural segregation and disinvestment, there are clear disparities between levels of community greening and the structural formation of environmental hazards such as the urban heat island (UHI) within Baltimore City. The beginning of this section states, "Trees are not plentiful in many areas of Baltimore City, yet urban forestry provides a host of very valuable benefits" (CoS, 2009, p. 70). This section's shortfall comes from the lack of responsibility the city takes for creating such inequitable spaces.

Although there is a lack of responsibility, it does outline an ambitious plan to double Baltimore's tree canopy from 20 to 40 percent by 2037, establish Baltimore as a leader in sustainable local food systems, provide safe and well-maintained public recreational space within a quarter mile of all residents, and protect Baltimore's ecology and biodiversity (CoS 2009). While these plans could greatly benefit the environment and the community, the CoS does not address the potential for the negative effects associated with community greening such as environmental gentrification and community displacement.

The 2009SP claims to be an all-encompassing sustainability document yet functions largely as an outline for Baltimore City's future environment. It is desperately missing the social equity and economic prosperity elements of the three-legged stool of sustainability. The 2009SP focuses on transforming Baltimore into a green city by shifting its physical landscape through more environmentally sustainable initiatives. While this plan lays the foundation for a more environmentally sustainable Baltimore, there is room for improvement when addressing the City's unmet social and economic needs.

5.2 Overview of the 2019 Baltimore Sustainability Plan

In 2019, the CoS released a 10 year follow up on the 2009SP, the 2019 Baltimore Sustainability Plan (2019SP). The 2019SP is a policy document meant to highlight the positive changes made in the last decade while also pointing out areas for improvement and setting new goals for the community and City government. Much like the 2009SP, the 2019SP has been adopted as a core element of the City's Comprehensive Plan serving as the framework to guide Baltimore's development for years to come (CoS, 2019).

The purpose of this plan is to serve as an umbrella document that gathers efforts in one single, cohesive vision. It continues and expands upon the work of the 2009SP and other sustainability measures such as the Baltimore Green Network (2018), The Baltimore Food Waste and Recovery Strategy (2018), The Baltimore Climate Action Plan (2012), The Disaster Preparedness and Planning Project (2018), and Homegrown Baltimore (2013) (CoS, 2019). This plan informs the reader about the ways in which Baltimore City plans to better address all three legs of sustainability, not just environmental stewardship (CoS, 2019). The 2019SP addresses the longtime issue of race

and place within Baltimore City. There is a large shift towards social equity as the focal point of this document as it addresses disparities in previous planning measures that have been historically harmful to some residents. The 2019SP broadens the scope of voices represented including race, gender, age, neighborhood, and employment status. The plan intends to provide guidance to both recognize and eliminate disparities within the community (CoS, 2019).

The 2019SP was created and authored by multiple parties including the CoS, the BoS staff, and the Sustainability Plan Project Manager (See Appendix E for a full list of names). The audience of the 2019 Sustainability Plan is primarily the Baltimore City community and City government agencies. The CoS strives to be open and honest about their successes and failures as they speak in terms that are understandable to all, refraining from the use of technical jargon (CoS, 2019). Much like the 2009 plan, this policy document has been written in an easily understandable, accessible way.

5.2.1 Analysis of the 2019 Baltimore Sustainability Plan

The 2019SP defines sustainability the same way the 2009SP does, as a three-legged stool. The CoS describes a sustainable Baltimore as a space where "the child born tomorrow grows up with the opportunity to nurture a connection with family, with their community, and with nature. To live free from violence. To receive a quality education. To enjoy plenty of healthy food on the table. To have access to a good paying job. And to thrive in a city that supports all residents to reach their potential" (CoS, 2009, p. 5). The 2019SP focuses more on economic health and social equity elements of sustainability, explicitly integrating "an equity lens, a tool designed to explicitly consider racial equity when developing policy" (CoS, 2019, p. viii). While there is still a strong focus on

sustaining a healthy environment, social equity and economic prosperity lie at the heart of the 2019SP.

The plan recognizes there is a certain level of responsibility put on the community to maintain a healthy, sustainable environment, but they also recognize it is the government's responsibility to provide the community with the appropriate resources to do so. The 'A Baltimore Where Everyone Thrives' section says, "Unlike most city plans, which are roadmaps for actions by City government, this plan relies on all parts of our community for its implementation" (CoS, 2019, p. 5). While the plan includes resident accountability to some extent, it places the responsibility of meeting goals primarily on Baltimore City's power structures. The plan does this by holding themselves accountable for reaching equity and sustainability goals, but also for creating the current inequities that have plagued Baltimore for so long. The plan states, "We recognize our city's complex legacy of profound problems: discriminatory laws and policies fueled by racial prejudice, profit-driven exploitation of our natural resources, and other interconnected injustices that have led to neighborhood decline as well as environmental degradation," promising to be transparent about where they have failed (CoS, 2009, p. 15). The plan also promises to share power and commits to "transparency and reject the old ways of decision-making that entrenched power inside closed institutions" (CoS, 2009, p. 15).

The plan attempts to empower the community by actively seeking to change the way decisions are made to foster more equitable political, environmental, and social landscapes. The most prominent theme of the plan 2019SP is equity. It approaches sustainability through an equity lens that is a "transformative quality improvement tool used to improve planning, decision-making, and resource allocation leading to more

racially equitable policies and programs" (CoS, 2009, p. 9). The 2019SP uses the equity

lens to approach the issues of race and place as it "forces us to look at the systems that

have prevented us from achieving sustainable outcomes for all of our residents and for

our city as a whole. It acknowledges that the playing field is not level, the starting lines

have been incorrectly drawn, and that in order for us to give people a fair shot, the way

forward is to correct what's not working" (CoS, 2019, p. 9). Again, this type of language

reflects the City accepting responsibility for creating inequitable, unsustainable spaces

and acknowledging it is their obligation to make a change in the way policies are created

and implemented. Page 10 of the plan shows a historical redlining map of Baltimore City,

addressing the issue of race and place head on in contemporary discourse.

In order to effectively craft equitable policy, the CoS conducted an extensive

public engagement process that engaged with thousands of residents. In order to include

as many diverse voices into the plan as they could, over 125 residents agreed to be

sustainability ambassadors, 68 percent of which were African American (CoS, 2009).

With the help of the ambassadors, the CoS designed a survey that reached over 1,200

neighbors in order to discuss ideas, needs, and visions for the future. The survey

questions were specifically designed to be open ended and accessible to all that

participated. Ambassadors conducted interviews with people in unconventional places

such as churches, schools, markets, stoops, and kitchen tables. Sustainability

Commissioners and BOS staff attended nearly 25 meetings that engaged with over 500

people from a multitude of backgrounds to offer visions for a more sustainable Baltimore

(CoS, 2009).

The 2019SP recognizes that "The strategies and actions require on going engagement with those who will be leading projects as well as with those whose daily lives will be impacted by a more sustainable Baltimore and who will be ultimate judges of the Plan's success" (CoS, 2009, p. 22). The community outreach process engaged with a diverse mix of residents in multiple spaces outside of the conventional community meeting setting in order to hear from people that usually would not have the opportunity to participate in the engagement process. Questions asked were designed to be accessible and thought provoking to reach community members from all backgrounds. This makes sure that all residents have the opportunity to participate in the planning process, allowing for the creation of well-informed and well-rounded public policy.

Moving forward from public engagement, the policy portion of the plan begins. The 2019SP highlights five core themes and twenty-three topic ideas. The major themes include: community, human-made systems, climate and resilience, nature in the city, and economy. While the 2019SP certainly contains environmental policies and plans, it is heavily structured around the embodied experience of the individual within the city. For this analysis, I'd like to explore the 'Nature in the City' section further.

The first subsection ties together people and nature, emphasizing the importance of equitable access to nature. The plan approaches green infrastructure implementation as an important step in increasing environmental health and community morale. The plan states "The emotional, physical, intellectual, and psychological benefits are significant. As we plant more trees and transform vacant land into nurtured gardens, quiet natural places, and inviting play spaces, we will improve our connections to nature while strengthening our communities" (CoS, 2019, p. 100). This subsection incorporates

residents into environmental plans and programs by outlining opportunities for the community to be engaged in shaping what nature in the city looks like.

The 2019SP primarily addresses green infrastructure implementation as a benefit to public health and environmental hazard mitigation such as stormwater management, but it does lightly touch on the presence of the UHI in Baltimore City. Disparities between the presence of trees in low-income, minority neighborhoods are discussed as the plan points out, "In many low-income neighborhoods densely populated by African-American and Spanish speaking residents, the tree canopy is closer to six percent, while it reaches nearly 50 percent in more affluent neighborhoods. This disparity in tree canopy impacts quality of life: areas with fewer trees have more surface area covered by concrete and other hard surfaces, which contribute to higher summer temperatures associated with adverse health impacts" (CoS, 2019, p. 107). The plan outlines strategies to implement trees in low-income neighborhoods while preserving the City's existing tree canopy. Green infrastructure implementation is framed as a positive addition to the community as it may offer a range of social, psychological, and ecological benefits.

The 2019SP acknowledges the presence of socially vulnerable populations and the potential negative effects the plan could have on them. The plan defines vulnerable residents as senior citizens, those of low-income, and non-English-speaking residents (CoS, 2019). The 2019SP does not explicitly utilize the 'just green enough' (JGE) approach to green infrastructure planning, but it certainly falls in line with what the JGE approach entails by acknowledging the potential for displacement when creating large green infrastructure projects. The plan states "This work of creating green space can, however, be a gentrifying force. An equity lens calls for connections and interactions

between people and nature to be made with the intentional integration of sustainability and social justice" (CoS, 2019, p. 103). One of the specific goals highlighted in the plan references creating standard design specifications and a streamlined process to implement green infrastructure practices, particularly for projects under 5,000 square feet (CoS, 2009). Creating multiple smaller parks may limit displacement while providing access to green space on a larger scale. The greening section references the potential for green gentrification multiple times, suggesting it needs to be addressed from the beginning stages of the planning process in order to avoid community displacement. The 2019SP intends to engage in a partnership with residents and local communities to shape nature in the city, provide opportunities for green employment, and keep people in their homes.

The 2019SP functions largely as a social equity document, focusing on people-centric plans and sustainability initiatives. There are aspects of the plan that address environmental concerns, but the community is at the heart of the document and the planning process that created it. Baltimore City's government stressed the importance of righting past wrongs by holding themselves accountable for creating such inequitable spaces; the 2019SP takes a large step towards achieving more environmentally and socially equitable landscapes

5.3 Policy Analysis Findings

A lot has changed in the social and physical environment during the 10-year period between when the Baltimore Sustainability Plans were released. Even though the 2009 and 2019 plans were created by the same organization for the same city, they both approach sustainability in different ways. The most notable difference between the two pieces was the shift in thinking from the 2009 strictly environmental plan to the 2019

social equity document. The 2009SP used the word equity nine times throughout the entire plan while it appeared 60 times in the 2019SP. Inequity did not appear at all in the 2009SP while it was used 14 times in the 2019SP. Other differences include the shift in responsibility assumed by the City, changes in public engagement strategies, and the acknowledgement of socially vulnerable residents and the potential of policy induced harms such as gentrification and displacement.

The 2019SP acknowledges, "While the 2009 plan had a strong focus on environment, we saw the need to uplift the social and economic aspects of sustainability. We began by asking questions – about past, current, and future policies and programs - to learn who is included or excluded from decision making and participation" (CoS, 2019, p. vi). The 2019SP includes a section dedicated to incorporating equity into the planning process where the city holds itself responsible for past injustices that led to contemporary inequities. This is where a distinct shift in responsibility is first visible between the two plans.

The 2009SP discusses concerns for the physical environment and strategies to address these issues. The language of the plan suggests that it is a communal responsibility to foster healthy environments for the people of Baltimore, which to an extent, is true. What the 2009SP fails to do is address the structural conditions that created Baltimore's poor environmental conditions and disparities. It suggests that it is the resident's responsibility to mitigate the product of decades of disinvestment and little access to resources. The 2019SP assumes responsibility for fostering landscapes of inequitable opportunity that led to the degradation of the environment, physically and socially. The 2019SP also addresses that it is the City's responsibility to provide the

necessary resources to the community so they can play their part in making Baltimore a truly sustainable city from the ground up.

The community played a large role in creating both the 2009 and 2019 sustainability plans. Both public engagement processes actively sought the opinions of the community and welcomed ideas, concerns, and critiques. The major difference between the two was the people left out of the engagement processes. The 2009SP created working groups, youth groups, and rallied sustainability ambassadors to address the community's needs. While they actively engaged with residents, they worked in places that were full of like-minded residents that whose ideas and concerns were likely to fall in line with the more powerful stakeholders of the plan. The 2019SP actively made an attempt to speak to residents all over the City, including in spaces like on stoops, at kitchen tables, and in everyday encounters. Engaging with residents outside of the traditional community meeting space or organized event brings an entirely different perspective into the planning process. People that cannot attend meetings or make it to planning events have historically been left out of the process; the 2019SP stepped up their engagement strategies, making an effort to hear from the most marginalized voices within the city.

Another notable difference was in the way the plans addressed vulnerable populations within Baltimore. The 2009SP briefly addressed vulnerable populations one time in the 'Improve the health of indoor environments' subsection. The plan did not define what is considered a vulnerable population or how they may be affected by such public policy implementation. The 2019SP addresses social vulnerability head on as it identifies characteristics of vulnerable groups, identifies strategies that cater specifically

to the needs of vulnerable residents, and offers suggestions on how to prevent the onset of negative outcomes associated with sustainability planning in the urban setting. As vulnerable groups tend to suffer the most from inequitable policy implementation, the 2019SP made an effort to plan for the future of the most vulnerable residents preventatively.

The 2019SP includes increased attention drawn to the possibility of the displacement of native, low-income, minority residents upon the implementation of green infrastructure and the sustainability plan in general. The plan uses the 'just green enough' strategy, the use of multiple smaller-scale greenspaces to prevent gentrification and displacement, when discussing strategies to create a more equitable and accessible greened environment. Green infrastructure is intended to benefit the community, not harm it. The 2009SP does not address the potential negative effects associated with community greening, neglecting to acknowledge possibilities for green gentrification and displacement if not carried out in a thoughtful way. In the 2019SP, we see equity as a focal point of the community greening section as the CoS recognizes that historical planning policies and power structures have fostered environments where green amenities been inequitably distributed over time, leading to the presence of environmental disamenities in unevenly developed urban neighborhoods.

The social and political landscape of Baltimore City changed a lot during the 10-year period between the two plans, calling for the 2019SP to address elements of sustainability that had been left out of the previous plan. Baltimore had been ranked as one of the top sustainable cities when it came to its environmental initiatives, but it fell short when it came to the social equity and economic prosperity elements of

sustainability. The 2019SP intended to address the gaps left by previous policies while building on the strong environmental framework it had already laid out. The adoption of the 2019SP is a step forward for Baltimore City in becoming a truly equitable, accessible, and sustainable city for all current and future residents to come.

Both the 2009 and 2019 Baltimore Sustainability Plans intend to engage with the widely cited definition of sustainable development, "development that meets the needs of the present without jeopardizing the ability of future generations to meet their own needs" (WCED, 1987). Sustainability may be defined in a similar way between the documents, but they take two radically different approaches to achieving their sustainability goals. The 2009SP was designed as a strictly environmental document that focused on maintaining environmental health and mitigating climate change. By design, it placed environmental stewardship front and center, but it lacked components addressing equitable policy implementation. The 2019SP functions as a social equity policy document that approaches sustainability through a racial equity lens, focusing on raising awareness on the issues associated with race and place, mitigating environmental injustices, and creating a truly equitable environment where sustainability could easily be maintained by the people and the City government.

The next chapter will introduce and analyze the one-on-one interviews I conducted with representatives of the Baltimore City government, local NGOs, and Pigtown residents.

CHAPTER SIX

INTERVIEW ANALYSIS

Semi-structured interviews were used to investigate residents' lived experiences of the UHI and the GI implementation efforts in the city to better understand where the resident is placed in the planning process. Interviews were conducted with representatives from three populations: Baltimore City government employees, local non-governmental organizations (NGOs) Pigtown Main Street and the Baltimore Tree Trust, and Pigtown residents. I wanted to learn more about the individual resident experience of the UHI, GI implementation, and the strategies that city agencies and local NGOs use to conduct community outreach. In this chapter, I provide a brief synopsis and discuss the findings from the analysis of each of interview. I have structured this chapter in a sort of chronological order based on interview population. As eight interviews were conducted, I felt this was the best way to keep each analysis consistent and this chapter organized while still cross-referencing common themes and findings across interviews.

6.1. NGO Interviews: Pigtown Main Street and the Baltimore Tree Trust

I spoke two representatives from Baltimore NGOs: with Kim Lane, the Director of Pigtown Mainstreet, and Bryant Smith, Chief Executive Officer of the Tree Trust. With these interviews, I hoped to learn how both organizations approach the UHI phenomenon, GI implementation strategies, and community outreach efforts as private entities, separate from the city government.

6.1.1 Pigtown Main Street – The Presence of the UHI

I spoke with Kim Lane, the Director of Pigtown Mainstreet. The first portion of Kim's interview was based on the presence of the UHI in Pigtown and the effects GI implementation has on the community. There was no question as to whether the UHI exists within Pigtown as Kim stated, "you walk through, drive through like through neighborhoods without trees, and you know you're in a heat island right so it's and you can feel the difference" (pers. comm., 2021). Kim also mentioned the difference in temperatures between streets that have greater tree canopy percentage versus those that do not. She stated, "it's just a better quality of life if you're not as hot, in addition to save big on your gas and electric bills for cooling…" (pers. comm., 2021). The negative effects of the UHI were not new phenomena as Kim readily acknowledged the challenges extreme heat can have on residents living within the UHI.

We discussed the project that had been going on in Pigtown at the time with the Tree Trust and some of the motivations behind greening the neighborhood and areas for prioritization. The homeownership zone was Pigtown Mainstreet's biggest concern and the area they wanted to focus greening. This area had very few trees, so it was a priority zone for planting. Kim mentioned that if you look at the areas in Pigtown with a greater tree canopy percentage, you see higher real estate values and assessments of homes located on those streets. In this case, higher home values due to an increase of trees and greenspace is framed as a positive for the homeowner. Higher property values are considered a good thing for the homeowner as their home, their investment within the community, is now worth more. If the homeowner goes to sell their property, they would be able to make a larger profit off their home.

After discussing the areas for prioritization, we discussed community greening in general in Pigtown. For Pigtown Mainstreet, community greening has been a relatively low priority. Kim talked about receiving grant money from the Chesapeake Bay Trust as a large push for this project; "Greening the neighborhood as part of our design committee, I will tell you it's kind of a low, it was a low priority, but the bottom line is we had this grant and we had the opportunity" (pers. comm., 2021). This was the first large greening project that Pigtown Mainstreet had organized, and the first large greening project in the community in general at least for a few years, showing how low greening in Pigtown has been on everyone's priority list. It shows that various actors are have different priorities for the community depending on what their end goal is.

The next portion of the interview discussed keeping the benefits of community greening in the community. I asked, "does your organization incorporate anything to prevent the negative outcomes associated with community greening" (pers. comm., 2021). In response, Kim mentioned that signing up for this project was only offered to homeowners within Pigtown. This was an attempt to really focus those benefits on the community and boost property values and attract investment for rehab and restoration in the neighborhood. The main concern in the neighborhood is the high vacancy rate, which is associated with negative things such as crime and disinvestment. Kim discussed this project as a means of beautifying the neighborhood and attracting investment in order to rectify some of that vacancy and mitigate the issues associated with it. She said, "you can drive up the market rate of rentals, homes for sale, and you can displace people have lower income regardless of their race right and so we are concerned about that" (pers. comm., 2021). Planting trees and greening the homeownership zone was a multifaceted

approach to addressing the vacancy problem, beautifying the neighborhood, and addressing the issue of urban heat while being careful not to disturb the community fabric by causing undue displacement. Kim also mentioned that "many of our section eight properties are some of the best-looking properties in the neighborhood and in the greenest areas" when talking about greening the neighborhood and watching for displacement in the lower-income sections of town.

We also talked about gentrification in Pigtown and how the organization attempts to prevent that from happening. According to Kim, gentrification is not occurring in Pigtown. It has historically been, and continues to be, a very diverse neighborhood in terms of racial diversity and socioeconomic status. Pigtown was listed as one of the top ten selling neighborhoods in Baltimore City in Live Baltimore's 2020 report. Kim mentioned "a certain percentage of our sales were called nontraditional so that means people are coming in and paying cash. It's investor people who are investing in a rehab it's that kind of thing" (pers. comm., 2021). Although Kim said that gentrification is not occurring in Pigtown, gentrification can be associated with exactly that type of investment where people buy up vacancies, flip them, and sell them for a large profit (Anguelovski et al., 2019).

6.1.2 Pigtown Main Street – Community Engagement

In the community engagement section of the interview, we talked about the efforts taken by the Tree Trust to get into the community and engage with residents. It was brought up that the Covid pandemic had really thrown a wrench into everyone's since the world was forced to take a hiatus from face-to-face contact and in-person engagement. Pigtown Mainstreet sent emails to the residents on their mailing list and the

Tree Trust flyered the homes where Trees were going to be installed (See Appendix A for flyer). A flyer was placed in the mailbox of the home in front of the tree and also both neighboring properties. The entire block was not flyered. In response to the flyers, Kim mentioned "I would have liked for the Tree Trust to flyer the blocks where people requested trees to see if there was anyone we missed through our emails, to see if they would like a tree be planted" (pers. comm., 2021). Community outreach efforts were utilized for this project, but they could have been better utilized to engage the entire community. Kim also discussed that if we were not dealing with Covid, the Tree Trust normally does things differently and engages in door-to-door forms of community engagement.

6.1.3 The Baltimore Tree Trust – The Presence of the UHI

My next interview was with Bryant Smith, Chief Executive Officer of the Baltimore Tree Trust. Like Kim, the beginning portion of Bryant's interview focused on the UHI effect in Baltimore City. When asked what the UHI meant to him, Bryant responded with "it specifically means to me that underserved communities are struggling to deal with public health issues related to urban heat island issues and that we need to address that through forestry operations" (pers. comm., 2021). The Tree Trust plants about 3,000 trees per year and will soon be ramping up to nearly 10,000 trees per year to mitigate the effects of the UHI on the community. Bryant discussed their efforts of planting trees in order to mitigate the UHI and the effects it has on the environment and public health, but also their Workforce Development Program where residents are educated and trained to become community ambassadors to help address the issues of the urban heat problem.

6.1.4 The Baltimore Tree Trust – Community Outreach and GI Implementation in the

City

When asked about their prioritization strategies, not for this project but in their general work, Bryant talked about the use of an urban heat index map. He said, "the majority of our low-income neighborhoods are the highest priority on those maps and so those are the areas that we target" (pers. comm., 2021). As noted in previous sections, the presence of the UHI is often correlated with previously redlined spaces that suffered through periods of disinvestment, leading to contemporary pockets of low-income, socially vulnerable populations. In the case of the tree planting taking place in Pigtown, the Tree Trust was contracted by Pigtown Mainstreet since they have the commercial skills and experience to do planting on a larger scale. The streets where tree canopy percentage was low were the main areas prioritized for planting, along with any address where a homeowner had requested a tree be planted.

The next portion of the interview covered how resident input is incorporated into the plans for planting. Bryant discussed some of the community outreach and engagement strategies the Tree Trust utilizes before they put shovel to dirt in the neighborhood. He talked about the pushback that is sometimes experienced from the community before planting takes place, emphasizing the importance of the educational piece of the outreach process. Bryant stated, "for every neighborhood we go into, 40 percent of residents are resistant to us planting trees" (pers. comm., 2021). The community outreach portion of the Tree Trust's operation helps to mitigate some of those negative feelings. Bryant mentioned, "We're knocking down old myths about issues with trees and once we get final approval from the community, then we begin the actual

implementation portion" (pers. comm., 2021). Reasons why residents may be against tree planting in their neighborhoods will be discussed later in the chapter.

Both NGOs mentioned tree-resistance from residents in our interviews. Kim also mentioned that residents are often concerned with certain things associated with street trees such as the presence of rats and sidewalk disrepair from overgrown tree roots, so it is clear that NGOs are aware that residents do have some concerns and legitimate reasons as to why they might not want trees planted in their neighborhoods. Homeowners in Baltimore City are responsible for the walkway in front of their home, even though it belongs to the city. Bryant talked about the issue of tree roots busting up the sidewalk when a tree is planted in a pit that is too small. Previously, homeowners were expected to pay that repair bill, making property owners less inclined to sign off on planting a tree in front of their home. Bryant talked about their partnership with the city and how they have worked to eliminate the resident from being fined for damages caused by tree roots.

The Tree Trust collaborates with residents by offering a choice of tree species to be planted, which may also alleviate some of the resident's worries. Some residents may not want a large tree or a tree that flowers, so choice is a huge component in the planting process. Bryant said, "we work with them closely to identify a species that they feel comfortable with, but that also has the environmental impact that we're trying to achieve" (pers. comm., 2021). From Bryant's responses, it is clear that the community education portion of the Trust's work is crucial in including the resident in the planning process. Some residents may not know the benefits of having street trees in their neighborhoods, so the education piece may change their mind if they had previously been against tree

planting. Education may help connect the dots between the negative effects of the UHI such as high energy bills, asthma rates, and the lack of trees in the neighborhood.

When it comes to community outreach, Bryant discussed the strategies the Tree Trust normally uses. As in my conversation with Kim, Covid played a large role in the disruption of their normal community outreach operations. Typically, the Tree Trust utilizes community meetings, door-to-door efforts, and interactions with community associations to spread the word and get involved in the community. Virtual tools were used, particularly during Covid, to remain in contact with the community when in-person meetings were shut down and face-to-face contact was limited. Bryant also emphasized the importance of utilizing multiple avenues of community outreach since one method of outreach will not reach everyone. He said, "the Community engagement and outreach component must have multiple avenues in order for us to have a larger reach in the communities that we're targeting" (pers. comm., 2021). One method of community outreach will not reach everyone, especially those that may not have internet access or the available time to regularly attend community meetings.

Bryant talked about the workforce development portion of their organization towards the end of our interview. One of the ways the Tree Trust involves the community in the program and planning process is by employing community members and providing the necessary tools to create a successful career in the urban forestry sector. Bryant discussed the importance of the social component of green infrastructure implementation. Educating residents on green infrastructure and tree planting not only brings positive environmental impacts into the neighborhood but providing opportunities for education

and employment creates long-lasting positive impacts on the social fabric within the community.

6.2 Baltimore City Government Employees

While I was conducting research for this project, I spoke with two employees from the Baltimore City Government. First, I spoke with Aubrey Germ, Climate and Resilience Planner for Baltimore's Office of Sustainability. Next, I spoke with Meghan Hazer, Planner I for Baltimore City's Department of Public Works (DPW).

6.2.1 Aubrey Germ – The presence of the UHI

Aubrey prefaced our conversation by letting me know that she does not work explicitly on green infrastructure or heat mitigation in Pigtown, but that she could speak generally to UHI impacts in the city and try to connect me to a few others who may be better positioned to talk on the subject. The interview started with a discussion of sustainability and how she, as an employee of the Baltimore Office of Sustainability, defines the sustainable city. Aubrey stated that one of the main framings that her office works with is the idea that you cannot have a sustainable city without having an equitable city. She brought up the 2019SP, which heavily concentrates on equity within the city, and the importance of identifying the intersection between sustainability principles and equitable implementation.

I next asked Aubrey how the issue of urban heat is defined by her organization. She discussed looking at general heat data to better understand where the impacts of heat could be highest. She also talked about looking at highly vulnerable populations and higher exposure rates. She stated, "we look at where highly vulnerable populations could

have higher exposure to the heat so looking at both the, you know, actual heat side of things, but the climate data and then also the social impact side and the public health side" (pers. comm., 2021). She talked about how vulnerable populations may not be able to cope with extreme heat days as well as non-vulnerable populations due to things like not having central air conditioning at home, well weatherized homes, etc. She did bring up that Baltimore has a 'Code Red' program, which is the extreme heat program for the city that is run by the Health Department. She, and her organization, tries to collaborate with them to utilize a more holistic approach to sustainability and hazard mitigation planning when it comes to extreme urban heat.

Aubrey talked about Baltimore's Disaster Preparedness plan which focuses on hazard mitigation, along with the 2019SP as they both consider extreme heat a hazard to city residents and city infrastructure. The 2019SP acknowledges the presence of extreme heat and disparities between tree canopy percentage in low-income, minority neighborhoods, but the plan discusses green infrastructure implementation as primarily a stormwater management function, not an urban heat mitigation strategy. There is a small section that describes extreme heat as a public health threat in the 2019SP; urban heat and the presence of extreme heat is mentioned four times (CoS, 2019, pp.77, 79, 86, 107) within the plan, showing how little attention it truly receives.

Aubrey mentioned the task of securing funding specifically for urban heat mitigation by saying, "That's something I'm working on trying to find funding explicitly for. Additional capacity within our office would help with that, but you know there's no guarantee on where that funding is going to go, but it is on our radar, I am speaking on my behalf so it's on my radar and I'm trying to get it on more people's radar" (pers.

comm., 2021). Aubrey further acknowledged the lack of planning around UHI mitigation by saying, "It is something that we are really trying to expand and grow, because I do think we need a comprehensive extreme heat mitigation strategy…" (pers. comm., 2021). She is aware that urban heat needs to be addressed through policy implementation and physical, on-the-ground initiatives. She said "I do think like in general extreme heat is taking on a bigger force. There is more momentum around trying to plan for it than there was before" (pers. comm., 2021). While this may be a general opinion from someone who works in the field, current written policy and implementation efforts show that urban heat mitigation is not one of the top priorities within sustainability planning effort in Baltimore City.

6.2.2 Aubrey Germ – Community Outreach

The last portion of the interview discussed the community outreach strategies utilized by the BoS. Aubrey categorized the BoS as a progressive office when it comes to the community outreach process. The main strategies used include attending community meetings, getting out into the community by leading workshops or focus groups, and using virtual tools to connect with residents. Aubrey said, "we actually have surprisingly had higher numbers of participation on like public facing like Webex or Zoom calls" (pers. comm., 2021). She talked about while virtual participation is great, it is incredibly important to get back into the community and have face-to-face engagement once it is safe to do so.

Another way the BoS conducts their engagement processes is by securing grant funding to pay residents for their time. Aubrey talked about, "finding grant funding to pay participants who support planning processes with quite a bit of their time. This way

they're not just purely volunteer based, but we can say 'hey we value your time, we value your input, and we know this is taking up time that you could be with your family or elsewhere'" (pers. comm., 2021). This is an incredible effort from the BoS that other city agencies should adopt throughout the planning process. Participation in the planning process can be a laborious task, especially for people who are doing it purely on a volunteer basis. This way residents feel like their time and responses are truly appreciated, heard, and inputted into future planning efforts.

There was a heavy emphasis on the 'word of mouth' method of community engagement. Aubrey and her organization are very aware that so much information can spread through the community by word of mouth, you just have to know who to connect with to ensure word gets around. She said, "In Baltimore so much passes through word of mouth. Neighbors tell neighbors and family members and stuff so sometimes it's a really matter of knowing who is such a strong community leader and advocate that like a ton of people" (pers. comm., 2021). The idea that things spread through word-of-mouth communication efforts came up many times in the resident interviews which will be discussed later in this chapter. There is definitely a strong network among community members facilitating the spread of ideas and information through the community, especially to those that may not be able to come to community meetings or have access to join in virtually.

Within the planning process there is a strong emphasis on meeting with people in the community, much like there was in the Tree Trust's planning efforts. Aubrey mentioned, "We really try to meet people in their communities rather than having them to like come to City Hall or come to us" (pers. comm., 2021). Both Bryant and Aubrey

discussed the importance of meeting people in the community, on their own terms, to solicit input on planning efforts and discuss their wants and needs when it comes to policy implementation in their neighborhoods.

Lastly, Aubrey talked about the known fatigue around the planning process within the community. For so long residents were either promised redevelopment that never came or there were planning initiatives that fell through due to budget constraints or some sort of hiccup in the planning process. Aubrey discussed the importance of not over-surveying or over-engaging with the community. Input is critical within planning efforts, but too much input creates a sense of false hope when it comes to not only sustainability planning, economic development opportunities, and plans for community redevelopment. Aubrey said, "You know this is a planning process we're not promising anything. We are always trying to balance our engagement with what's actually possible…" (pers. comm., 2021). Aubrey suggested it is important to recognize that there is only so much that can be done at one time with the time and resources available; there is a delicate balance between engaging with residents enough to get a sense of what they want and need in their communities, but not promising too much to create a sense of disappointment when all their wants and needs cannot be met.

6.2.3 Meghan Hazer – The Presence of the UHI

Finally, Meghan's interview took place after Aubrey referred her for the work she does she does with green infrastructure implementation in Baltimore City. Before the interview, Meghan brought to my attention that there were no green infrastructure efforts taking place in Pigtown at the moment, but she could speak to green infrastructure efforts more generally in Baltimore City. The interview started just as Aubrey's did with a

conversation about how she and her organization (DPW) define the sustainable community. She relayed to me that DPW does not have a formal definition of the sustainable community, but personally, she defined it as "How do we use our resources well and recover from stressors in a way that allows the, you know, healthy and successful functioning of the community" (pers. comm., 2021). There was no mention here about equity or the equitable implementation of policy like there was in the previous interview with Aubrey. This definition of sustainability falls more in line with the 2009SP, something that caters more towards environmental sustainability versus the three-pillar approach to sustainability, people, prosperity, and planet.

6.2.4 Meghan Hazer – Community Outreach GI Implementation in the City

Next, we discussed GI implementation and how it functions within the community. Much like the 2009SP and 2019SP, GI functions primarily as a tool for stormwater management. Meghan described, "When we specifically talk GI, we are talking about green stormwater infrastructure so that is facilities or techniques that the state defines as viable for mitigating water quality, surface water quality… When we talk about green infrastructure the most common things we are using are bioretention rain gardens, rainwater harvesting reuse, tree planting, impervious surface removal, things like that" (pers. comm., 2021). While DPW implements GI as a storm water management tool, by nature it is mitigating some of the effects of the UHI as well. Across both the BoS and DPW, green infrastructure is not thought of as primarily an UHI mitigation tool, but it is praised for its versatility as it can mitigate environmental hazards such as stormwater runoff and extreme heat. This differs greatly from the Baltimore Tree Trust as

their primary reason in planting trees is to reduce the effects of the UHI within Baltimore City.

When asked about how DPW prioritizes spaces for GI implementation, Meghan talked about a "three-tiered priority system" which considers the UHI and racial and socioeconomic equity when thinking about areas for possible implementation. She stated, "We made the decision to recognize, you know, that there's disparities in health outcomes and Baltimore has a pretty tragic history within that existing system. Certain groups are at a greater risk than others, so we wanted to prioritize the built environment based on these public health factors" (pers. comm., 2021). This was when the discussion of equity and vulnerability within Baltimore started. Both Aubrey and Meghan acknowledged the presence of socially vulnerable populations within Baltimore that are more susceptible to the negative effects of environmental hazards.

When asked about how GI projects vary across the city, Meghan spoke about some of the challenges that DPW faces during the implementation process. She said, "The city was built in waves and in different densities" (pers. comm., 2021). Baltimore City is an already built space so DPW, along with other city agencies, face the issues of 'how do you install GI when there is no room for it?' The types of GI the Baltimore City DPW utilizes such as bioretention gardens are larger pieces of infrastructure; these require more space than just one of two blocks of sidewalk like a typical street tree would. In the case of the Tree Trust, they can pretty easily bust up a few feet of sidewalk and plant a tree. When it comes to installing larger GI projects such as bioretention facilities, it is much harder to find readily available, open space where these things can be implemented. Another constraint mentioned was whether or not residents wanted a

stormwater management facility nearby, showing that resident opinion is taken into consideration during the planning process.

Coming back to the earlier segment of the interview about equity, Meghan also said, "We're also looking to prioritize areas and opportunities in the city where there is a lack of investment or are bigger health risks or these people could benefit from having these facilities so I guess that's how it would vary" (pers. comm., 2021). Again, this shows acknowledgement on behalf of DPW, a city agency, that there has been a lack of investment in certain areas leading to a high concentration of vulnerable populations. These populations would greatly benefit from the equitable distribution of GI and other environmental hazard mitigation efforts as the inequitable distribution of environmental disamenities has been long observed within Baltimore.

The next portion of our interview focused heavily on equity within the planning process. Meghan noted that DPW has an Office of Equity and Environmental Justice where dedicated staff members coordinate equity across the agency. She felt as if the BoS was a pioneer in incorporating equity into the planning process and making it more of a focal point from the beginning. Meghan stated, "Instead of us coming up with an approach and asking for comments, how do we include those voices in coming up with our approach from the beginning? How do we engage those under engaged voices, how do we reach more people and get more diverse perspectives from the onset?" (pers. comm., 2021). There is a lot of self-reflection within the department leading up to the community outreach and policy formation process.

When asked about how the community is invited and encouraged to join in the planning process, Meghan said, "We sent out invites to have a wide variety of agency

partners and community partners, nonprofits, people that we have run into through various activities, come and join us in the planning process" (pers. comm., 2021). She acknowledged a shift in methods from first doing analysis and then seeking public comment to now looking towards the community first for guidance on how their analysis should be done. DPW utilizes community meetings, virtual and face-to-face, as a mean of public outreach. When talking about the design process and participating in community meetings, Meghan did point out that, "Normally people don't really pay attention unless they're mad about something… the worst thing that can happen is have people surprised when we come into the community" (pers. comm., 2021). This suggests that some residents may not pay attention to or want to be involved in the planning process in its entirety, just when there is something going on they do not like or would like to see change.

When talking about means of communication outside of community meetings and virtual tools, DPW also utilizes the word-of-mouth network within Baltimore, much like Aubrey and the team in the BoS. Megan said, "People who are involved in their communities and decision-making typically spread information… Probably the best people we talked to are the older generation because they are more likely to go to community meetings in person and then spread the word that way" (pers. comm., 2021). Across all organizations I spoke with, NGOs and government agencies, the word-of-mouth network in the city is one of the most important methods of communication as word spreads to people that may not have time to attend community meetings or access to the internet to connect via social media or through other virtual opportunities.

Lastly, we discussed the potential negative effects of GI installation, particularly gentrification. Meghan stated, "As for gentrification, I would say it's not something that we've seen happen, so it's not a concern. You could say that property values have been pushed up, but people haven't been pushed out of their neighborhoods" (pers. comm., 2021). Much like Kim, Meghan believes that gentrification is not happening in Baltimore even though they both acknowledge that increased property values are a side effect of neighborhood greening. Gentrification is a "concern" within the department, but it is not something they believe is actively an issue.

6.3 Pigtown Residents

For the resident interviews, each participant provided their individual own experience of dealing with extreme heat in Pigtown, their take on GI implementation, and their experience with community outreach efforts in their neighborhood. The following sections provide a brief synopsis of each interview.

6.3.1 R – The UHI Experience

The first resident interview I conducted was with R, a young woman who had requested a tree be planted in front of her home from the Tree Trust. She had received an email from Pigtown Main Street letting her know that trees were available from the Tree Trust. The interview started out with a discussion of the UHI and how they feel it effects their life. R stated that she never really paid much attention to the fact that it was hotter in Baltimore than it is in other areas until I inquired about their participation in my project. Once they heard about the project and started consciously thinking about it, they felt that

they "noticed the symptoms of a lack of trees." R said, "I definitely did start to notice, like I just paid more attention to the fact that like it's hotter" (pers. comm., 2021).

R has central air conditioning which they felt very lucky to have. Staying in the air conditioning and avoiding the heat is the primary way they deal with the extreme temperatures. R talked about how the heat effects their mode of transportation as when it is nice outside, they ride their bike to and from work or to wherever they need to go. Bike riding is their preferred choice of transportation, but when the temperatures are so extreme, they felt like they have no choice but to take their car.

We next discussed how the heat affects social cohesion within the neighborhood. R said that they feel social cohesion and their sense of community is affected by not only the extreme temperatures, but the visual aspect of the lack of trees. Streets with fewer trees and less greenery are far less aesthetically pleasing. R also discussed a lack of shade due to the lack of trees, which is another reason they are more likely to stay indoors rather than sit on their stoop or venture down the street. The visual component coupled with extreme temperatures leads R to feel far less motivated to walk around the neighborhood and interact with the rest of the community. R said, "I think that people are happier around trees and maybe more motivated to do landscaping or be outside and when you're outside you're interacting with the space, therefore, caring about it more" (pers. comm., 2021). When asked what a greener Baltimore would look like, R stated they wanted to see more trees, "which is why it is so great that Tree Trust has planted trees" (pers. comm., 2021).

6.3.2 R – Community Outreach and GI Implementation in the City

The next portion of the interview was focused on community outreach in the city from NGOs and the city government. R is a part of their neighborhood association, so she hears information on what is happening in the neighborhood. The only engagement tool they interacted with when it came to this project was a Google form to request a tree and pick the species. R relayed that no tree had been planted in front of their home and no one reached out to tell them why. They noted that a few trees had been planted down the street, but nothing in front of their home as they had requested. R expressed her disappointment in the lack of communication between the Tree Trust and the residents that had requested trees. She said, "that part was a little disappointing because that's where I think it would have been helpful to just say like "Hey, we know you responded to this Google form, we're planting trees in this location" (pers. comm., 2021).

R also discussed the issue of maintenance when it came to the newly planted trees. She said the trees that had been planted down the street were not doing well. Their neighbors had been watering them to keep them alive, but no one from the Tree Trust or any other organization had come out to take care of them. R expressed her frustration around the lack of maintenance and clarity on who is responsible for taking care of the newly planted trees. R stated, "So it just goes, I think, to me it goes beyond planting. We need more engagement." When asked about their satisfaction with the engagement process, R felt as if community engagement was off to a good start, but wanted to see more diverse methods of communication other than just news coming from the community association before a project takes place. R felt the lack of communication after the fact was the most disappointing aspect.

6.3.3 S – The UHI Experience

The next interview I conducted was with S, another young woman that had requested a tree be planted in front of their home through the Tree Trust. S has lived in the city for at least 10 years, but moved to Pigtown about 6 years ago. The interview started out just as R's, with a discussion about the UHI. S was very aware of extreme heat in Baltimore as they have lived in the city for some time. S made note of the warmer forecasts in the city than in surrounding areas. She said they could feel the difference in temperatures when they walk to work in the mornings. Much like R, they also appreciate the city for its walkability and access to other means of transportation aside from a vehicle. This led to a discussion about how the heat effects their daily lives as they walk to work and generally enjoy being outdoors. Walking to work and being outside is difficult when it is so hot outside, especially while wearing a mask since we are still dealing with Covid precautions.

S deals with the heat similarly to R, by avoiding it. S talked about staying inside in the air conditioning and taking preventative measures when they know it is going to be extremely hot. They choose to eat indoors versus outdoors, they make sure to stay hydrated, and they wear lots of sunscreen. They said, "I'd rather be outside, but when it's just unbearable you can't be" (pers. comm., 2021). S had similar feelings about social cohesion as R as they stay in to avoid the heat. They feel less inclined to be outside and talk to their neighbors. They also made note of seeing fewer of their neighbors outside as well. S said, "when it's really hot you really don't see people outside" (pers. comm., 2021). S enjoys living in their neighborhood because it had a strong sense of cohesion, but the heat takes a toll on that directly as people do what they can to avoid the heat.

When asked how living in Baltimore makes dealing with the heat more difficult, S talked about it not necessarily being more difficult, but that her life is impacted by the heat, so she has to make changes throughout their day to accommodate that. As discussed earlier, walking is her main mode of transportation which is difficult when it is so hot. S shares a car with their partner, making it challenging when they both need want to drive due to the heat. Also, S noted that their electric bill is probably much higher than those that might not have their air conditioning cranking all summer long. S feels grateful that they do have access to public greenspace in Pigtown as Carroll Park is close, providing a break from the heat, but in places with pavement and no trees, there is a noticeable difference in temperatures.

6.3.4 S – Community Outreach and GI Implementation in the City

The next portion of the interview covered S's feelings on GI implementation in the city. S said, "Having green space is so nice, it fosters more of a community people can be more active, so I definitely love green space" (pers. comm., 2021). S also talked about street trees beautifying the neighborhood, making it more aesthetically pleasing. S mentioned the difference in tree canopy coverage on their street versus others in Pigtown. Her street is more of a middle ground as it has some trees, but not as much as others. S also stated, "It's pretty obvious like the wealthier areas have more trees" (pers. comm., 2021). S discussed the socioeconomic differences in Pigtown that correlate with the lack of trees in the area. In the lower-income areas of Pigtown, S said, "The trees disappear. As soon as you go past Cross Street, that's when it's obvious that there's not an investment in greenspace for the neighborhood" (pers. comm., 2021).

When asked what a greener Baltimore would look like, S talked about equitable greening across the city, not just in wealthier areas. S said, "I think investing in street trees for neighborhoods that don't have them and, like particularly low-income neighborhoods, I would say. Parks, like green parks that are like clean and safe and accessible to everyone" (pers. comm., 2021). As a resident, S was very aware of the inequitable provision of greenspace within the city. They were also aware of the risk of gentrification as more investment comes into a neighborhood. They said, "Pigtown Main Street has done a lot of stuff to bring commerce into the area and bring more like resources in and without trying to like gentrify the area so I think that Pigtown is getting more of their collective voice heard" (pers. comm., 2021).

We talked about the community engagement process in the city through Pigtown Mainstreet and the city government. She felt as if they wanted to reach out to an entity to get a tree planted or for some other reason, she would be listened to. S stated, "What I am saying is, I am not the disenfranchised one I guess," (pers. comm., 2021) again, making note that there is a difference between whose voices are sought out and listened to and whose are not. S also talked about the need to seek the opinion of residents when planning projects are in the works by noting, "You don't want to go into a community and like tell them what they need, like you need to go in and ask them because they're the experts on their neighborhood in their community, and so you can't force your own ideals and ideas on someone" (pers. comm., 2021). S's engagement in the planning process did not exceed the Tree Trust's tree planting project, much like R's experience. As there are not any other UHI mitigation projects going on in Pigtown, let alone Baltimore City in

general, neither R or S had been involved in the UHI mitigation planning process aside from this project.

When asked what the city and NGOs could be doing better, the main answer was seeking resident opinion in the beginning of the planning process. In the case of the tree planting project in Pigtown, the trees intended to be concentrated in the homeownership zone. Minimal outreach had been done through Pigtown Main Street's email list and through social media, but those methods were used to inform people that trees were coming; not to ask the neighborhood if trees were something they wanted. S also mentioned wanting to see city agencies utilize resources in disenfranchised neighborhoods versus wealthier spaces. She said, "It's hard to see the city pouring all of its money into the wealthier areas in neighborhoods when there are obviously neighborhoods that could better use those resources and that funding" (pers. comm., 2021). S also talked about organizations focusing on more "sustainable" initiatives by investing in the city equally, not just in spaces that have been and will continue to accumulate wealth. S discussed the noticeable differences in the way funds are allocated which leads to inequities in the provision and maintenance of greenspaces.

6.3.5 B – The UHI Experience

This interview was conducted with a resident that did not request a tree be planted through the Tree Trust but was solicited for participation through other means. I spoke with B who has lived in Pigtown for the majority of her life. Again, the conversation started with the UHI and how they notice the extreme heat. B was not familiar with the term UHI but was very familiar with the incredibly hot temperatures in the city. She said, "It's hot and it's sticky, especially with all this pavement. In the summer months it's just

too hot to go outside and do anything" (pers. comm., 2021). Much like S and R, B avoids the heat as best as they can in order to cope. They also have central air conditioning which helps alleviate some of that stress heat puts on the body.

B told me how she lived next to elderly woman with COPD and has been on oxygen for years. B said, I used to run to the store for her and get her groceries when it was so hot because she couldn't really be out in the weather" (pers. comm., 2021). She mentioned that it makes life harder for older people, especially those with underlying health conditions, but also young and healthy people as well. They are aware that not everyone has air conditioning access but feels lucky that theirs can crank all summer long. This led to B asking me some questions about the difference in electric bills in and out of the UHI.

Like R mentioned in their interview, the symptoms of a lack of trees are most noticeable in the area. B said not only is it hotter on streets with no trees, but it is also less aesthetically pleasing and gives off "a bad vibe." B said, "If you look down our street where there are no trees and houses that aren't the nicest looking on the outside, you don't really get a good feeling about that street. So, I try to use my car and drive to where I need to be because I don't want to walk" (pers. comm., 2021). This suggests that safety is an issue on streets with fewer trees because there are less people outside which makes way for higher rates of crime.

B also mentioned having Carroll Park nearby, although she noted that sometimes it can get crowded as it is a popular space within the neighborhood. When talking about GI implementation, B brought up how the city was originally constructed a long time ago, making it difficult to find space to implement large GI projects. She said they would

like to see something happen with the vacant houses in the neighborhood as it would

make room for smaller, closer, recreational space, but understood that that is a large feat.

B was the first resident to mention cooling centers. B stated, "The city does provide

cooling centers, but just the way the city is set up makes it difficult to deal with the heat if

you don't live within walking distance to a cooling center or have the funds to have

central air" (pers. comm., 2021). B did not specify if she had ever used the cooling

centers, but she did talk about the presence of the cooling centers in the city.

6.3.6 B – Community Outreach and GI Implementation in the City

The next portion of the interview focused on GI implementation in the

neighborhood and methods of community engagement. Overall, B welcomes GI

implementation, but has experienced similar issues with maintenance as R and S had. B

was unaware if whoever came to install tree pits solicited the residents for their opinion

on the project but did know that some of the residents were upset and did not want them

installed. After the trees were planted, B said, "The saplings died because it was hot, and

no one ever came out to water them except like once or twice" (pers. comm., 2021). This

caused people to be even more upset because they then had empty tree pits or dead trees

in front of their homes that they had not wanted in the first place. B also brought up the

fact that tree pits, particularly empty ones, become a hot spot for people to leave their

dog's waste. In turn, dog waste attracts rats, which is another reason so many residents

within Baltimore are against the installation of street trees.

B has noticed a difference in the presence of street trees in Pigtown. Much like S,

there seems to be a divide in the neighborhood as some streets are fully planted out, while

others have little to no tree coverage. B said, "The difference is pretty drastic from street

to street in this neighborhood. You know, ask for other neighborhoods or areas of

Baltimore, I think we really lack trees here" (pers. comm., 2021). As for other

neighborhoods in Baltimore, B was aware of the greenery gap that corelates with a

wealth gap as well. She pointed out McElderly Park in particular as an area that really

lacked tree canopy coverage. She noted areas like Rolland Park and Hamden as spaces

that are clearly more socioeconomically privileged that have higher tree canopy coverage.

When asked what a greener Baltimore would look like, they wanted to see more

equitably distributed tree canopy coverage along with a few smaller, safer parks. Again,

as Baltimore is an already built-up area, it is hard to create large parks and implement

large GI projects. B was unfamiliar with the Tree Trust before this project but intends to

contact them in order to have trees planted on their street. B was familiar with Pigtown

Mainstreet before I invited them to participate in this interview but is not active within

the organization or signed up for their email list. B has always worked multiple jobs or

has been involved in school, so they did not have a lot of time to pursue things outside of

their daily obligations. B stated, "I never had time to go to the meetings. you know, life

gets in the way. Sure, there are things that I would like to bring up because I think they

should be addressed, but I just haven't found the time to go to the meeting" (pers. comm.,

2021). Outside of community meetings, B did not mention any other efforts they were

familiar with where NGOs or the city was soliciting community engagement for GI

planning projects. They mentioned they would have liked for the Tree Trust to flyer the

entire neighborhood in order to offer the opportunity for everyone to have a tree planted.

They never received flyers or any sort of door-to-door contact advertising the tree

planting project that was going on in the neighborhood.

6.3.7 J – The UHI Experience

The final interview I conducted was with J, an elderly resident of Pigtown whose son was able to set up our meeting. J did not request a tree be planted in front of their home through the Tree Trust; this interview was set up through different means of communication. J has been a Baltimore City resident for his entire life, living in different parts of East and West Baltimore. Their family has been in Baltimore for generations and their children are following suit as they now live in Pigtown. J moved in with his son and grandchildren a few months back, as living on their own was becoming too much to handle. They said, "I was living in east Baltimore, but it was too much for me on my own. My house was too much to take care of. You know, I'm old" (pers. comm., 2021).

As J has lived in the city for a long time, they were able to speak to the extreme temperatures in the summer. J said, "Oh honey, it's hot. It never used to be this hot though… A long time ago it was bearable, but now I can't stand to be outside in the summer" (pers. comm., 2021). J has also had asthma their entire life and now as an adult, a touch of COPD as well. The heat, in combination with the humidity, makes it incredibly challenging to maneuver through the summertime. Not only does J have breathing issues, but their eldest grandchild also suffers from childhood asthma too. J said, "She's had an inhaler since she was in elementary school. She's gotta be real careful of getting overheated and doing too much, especially when it's hot" (pers. comm., 2021).

J deals with the extreme temperatures much like every other resident does – her avoids them. J's family has central air conditioning, so they spend most of their time indoors. He talked about when he was raising his children, they did not have air conditioning and utilized the cooling centers that the city opens when it gets to be

extremely hot. He appreciated that the cooling centers were an option but expressed how his children found them to be quite boring as they are typically a rec center or a school gymnasium set up with tables, board games, maybe with a movie playing. J spends most of his time indoors, which has been difficult, especially during the pandemic. He said, "I've been inside for the past year and some change because of this pandemic, I at least wanna sit on my stoop. It's just so hot that I feel like I can't breathe so I have to go back in" (pers. comm., 2021).

6.3.8 J – Community Outreach and GI Implementation in the City

When asked about greenspace in their neighborhood, he also brought up Carroll Park and how it is a nice place to take their grandchildren to play. Carroll Park is close by and well maintained, making it a nice area to take their grandchildren. They mentioned how some of the smaller parks in the city are not as well maintained. They said, "The grass is all grown, it looks really ugly, there's probably rats. But Carroll Park is nice" (pers. comm., 2021). When asked about street trees, J had a different reaction than the other residents did. They were not a fan of street trees as they littered the street with flowers or leaves and some of them had a very strong, unpleasant smell. Previously, they had been burdened with street tree maintenance, which they did not agree to. J said, "You know, it was pretty to look at, but I didn't wanna take care of it. If the tree is in front of someone else's house, by all means, plant all the trees. I just don't want one in front of my home" (pers. comm., 2021).

Again, the presence of rats was brought up. J mentioned sitting on their stoop and seeing rats dig holes in the dirt in the tree pits where they would burrow. J stated, "Who wants to see rats in their neighborhood? Now I know it's not the tree's fault, but I just

don't want it in front of my home" (pers. comm., 2021). This was an important note as they were aware that the tree itself did not bring rats into the neighborhood, but the presence of rats in the tree pits were one of the biggest reasons they did not want to have trees planted in front of their home.

Maintenance issues were also discussed. Similar to R and S's interviews, there had been issues noted about street tree maintenance and whose responsibility it is to tend to the trees. This was noted for new trees that are planted and established trees that had been in the area for a long time. J discussed the issue with old trees as their roots buckle the sidewalks up. He felt this is a safety hazard for his grandchildren as they could trip and fall over the broken pavement and exposed roots. With younger trees that needed to be maintained, J said, "You know, no one asked me to take care of the tree in front of my home, it was there when I moved in, but it was my responsibility to take care of it" (pers. comm., 2021). He felt as if the money that had been spent on the installation of those trees could have been better spent elsewhere since no one was coming to take care of them, they ended up dying, and becoming a nuisance to the community.

When asked about the difference in GI provision through the city, J noted that discrepancies in targeted areas for GI implementation and development. They said, "It's no secret that them richer neighborhoods have more stuff" (pers. comm,. 2021). J pointed out Canton and Federal Hill as two areas that are well-kept, better developed, where high quality parks and an influx of money seemed to follow behind them. J feels as if the areas that have better quality parks and new development are not intended to serve long-time city resident such as himself and his family. J said, "They aren't really for us folk anyway" (pers. comm., 2021). When asked to describe what they meant, he asked me,

"Oh honey, do you live here?" (pers. comm., 2021) which was arguably the most sobering interaction I had the entire duration of this project. J described feeling like they were not welcomed in those spaces and that they were not intended for their use, but rather to attract wealthy, young newcomers into the area.

J and I discussed what a greener Baltimore would look like to him and if that is something he would want for his community. J was weary about street trees due to maintenance and responsibility issues in the past. For J, a greener Baltimore would include a denser concentration of smaller, well-maintained parks where they could take their grandchildren to play. A greener Baltimore would be greener everywhere, not just in places like Canton or Federal Hill or near the harbor. J expressed wanting a greener city for his grandchildren to grow up in where they could enjoy being outside.

Lastly, we discussed community engagement within the city. As J is an older resident, they had not gone to community meetings since the start of the pandemic. J does not have a lot of experience using technology, so he has not been able to attend the virtual meetings either. J gets most of their information either from their son who is pretty involved in the community or through word-of-mouth by talking to their neighbors and other active community members. Since the start of the pandemic, J has not spoken with anyone from the city directly and seems to like it that way. He said, "I don't hear no mumbo jumbo fancy talk, people around here tell it like it is and spread the word through casual conversation" (pers. comm., 2021). When asked if he felt like the city is doing a good job at seeking resident input and opinion, J said, "I guess, they might be doing a good job to get other people's opinions, but not mine I guess. But that's my fault too, you know" (pers. comm., 2021).

J discussed preferring "old school" methods of communication such as handing out flyers and getting into the community to talk to people in their neighborhoods. J said, "Hand out Flyers, ask questions, don't just post something on the Facebook and expect everyone to respond" (pers. comm., 2021). As an older resident that does not connect with the community online, the new-aged methods of communication do not work for him, presumably much like other long-time, older residents in the community. Along with this, J discussed the importance of including kids in the conversation around the environment. J said, "I think the kids are real important. I'm old, my opinion don't matter. What's going on in the world is just so crazy, I at least want my grand babies to grow up in a healthy environment" (pers. comm., 2021). Again, J circled back to wanting a healthy environment for his grandchildren to grow up in and enjoy.

This chapter has covered all eight interviews with representatives of two local NGOs (Pigtown Main Street and the Baltimore Tree Trust), two city government agencies (the Baltimore Office of Sustainability and the Baltimore City Department of Public Works), and four residents of Pigtown. Each participant was asked about their interpretation and experience of the UHI, the GI policies implemented to alleviate the issue, and the community outreach efforts within the planning process. The final chapter will conclude this paper by presenting an analysis of all findings from the research process. Results from the policy analysis and conducted interviews are presented to answer my research questions (See Chapter 1).

CHAPTER SEVEN

DISCUSSION OF FINDINGS

7.1 Vulnerability in Pigtown

This chapter will continue my research analysis by discussing my findings from the conducted interviews and the completed policy analysis in order to answer my primary research question: In Baltimore City, how does the uneven distribution of the UHI differently affect socially vulnerable residents of the Pigtown/Washington Village neighborhood and those in positions of power based on their level of involvement in the sustainability planning and implementation processes?

Upon conducting the interviews, I concluded that while Pigtown is located within the UHI and has a moderate vulnerability level according to the DSL, it should not be considered a contemporary socially vulnerable neighborhood. There are certainly socially vulnerable residents, but Pigtown as a whole is not a socially vulnerable neighborhood like you may consider other areas of the city. As different forms of investment come into the city and overall socioeconomic characteristics progress towards middle to upper class levels, the neighborhood as a whole becomes less socially vulnerable. This creates a polar gap between the most advantaged and disadvantaged residents within Pigtown. As the socioeconomic minority, socially vulnerable people are going to be faced with a harder time navigating the newly developed neighborhood as social services and opportunities for assistance will surely deplete over time.

When speaking with S, she said "I am not the disenfranchised one," (pers. comm., 2021), prompting a conversation about vulnerability in the neighborhood. S pointed out Cross Street as the barrier between the middle to upper income and lower income residents in the neighborhood. Depending on where you are in Pigtown depends on the type of infrastructure, businesses, and also tree canopy coverage you see. Kim mentioned Pigtown's census data keeps progressing with higher income levels and greater levels of investment within the neighborhood. She spoke about investors coming in and buying properties in cash to rehab the home and sell it at a high price point. This is the behavior that is typically seen when a neighborhood goes through the beginning stages of gentrification; investors purchase homes at a low price, rehab them, and sell them to middle-to-upper class people. This calls for sustainability and green infrastructure planning to be mindful and protective of the city's most vulnerable residents as these planning processes often inequitably and negatively impact socially vulnerable populations the most.

7.2 Resident Experience of the UHI

The first of the subordinate research questions I answered was: How do residents in Baltimore City's Washington Village/Pigtown neighborhood experience the uneven distribution of the UHI and the policies created to alleviate the issue? This subsection will explore the first portion of that question focusing on the resident experience of the UHI. As stated earlier, Pigtown is located within the UHI in Baltimore City which effects anyone no matter what their vulnerability level may be. The most common response from participants was avoidance. People do their best to avoid the heat by staying indoor in the

air conditioning, choosing to drive to work rather than walk, and keep the curtains drawn in their homes.

All interview participants had central air conditioning in their homes, which is surely not the case for every resident in Pigtown. This allows for people to escape from the heat in the comfort of their own homes, eliminating the need to travel to cooling centers. J was the only resident that spoke about utilizing cooling centers, but this was in the past. S, B, and R spoke about the modification they make to their mode of transportation when temperatures rise. Typically, both S and R walk or bike to work, but when it is too hot, they choose to drive their cars instead. S stated that they share a car with their partner, making it even more difficult when both of them need to use it. While using your car may help you escape from the heat, the heat produced from motor vehicles contributes to the UHI. S talked about keeping her curtains drawn in the summer to prevent the sun from peeking in and heating up her home. This, in combination with generally staying indoors to avoid the heat, contributes to a lack of social cohesion that every participant noted during their interview.

As more people are staying indoors to beat the heat, fewer neighbors are out and about, interacting with the community. During the community engagement process of creating the 2019 Baltimore City Sustainability Plan, 1,200 residents were surveyed on their ideas, needs, and visions for the future. The first question was "What do you like most about your neighborhood?" Across all races and age groups, the most overwhelming response features "neighbors," appearing in 36 percent of responses (CoS, 2019, p. 25). A strong sense of community cohesion and Baltimore's walkability were some of the most championed aspects of the city. All residents I spoke with supported

this claim but noted that the heat and a lack of greenery impacted how often they interact

with their neighbors. As each resident lives in a row home in Pigtown, they talked about

sitting on their stoop and talking with their neighbors as a regular part of city living.

Early on, R mentioned the "symptoms of a lack of trees," such as sour smelling air, a lack

of shade, and an overall unpleasant look of their street. B seconded that when they talked

about streets with fewer trees giving off a "bad vibe," making them less inclined to be

outside in those areas.

B and J discussed elderly residents and avoiding the heat. When B was younger,

they had an elderly neighbor who had COPD and was on oxygen. B used to go shopping

for her and bring in her groceries as it was too hot and too dangerous for her neighbor to

be outside. J mentioned that they have asthma and COPD, making it harder to be outside.

J said "I'm too damn old to be out in that nonsense… I've been inside for the past year

and some change because of this pandemic, I at least wanna sit on my stoop. It's just so

hot that I feel like I can't breathe so I have to go back in" (pers. comm., 2021). Being

involved in the neighborhood is something you typically see in the older generation,

especially with those that are unfamiliar with using the internet and social media. The

word-of-mouth network is strong in Baltimore City, and people staying inside to avoid

the heat greatly effects its strength.

7.2.2 Resident Experience of Urban GI

This subsection will explore the second portion of the first subordinate research

question, focusing on resident experience of urban GI. When residents were asked how

they felt about GI implementation, there was a generally positive response. Parks were

championed from all resident interviewees, particularly small, pocket parks. All four

residents mentioned Carroll Park, a large park in Pigtown, as a generally clean, well-maintained park in the area. People felt that GI and greenspace were great assets to the community but felt weary when it came to maintaining street trees and greenspace that have been implemented in their neighborhood.

Issues associated with street trees include maintenance responsibility, sidewalk disrepair, tree litter, and the presence of rats. All resident interviewees had personal encounters where maintenance of street trees was questioned. They all asked, "whose responsibility is it to care for these trees?" Particularly when the trees are newly planted, they need a lot of care and attention. More often than not, an organization came in, tore up the sidewalk, planted a tree, and only came back to water it once or twice, if they ever came back at all. S and R said their partners and their neighbors had watered the trees a few times. It was noted that no one had a problem doing this, but they would have liked to have been told that this would now be their responsibility. J had similar feelings in the past when he became responsible for taking care of the tree that was out front of his home when they had moved in. The tree was there before they were, but they had to assume the responsibility of maintenance keeper of the tree as no one else was taking care of it.

Even though the resident is responsible for taking care of the sidewalk in front of their home, sidewalks are still considered the city's property. Residents noted issues with the roots of street trees buckling sidewalks causing them to crack. J talked about buckling sidewalks as a safety hazard for their grandchildren and another reason as to why they were against street trees. This is not only a safety hazard for people walking by; but residents may also get hit with the repair bill. This is something the Tree Trust has been

working to change as Bryant mentioned their efforts to stop the city from billing the resident when tree roots damage the sidewalks.

Tree litter was another reason residents may be less inclined to want a tree planted outside their home. J strongly disliked flowering trees for the litter that they created. Not only did the fallen flowers create a mess, but some tree flowers also give off a very unpleasant smell making it more difficult to deal with. When I went into the neighborhood with the Tree Trust to hand out flyers and mark concrete, one neighbor originally did not want a tree planted in front of her home. She did not want flowers all over her car and on her sidewalk. Once she heard about the benefits of street trees and that she was able to pick the tree species, she changed her mind. This resident opted for something tall and shady as she had a young grandson that often played in her front yard. She mentioned how hot it would get in the summertime and that she would appreciate a tall, leafy tree to shade her front yard when her grandson wanted to play. The Tree Trust did offer multiple species for residents to pick from when they signed up to have a tree planted in front of their home. Residents could pick from tall and shady trees to flowering trees, giving them a wide variety of options. Species selection is an important part of the tree planting process as it includes the resident and allows them to pick something that suits their needs.

The presence of rats was also noted as a reason against the implementation of street trees. J had talked about sitting on his stoop and watching rats carry trash into their burrows they dug in the tree pits. While he noted this "was not the trees fault," it was a good enough reason to be against street trees in front of their home. Again, while I was in Pigtown I had a run-in with another neighbor who had talked about a similar situation

with rats. This resident felt very strongly about the presence of rats and their association with street trees; strongly enough to call on her neighbors to refute the Tree Trust from installing anymore trees on the entire block.

When asking the residents if they have noticed a difference in the presence of GI such as tree canopy percentage and access to public greenspace, all resident participants said yes. Residents pointed out areas of Baltimore City such as Hampden, Canton, Fells Point, and the Inner Harbor as places that have better GI provision, but also as places that see higher amounts of investment and development. S stated, "it's pretty obvious like the wealthier areas have more trees." J stated, "it's no secret that them richer neighborhoods have more stuff." R talked about considering selling their home and moving to a different neighborhood in Baltimore due to the lack of trees. They said, "They're not necessarily parts of the city I want to live in, it's just, like I wish I could copy and paste a bunch of trees into Pigtown." B noticed, "When you compare those areas, typically the richer areas, with neighborhoods like McElderly Park, you can really see the difference," when talking about tree canopy coverage. As noted earlier, residents do have Carroll Park within Pigtown, which everyone has praised. It is predominantly the presence of trees and other small GI projects that people have noticed a shortage of throughout the neighborhood.

J was the only resident I spoke with that mentioned feeling unwelcome in newly developed spaces. They said, "It's like you got all these young professionals with their fancy jobs that move in and the parks and money followed behind them. Then you got these poor families that have been here forever, like my momma and her momma, in East Baltimore that don't have nothing. There might be some trees or some open space, but

nothing like in those fancy neighborhoods. They aren't really for us folk anyway" (pers. comm., 2021). While J recognized that there are trees and some sort of open spaces in their neighborhood, its nothing like what is provided to wealthier neighborhoods that have been redeveloped over the years. When asked to explain what he meant by "They aren't really for us folk anyway," he asked me, "Oh honey, do you live here?" (pers. comm., 2021), and described not feeling right when in those new spaces as if they were not designed with them and the original residents in mind. This interaction made me stop and really think about my position as the researcher in this study.

As a 23-year-old, white, female, graduate student that lives outside of Baltimore City, it is important for me to understand and reflect on the fact that I do not know what its like to live in the city, live in an UHI, or the way residents experience greenspace and other forms of GI. This is not only important for me as someone who is researching a population, but it is important for other people in similar positions to me and in positions of power. It is so important for planners and those coming into the city from an outside position to be mindful of the resident and how they experience things differently than we do. The residents are the experts on the subject and should have their thoughts, feelings, opinions, and wants amplified by the researchers or the planners that are coming in to make a change since the change is going to affect the residents.

7.3 City Agencies Approach to Urban GI

The UHI and a lack of greenery clearly disrupts the lives of Pigtown residents in a multitude of ways. This project focused on GI project and policy implementation for UHI mitigation purposes, which brings me to my second subordinate question: a.   What types of UHI mitigation and GI implementation policies do different stakeholders such as

residents and city agencies want to see in their communities? This subsection will focus on how city agencies, including city government bodies and city NGOs approach GI for UHI mitigation in Baltimore.

Before the research process started, a policy analysis of the 2009 and 2019 Baltimore City Sustainability Plan's was performed to better understand the current GI and UHI mitigation strategies (See Chapter 5). It was clear from the policy analysis that there had been a shift in focus from environmental sustainability to social sustainability, particularly from an equity lens. After speaking with Aubrey and Meghan from Baltimore City, the shift towards equitable planning, specifically equitable GI planning, was even more apparent. After talking with Aubrey and Meghan, I gathered that the city government acknowledges the pertinent need to implement more equitable planning initiatives, but the tangible foundation for those projects are few and far between.

Both Aubrey and Meghan mentioned their organizations, the Baltimore Office of Sustainability (BoS) and the Department of Public Works (DPW), are incorporating equity into their plans, but running into some feasibility issues along the way. As an already built city, there is not a lot of space to implement LGIPs, or small GI projects for that matter, unless you implement them on private property or tear down existing structures. Meghan's office implements GI on strictly public property, so they are quite limited when it comes to space. Aside from street trees and rain gardens that may only take up a few squares of sidewalk, there is limited space for new, larger GI projects in the city. Tearing down existing structures to build parks and new greenspace may sound like a viable option, but limited funding hinders these projects from getting off the ground.

Aubrey discussed limited funding and the allocation of funds as one of the larger obstacles the BoS faces when it comes to community planning.

Particularly when it comes to UHI mitigation, there is a noticeable lull in current planning initiatives. After speaking with Aubrey and Meghan and completing the policy analysis, I have concluded mitigating urban heat and the presence of the UHI is not one of the top priorities within the Baltimore City Planning Department. Both Aubrey and Meghan discussed the presence of the UHI as a viable issue that needs to be addressed but were transparent about the lack of planning initiatives happening that directly target the problem. Aubrey mentioned that there were currently no UHI mitigation efforts going on in Pigtown. Meghan said there were no plans for GI implementation in Pigtown either. While the city does open cooling centers and publish information on how to beat the heat when it gets to be over a certain temperature outside, mitigating the root of the problem is not on the city's agenda; not just in Pigtown, but across the city.

The staff is aware that extreme heat is a problem, but policy and green infrastructure implementation are not designed to address these issues. While green infrastructure is a multifaceted tool and serves the community in multiple ways, including heat mitigation, its main function within Baltimore is stormwater management. Both Aubrey and Meghan acknowledged the presence of the UHI and the importance of policy implementation and mitigation strategies that alleviate the issue, but both interviewees also acknowledged the lack of focus on the UHI and extreme heat in current planning and green infrastructure efforts.

Aubrey suggested that the city needs to adopt an extreme heat mitigation plan that solely plans for extreme heat and mitigation strategies, but that is not something that is

currently in the works in the planning department. Government agencies recognize the UHI as a public threat, particularly to socially vulnerable populations, but are lacking targeted mitigation strategies within policy implementation. As someone who works on GI implementation in the city, Meghan was well aware of the UHI and the effect extreme heat has on the city but is using GI implementation strictly for stormwater management purposes. She recognized that GI is a multifaceted tool that can address multiple issues such as extreme heat and stormwater, but DPW first and foremost view GI implementation through a stormwater management lens. While the city does utilize GI implementation and recognize its ability to mitigate the UHI, it primarily functions as a stormwater management tool. The policy analysis resulted in similar findings. As the 2009 and 2019SPs discuss GI as a tool for mitigating environmental disamenities, mitigating the UHI and extreme heat through GI implementation are not direct areas of concern.

On the other hand, talking with Bryant from the Tree Trust framed the UHI as a much more pertinent issue that needs immediate attention. Bryant discussed the purpose of the Tree Trust as an organization that restores the tree canopy to mitigate environmental disamenities such as the UHI, particularly in socially vulnerable neighborhoods. Bryant's organization's entire purpose is to restore the tree canopy in the city through GI implementation, making them a great asset for this project and for the city in general. The Tree Trust is its own entity working to restore the urban forest and address one of the most serious public health issues Baltimore City faces, exposure to extreme heat.

While city government agencies may not be focused on the UHI and mitigation strategies, Bryant and his team are going to great lengths to use GI as an UHI mitigation tool in an equitable way. There is a disconnect between the Tree Trust and the city when it comes to the priority level they assign to the issue of the UHI, which makes the Tree Trust an important part of Baltimore's UHI mitigation strategy. Where city agencies may be lacking, the Tree Trust has been able to step in and alleviate some of the issues associated with a lack of trees and extreme heat in the city. The Tree Trust was the only group I spoke with that was aware of the UHI and currently engaging in efforts to alleviate the negative effects associated with extreme heat.

Within Pigtown, the difference in tree canopy percentage varies drastically from street to street. Pigtown Mainstreet is aware of the issue but does not engage in any work to directly mitigate the UHI. It is important to recognize that their sole purpose is to plant trees in Baltimore. Pigtown Mainstreet's mission is to "enhance the commercial corridor by improving the aesthetics, promoting branded events, connecting community institutions and protecting the Pigtown identity" (Pigtown Mainstreet, n.d.). Their main goal is not to green the community or participate in planning initiatives, so they should not be faulted for this being the first greening project their have taken part in. Thus, when they were awarded a grant from the Chesapeake Bay Trust, Pigtown Main Street contracted the Tree Trust to plant trees in the neighborhood since they have the tools and manpower to do so. This was something that Pigtown Main Street had imposed on the community since they received grant funding for the trees; this was not something Pigtown Main Street asked the community if they would be interested in before the project took place.

The city agencies on the other hand, as those with the power to implement change, have neglected to remediate the UHI and its effects on city residents. Agencies recognize that the UHI is a deadly public health threat but have yet to produce anything in policy or practical planning that addresses the issue head on. This stance comes from a place of power as other issues may seem more important to address from a planning perspective, which differs greatly from the perspective of residents who live in and deal with extreme temperatures and the uneven distribution of tree canopy.

7.3.1 Residents' Wants for Urban GI

When asked about what types of new greenspace they would like to see installed, a larger number of smaller parks was discussed. The reasoning behind this was primarily proximity. J has grandchildren and they want to see closer, safer spaces where their grandchildren can walk to and play. B mentioned installing smaller parks, especially in neighborhoods where there is not a lot of greenspace or recreational areas. The notion that there are small parks within Baltimore that already exist and are considered unsafe and not well-maintained came up in discussion as well. Residents liked the idea of smaller, accessible parks, but wanted them to be held to the same safety and cleanliness standards that a LGIP would be.

The other type of GI participants wanted in their neighborhood was trees. This was a touchy subject for some as there have been maintenance issues associated with trees in the past, but the most resident participants championed street trees and wanted them in their neighborhood on their street. J was the only resident that was unwelcoming to the idea of a street tree in front of their home. As J is an older, long-time resident of Baltimore City, they have had many run-ins with street tree implementation issues in the

past. While the other residents have had similar issues, J was the least willing to give it another chance as the trust between the organization that planted the tree and himself had been broken one too many times.

7.4 Just Green Enough and Equitable Greening in Baltimore City

When speaking with the NGOs and the city government employees there was no mention of the JGE or EG approach or similar planning approaches. The JGE approach call for calls for the planning process to be protective of resident's needs and demands, creating small green spaces, and affordable housing within close proximity, reducing the chances of green gentrification (Curran & Hamilton, 2012). The city does implement means of affordable housing as they are addressed in the 2019 Baltimore City Sustainability Plan (BoS, 2019, p. 61-64), but the plan makes no mention of providing affordable housing near redeveloped or newly implemented greenspaces to prevent green and environmental gentrification.

The EG approach calls for an advancement of the JGE approach by including the voices of residents in order to ensure new parks fit their needs and reflect their culture rather than being designed as 'tourist-oriented parks.' EG should include the provision of affordable housing near new and redeveloped greenspace, agency leadership staff that accurately reflects the city's ethnoracial makeup, adequate community outreach activities, and greenspaces that provide a welcoming atmosphere to long-term neighborhood residents. (Rigolon et al., 2020). As mentioned previously, affordable housing is not provided near new and redeveloped greenspaces. Some city agencies do reflect the ethnoracial makeup of the city, particularly the Tree Trust. However, this is one small NGO in the grand scheme of public and private environmental agencies

working within Baltimore City. As for community outreach that produces welcoming greenspaces that reflect the wants of the community, the NGOs and city government employees do conduct community outreach, but it is not an extension of the JGE or EG approaches, it is simply an important part of an overall thorough planning process. Resident input is a crucial part of the planning process to avoid the outcome that J described. J's testimony speaks to the importance of conducting adequate community engagement that truly reflect the desires of the preexisting community to protect native residents from unintentional negative consequences from GI implementation.

7.5 Community Outreach for Urban GI Planning

If the JGE and EG approaches to sustainability and GI planning are not utilized in Baltimore, then what is? This brings me to my last subordinate research question: What sort of approaches are utilized by Baltimore City's government and nonprofit organizations to involve the community in the sustainability/GI planning and implementation processes?

I spoke with residents, NGOs, and city government employees about community engagement and the types of strategies that are utilized in Baltimore City. When talking with Kim, Bryant, Aubrey, and Meghan, it was clear that the pandemic had put a strain on the forms of community engagement that are utilized by their agencies. Across the board, agencies typically attended community meetings, handed out flyers, and got into the neighborhoods to talk to residents in their native settings. In the case of the pandemic, most of that face-to-face engagement had been moved to an online setting, eliminating certain groups from participating in those conversations. Community meetings were held

virtually, neighborhood associations did not meet in person, and city agencies limited their time spent on the ground in the community.

Kim noted that for this tree planting project, they were advertising to only homeowners in Pigtown that were signed up on their email list. This limited those that were offered the option to have a tree planted as it cut out renters and those that were not signed up to receive emails from Pigtown Main Street. Advertisements were also posted on their social media accounts, but again only reaching people who are already connected through social media and using the platform to begin with. When the Tree Trust was marking concrete for this project, they also flyered portions of the neighborhood. If a tree was being installed in front of one home, that home and the two neighboring properties would receive a flyer in their mailbox. The Tree Trust also traveled outside of the homeownership zone which did give some renters and other neighbors the opportunity to request a tree and be a part of the project.

When talking to the residents, S and R had signed up for a tree to be planted in front of their home. Both of them had heard about the project through the email that had been sent out from Pigtown Mainstreet. B was not signed up to receive emails, therefore had never heard about the project and missed out on the opportunity. B also expressed wishing that the Tree Trust would have flyered the entire neighborhood to spread the word and reach more people. J, who does not use the internet at all, was unaware of the project as well.

Outside of the tree planting project, both Aubrey and Meghan shared how their organizations reach out to the community to get them involved in the planning process. Aubrey stated that community meetings were the biggest way that they met with the

public. She also said that since they had moved to a virtual setting, they had been having better turn outs than they did when they were held in person. Meghan had similar things to say regarding community meetings as DPW utilized the same techniques. Meghan did point out that even though people attend community meetings, they may not be listening to what you are talking about and planning for the city. She said, "Normally people don't really pay attention unless they're mad about something."

Both Aubrey and Megan talked about including the resident in the planning process from the beginning by talking to residents in their neighborhood and hearing about what they want to see happen in their neighborhoods. Meghan had talked about equitable engagement and how her office prioritizes areas for planning projects. She said, "We're also looking to prioritize areas and opportunities in the city where there is a lack of investment or are bigger health risks or these people could benefit from having these facilities." Aubrey discussed equity in the BoS. She discussed the 2019SP that heavily focuses on equity and viewing sustainability planning through an equitable lens.

Both also discussed the importance of the word-of-mouth network as community leaders are often the ones that spread news around the city. Aubrey said, "Neighbors tell neighbors and family members and stuff so sometimes it's a really matter of knowing who is such a strong community leader and advocate for a ton of people. This way you know you can reach out to them and then they'll spread the word, and so you know, we usually do this around like community-based events" (pers. comm., 2021). Meghan said, "the word-of-mouth network has definitely been very successful" (pers. comm., 2021), showing how important this mean of communication is in the planning process. City

agencies are aware that there are community associations and institutions that really care about the neighborhood and are tapped into what is going on.

As discussed earlier, the word-of-mouth network falls flat during the summer when it is too hot to be outside and talk to other residents. J mentioned not getting his community news from social media and the internet but getting it from other residents and his neighbors. When social cohesion is affected, there is a butterfly effect that touches so many other things. The word-of-mouth network loses its strength when people are staying inside because it's too hot and not communicating with one another in passing. Each resident I spoke with felt as if the extreme heat impacted their sense of community cohesion and how often they found themselves interacting with their neighbors. This walkable, outside friendly city that keeps residents connected becomes a stagnant when temperatures increase, negatively impacting the word-of-mouth network that that city government agencies so heavily rely on to spread the word.

City agencies and the NGOs use a mixture of community engagement techniques to get people involved, but what is lacking is the communication during and after the implementation process. The 2009 and 2019SP are very community informed, but the physical planning initiatives implemented by the city and NGOs are lacking in means of follow up communication. When it came to asking residents about how they have interacted with any of these agencies, most of the answers were similar; after the initial communication concluded, there was none.

For example, the tree planting project in Pigtown engaged residents in the very beginning of the process as Pigtown Mainstreet had sent out emails letting people know the Tree Trust would be planting trees in the neighborhood. If residents signed up for

trees, there was no other form of communication letting them know whether a tree was coming. Both S and R had signed up to have a tree planted but neither of them received one. Neither of them was informed why they were not selected to receive a tree but did notice that there were newly planted trees in the neighborhood. Both R and S stated they wished there was more communication between the Tree Trust, Pigtown Mainstreet, and the residents to let them know what was going on with the project.

All residents I spoke with brought up maintenance issues as one of their biggest concerns with not only this tree planting project, but tree plantings over time within Baltimore. For this project, the Tree Trust had promised to maintain the tree for the first two years which included watering and pruning them. Residents had noticed that tree pits were installed, and trees were planted, but only saw people come out to water them maybe once or twice, making it the residents responsibility to care for the new trees. Both S and R said they would not have had a problem with this, they just wanted to be made aware that they would have to pitch in to tend to the new trees before they were actually planted.

B and J did not request trees either because they were either unaware, they were able to or they just did not wish to have one planted, but both spoke about maintenance issues with tree keeping in the past. J had moved into a home with a tree out front where they were responsible for sweeping the sidewalk when the flowers fell. Much like S and R, they said, "A lot of the times when a new tree is planted, it dies, you know. No one comes to water it or trim it or take care of it. Then they end up dying. That's money that could have been used on something else and now it looks ugly, earlier than it did before." B had also experienced maintenance issues in her neighborhood in years past as an

organization came in, ripped up the sidewalk, planted trees, and never came back to water them. Neighbors were not only upset that their sidewalks were ripped up, but that they now had dead trees in their pits which looked worse than when there was no tree at all.

The real issue with community engagement in Baltimore is not asking what people want and communicating in the beginning, it is following through with planning promises and communicating throughout the entire process. Aubrey had talked about the problem of over surveying the community which leads to overpromising. She described this fatigue around the planning process where people had been over surveyed and over promised that development or these projects were coming but then end up falling through. She said, "You don't want to over survey or over engage communities because they're not going to trust that anything will come" (pers. comm., 2021). Residents are constantly asked "what do you want, how can we help, etc.," but then their answers go unnoticed, or plans take a different direction, leading to feelings of frustration and distrust towards the city and other agencies. Communication throughout the entire process to keep residents informed, updated, and included is crucial to planning a successful project.

This leads me to answer my primary research question: In Baltimore City, how does the uneven distribution of the UHI differently affect socially vulnerable residents of the Pigtown/Washington Village neighborhood based on their level of involvement in the sustainability planning and implementation processes?

As stated earlier, Pigtown is not considered a socially vulnerable neighborhood, but it is a neighborhood home to some socially vulnerable residents. However, residents and their lived experiences are affected by the UHI regardless of vulnerability status. As

UHI mitigation efforts really do not exist in Pigtown aside from small tree planting

projects, resident involvement in the UHI mitigation planning process is minimal. The

lack of planning efforts around extreme heat mitigation have fostered environments that

are physically, psychologically, and socially harmful to neighborhood residents. The

sustainability planning efforts carried out by both the city government and local NGOs do

include community outreach but are seriously lacking in long-term communication

between those in positions and power and neighborhood residents. Placing the resident in

the center of the planning process and providing the resources and support they need to

endure the UHI is a crucial part of ensuring equitable engagement opportunities and GI

provision, strengthening the community from one tree at a time.

Figures

Figure 1

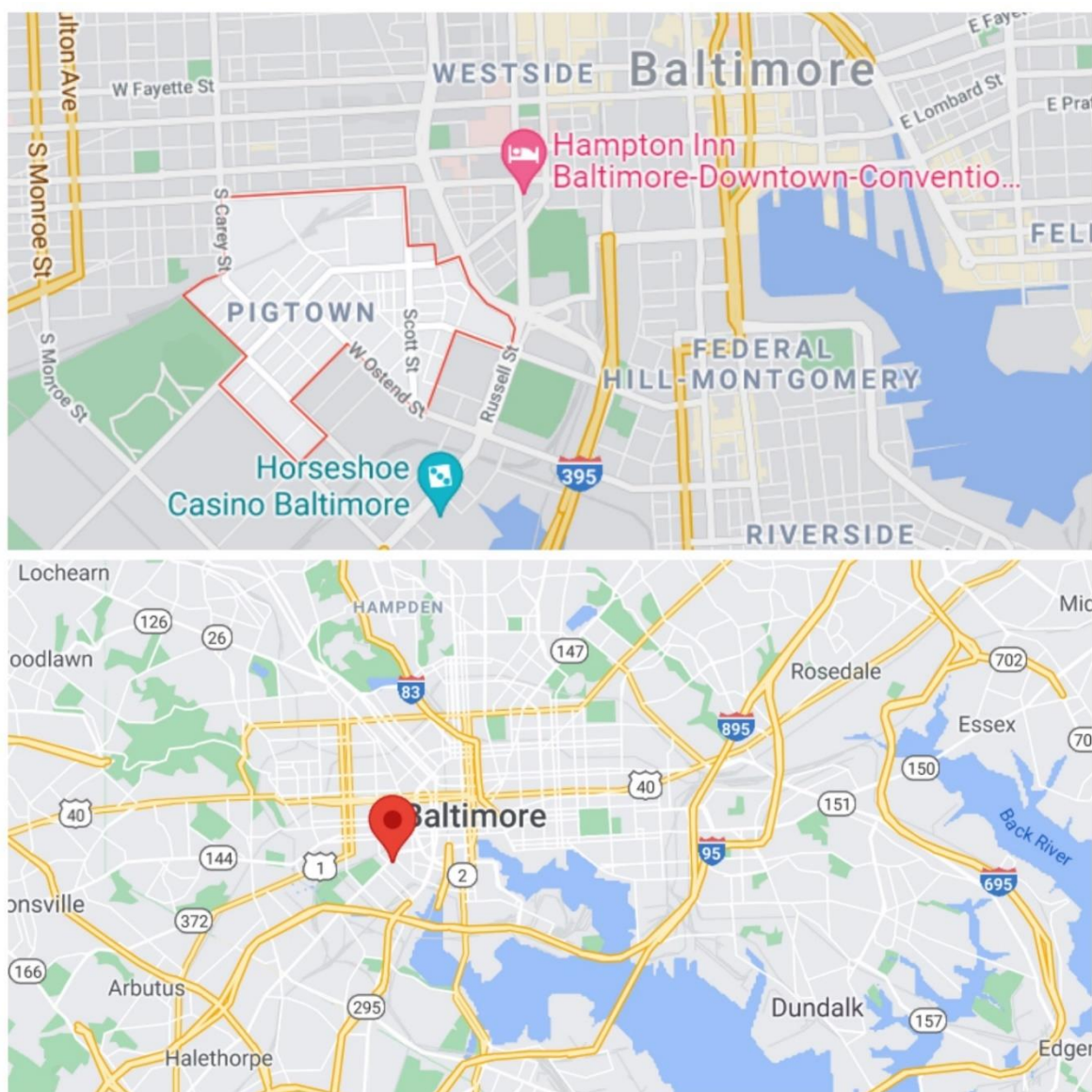*Map locating the Pigtown neighborhood in Baltimore City*

Figure 2
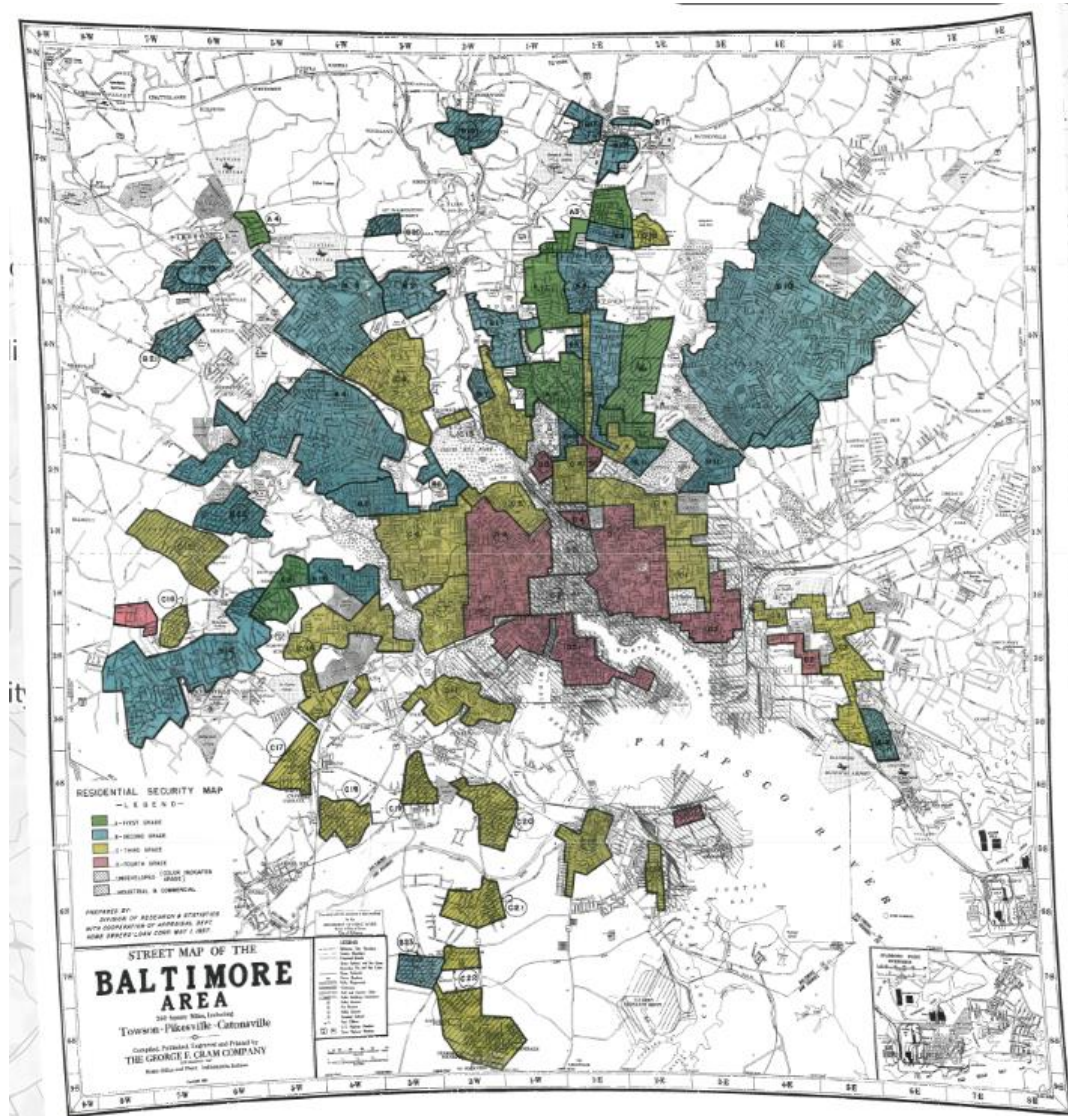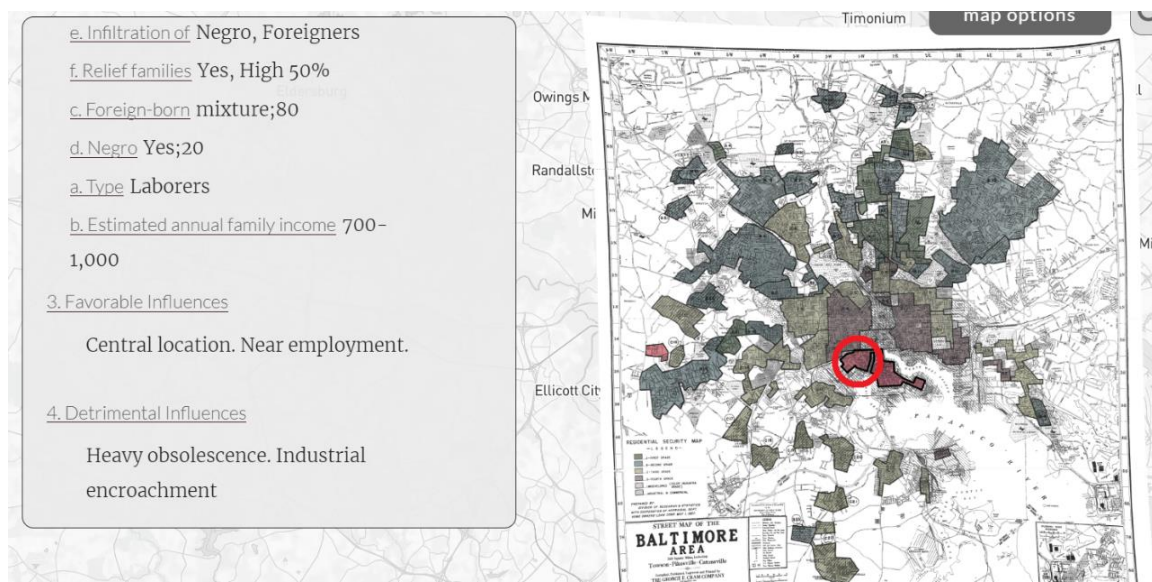
Redlining map of Baltimore City

Figure 3

Redlining map of the D5 district where Pigtown is located

Figure 4
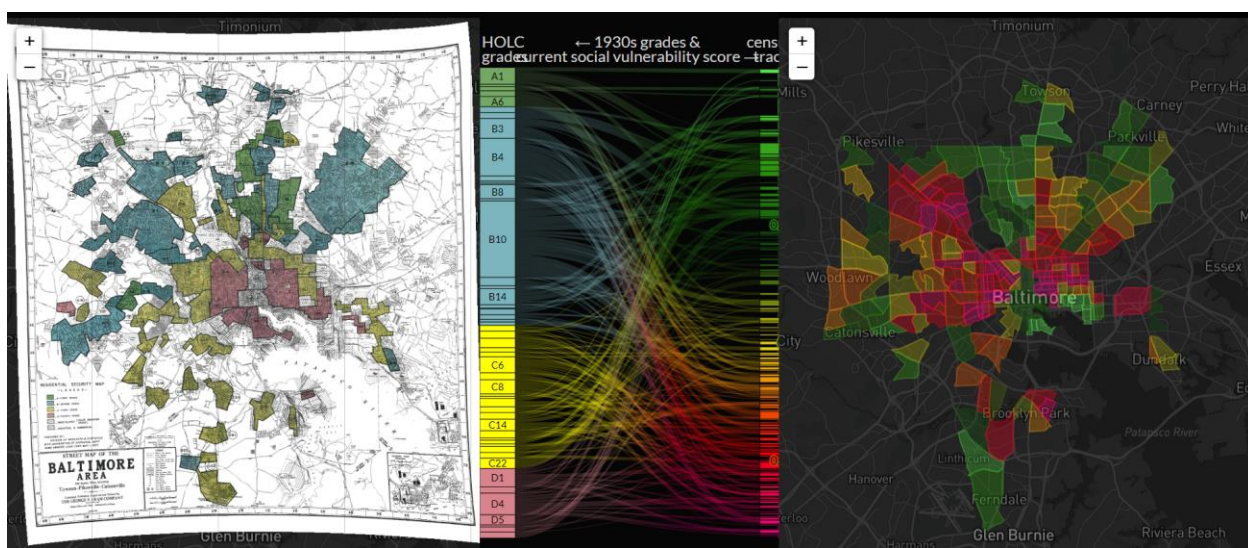
Social vulnerability and redlining maps

Figure 5
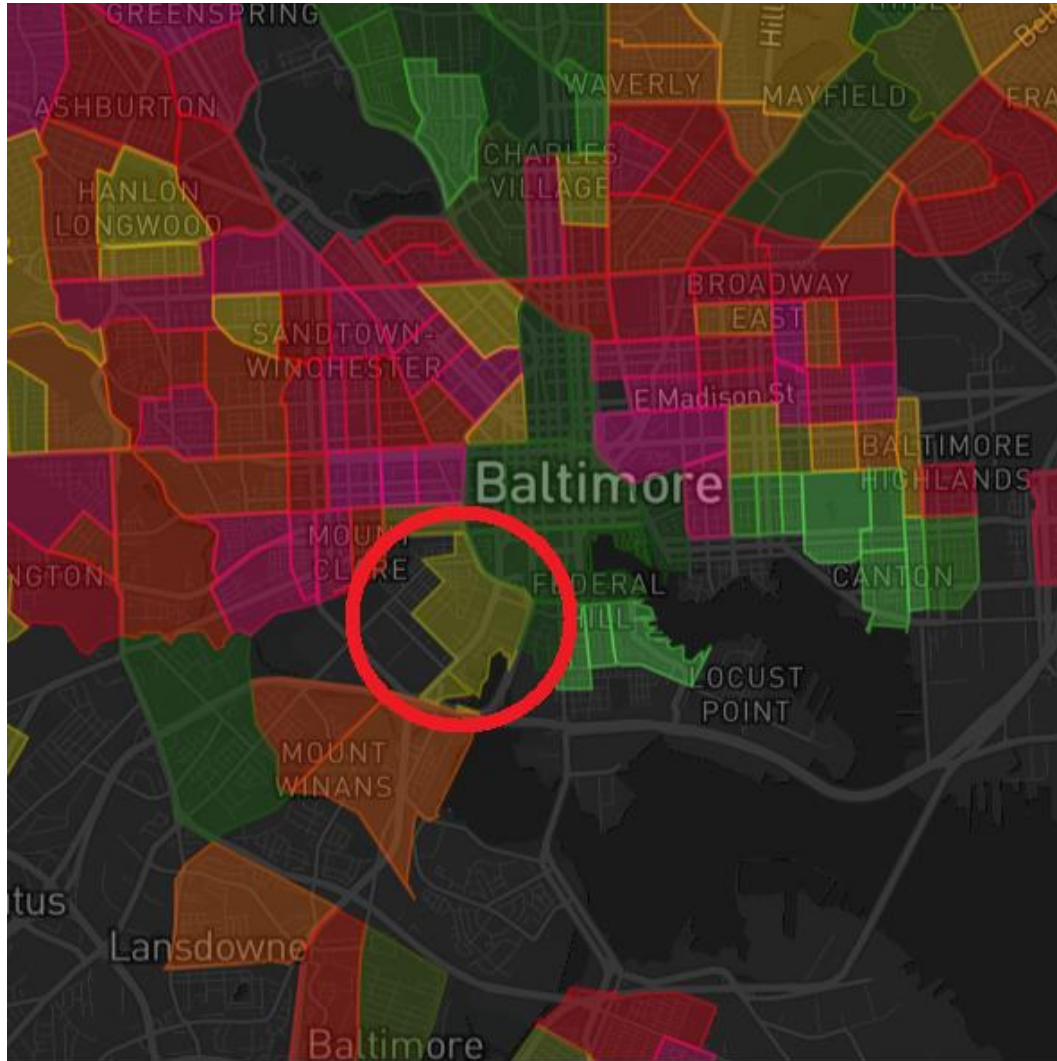
Social vulnerability grade - Pigtown

Figure 6

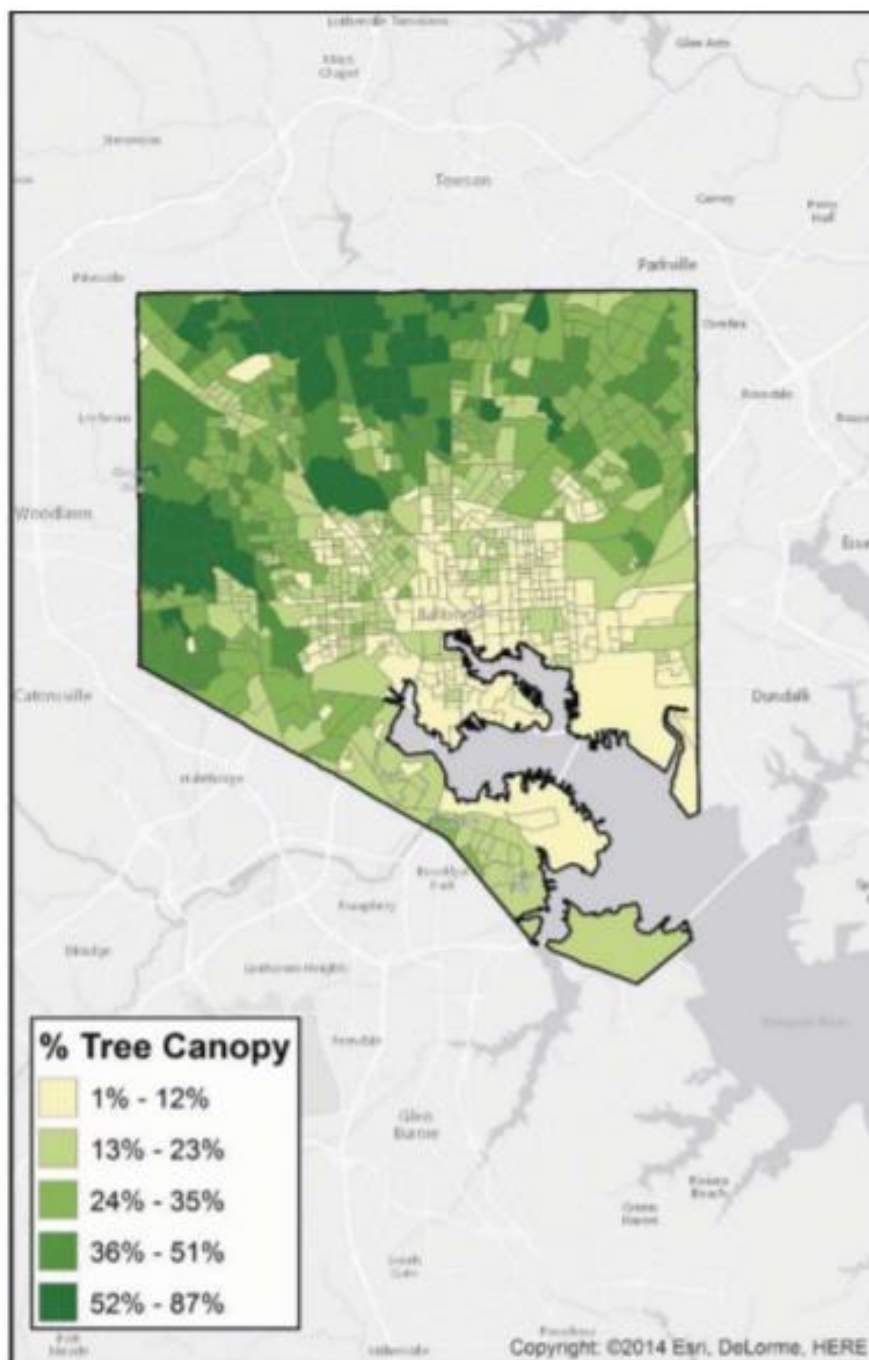*Tree canopy percentage map of Baltimore City*
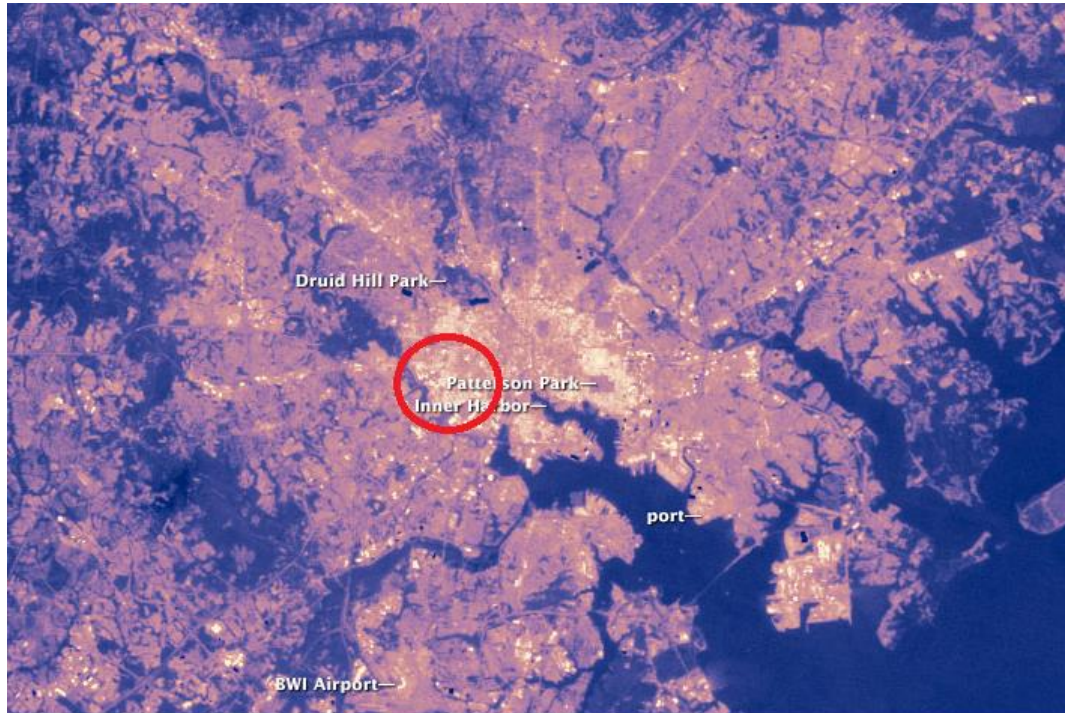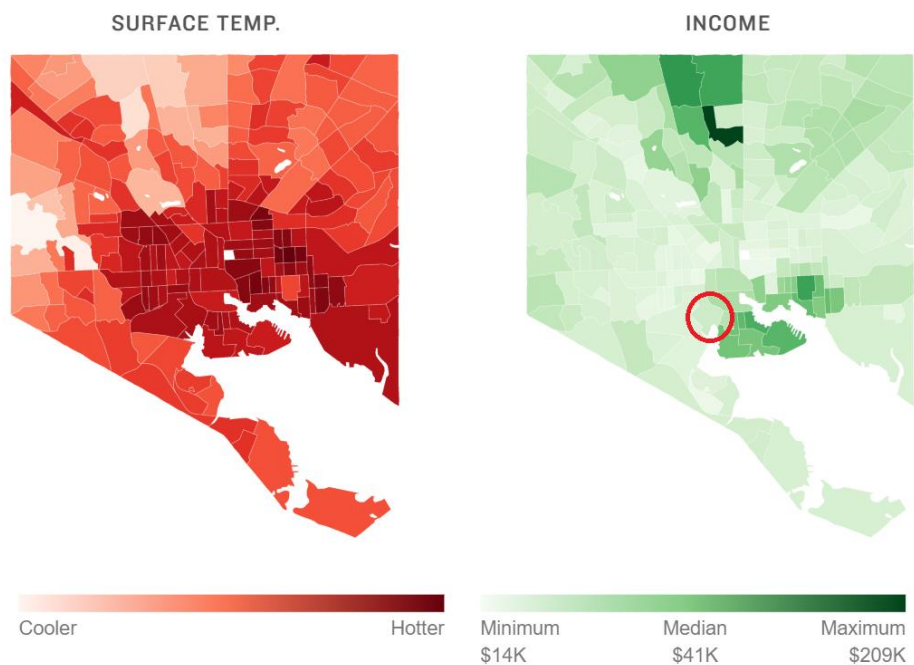
Figure 7

UHI map of Baltimore City

Figure 8

Surface temperature and income level maps of Baltimore City

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Appendix A: Baltimore Tree Trust Flyers

COMING SOON

SIDEWALK TREE WELLS

Your neighborhood and the Baltimore Tree Trust are teaming up this season to help foster a greener and healthier streetscape in your community!

This is a notice to inform you that you will likely see contractors removing concrete in the public space out front of your property in the next few weeks to make room for new street trees.

If you have any questions or concerns, please leave us a detailed message, including your name and address, using one of the following:

PHONE: (410) 861-0784
EMAIL: info@baltimoretreetrust.org

What You'll See

One of the Tree Trust's Community Foresters planting a street tree in a new sidewalk well. If you see white spray paint markings on the sidewalk, like what is shown in the diagram, that means a tree is coming soon!

Appendix B: IRB Approval

IRB Protocol Approved [Inbox]

Kuali Notifications Apr 16
to me

The Initial submission of protocol #1428, "Investigating Pigtown Neighborhood Residents' Experiences of Green Infrastructure and Urban Heat Island Effect (PI: Trionfo, Sydnie Morgan)" was Expedited approved on Friday, April 16th 2021 by the Towson University IRB Committee.

If your protocol was approved as Expedited, you must submit a continuing review application. Please submit a continuing review application on no date provided. The protocol will expire on Tuesday, April 16th 2024 unless the expiration date is extended in the continuing process.

If you should encounter any new risks, reactions, or injuries to subjects while conducting your research, please notify IRB@towson.edu. If you require changes to your current protocol, please submit an online amendment in Kuali Protocols. Should there be substantive changes in your research protocol, you will need to submit another application.

If you have any questions or concerns about this notice, please contact the IRB at 410-704-2236

PROTOCOLS   kuali ⬤

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Protocol   Activity Log

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IRB: #1428 Investigating Pigtown Neighborhood Residents' Experiences of Green Infrastructure and Urban Heat Island Effect

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Selected Version:

4 | Initial | Approved   ▼

Protocol Information   Show Less ∧

Review Type	Status	Approval Date	Continuing Review Date
Expedited	**Approved**	**Apr 16, 2021**	--

Expiration Date	Initial Approval Date	Initial Review Type
Apr 16, 2024	**Apr 16, 2021**	**Expedited**

Feedback

Approval Comment

Approved as expedited categories #6 and #7.

General Information

Project Title

Investigating Pigtown Neighborhood Residents' Experiences of Green Infrastructure and Urban Heat Island Effect

Principal Investigator   Department, Office, or Division?

Trionfo, Sydnie Morgan   Geography Environ Planning

General Questionnaire

Students

Is the PI a student?

Yes

What Type of Student is the PI?

Graduate

Appendix C: Interview Script and Questions

Interview Questions: All semi-structured interviews

Benning script for everyone: "Before we formally begin, there are a few things I want to be sure to go over. Did you have any questions about the consent form or the research project? I have 9 questions, but I would like to keep this casual and may veer from my script, especially if there are follow up questions. I want to remind you that you can ask for clarification at any point or stop the interview. Finally, I want to thank you for your time because, of course, this project is something I am really excited about and is important to me. So… let's get started"

Meghan Hazer: DPW

1. How does your organization define the sustainable community?

2. How does green infrastructure implementation fit into a more sustainable Baltimore?

3. How does your organization approach and develop green infrastructure projects?

4. How do greening projects vary across the city or between neighborhoods?

5. The 2019 Baltimore City Sustainability Plan places a heavy emphasis on equity and making sure historically underserved communities benefit from the plan. How do you prioritize communities for green infrastructure implementation?

6. How is addressing urban heat incorporated into general planning aside from GI planning efforts?

    a. Cooling centers? Other amenities?

7. What does the planning process look like within the community?

    a. Where do you place the resident in the planning process?

8. Can you tell me about how community outreach is conducted?

9. How are underserved neighborhoods prioritized within sustainability planning?

10. How are residents protected from the potential negative impacts of green infrastructure implementation?

11. What does the community engagement process look like in neighborhoods where people may not have internet access or cannot be easily contacted?

Pigtown Resident

1. How long have you lived in Baltimore City?

    a. Which areas have you lived in?

2. In highly developed urban areas, temperatures tend to be much hotter than in less developed, greener spaces creating the urban heat island effect. How have you noticed a difference in temperatures, especially in the hotter months?

3. Can you tell me about how you deal with the heat and extreme temperatures?

4. How does the heat impact the neighborhood life? Do you find yourself avoiding outdoor or neighborhood activities to avoid the heat?

    a. Does it affect your sense of social cohesion?

5. How does living in Baltimore City make dealing with the heat more difficult?

6. How do you feel about green infrastructure implementation like public green space or street trees in Baltimore City?

7. Living in Pigtown, do you feel like you have easy access public green spaces?

8. Have you noticed a difference in tree canopy coverage or the placement of street trees in your neighborhood compared to other neighborhoods in Baltimore City?

    a. What are some of the reasons you chose to get a tree planted in front of your home?

    b. What would a more green Baltimore look like to you?

    c. If you could change the city in any way to better their ability to accommodate extreme heat, what would you change?

9. When it comes to green infrastructure planning, do you feel like the City government and other city organizations have done a good job seeking your opinion as a resident on what you and other people would like to see happen within your community?

    a. If so, how? If not, why not?

10. Have you had any experience with community engagement when it comes to heat mitigation and green infrastructure policies?

11. Can you tell me about the communication between the City or other entities responsible for GI implementation and the residents of Pigtown?

    a. How was that? What would you like to see more of? (Workshops, etc.)

What do you think the City or related nonprofit organizations could be doing better?

Aubrey: DPW

1. How does the Baltimore City Sustainability Office define the sustainable community?

2. Urban heat, green infrastructure implementation, and other climate and social issues are addressed in sustainability planning. How is the issue of urban heat defined by your organization?

3. How does the sustainability office approach the urban heat island in Baltimore?

4. How have mitigation strategies and planning methods changed over time when it comes to addressing urban heat?

    a. What are some of the main strategies Baltimore utilizes? I am familiar with the Sustainability plans but there is not a whole lot addressing the UHI. GI is discussed, but it is primarily associated stormwater management.

5. What does the planning process look like within the community?

6. Where do you place the resident in the planning process?

7. Can you tell me about how community outreach is conducted?

8. How are underserved neighborhoods prioritized within sustainability planning?

9. What does the community engagement process look like in neighborhoods where people may not have internet access or cannot be easily contacted?

Baltimore Tree Trust

1. As someone who has worked in and experienced Baltimore City for some time, what does the UHI mean to you?

2. The Tree Trust works towards restoring Baltimore's urban forest to mitigate a host of environmental issues. How does your organization approach the issues of the urban heat island specifically?

3. How does The Baltimore Tree Trust approach green infrastructure planning?

    a. On a small or large scale? More work in residential areas or on public property?

    b. Why?

4. How do you prioritize neighborhoods for planting projects?

5. How do you incorporate the residents wants and opinions into those plans?

6. The "Just Green Enough" approach to green infrastructure implementation suggests that neighborhoods and cities should utilize multiple small scale green infrastructure strategies rather than one or two large green infrastructure projects in order to avoid the negative things associated with community greening such as gentrification and community displacement. Does your organization

incorporate the "just green enough" approach or anything similar into your plans?

7. Are residents generally open to the idea of getting trees planted on their property?

8. The City and the Office of Sustainability seem like they have green infrastructure and tree implementation in particular at the top of their priority list. Do you feel like you have the City government's support when working on planting trees in and around the City?

    a. What is your organization's relationship to the Baltimore City planning department?

Pigtown Mainstreet

1. As someone who has lived and worked in Baltimore City for some time, how have you personally noticed the effects of the urban heat island?

    b. How have you noticed the UHI specifically in Pigtown?

2. Does Pigtown Mainstreet do anything specifically to address the issue of urban heat?

    a. Why? Is it something residents have requested be addressed or is it something the organization feels is an important tackle?

3. Your organization is responsible for multiple greening efforts within the neighborhood. Can you tell me why these greening projects are so important to your organization?

4. What has been your most successful greening project?

    a. Why do you think it was so successful?

5. The "Just Green Enough" approach to green infrastructure implementation suggests that neighborhoods and cities should utilize multiple small scale green infrastructure strategies rather than one or two large green infrastructure projects in order to avoid the negative things associated with community greening such as gentrification and community displacement. Does your organization incorporate the "just green enough" approach or anything similar into your plans?

6. How does Pigtown Mainstreet prioritize spaces or certain streets for green infrastructure implementation?

    a. How do you incorporate resident voices in those plans?

7. Are residents generally open to the idea of green infrastructure implementation such as street trees?

   a. Why? Why not?

8. What is the most challenging aspect of implementing street trees or any kind of green project?

Baltimore Sustainability Office

1. How does the Baltimore City Sustainability Office define the sustainable community?

2. How does green infrastructure implementation fit into a more sustainable Baltimore?

3. The 2019 Baltimore City Sustainability Plan places a heavy emphasis on equity and making sure historically underserved communities benefit from the plan.

   a. How do you prioritize communities for green infrastructure implementation?

4. How does your organization approach and develop green infrastructure projects?

5. How do greening projects vary across the city or between neighborhoods?

6. How is addressing urban heat incorporated into general planning?

   a. Cooling centers? Other amenities?

7. How has urban heat been addressed through green infrastructure planning?

8. What does the planning process look like within the community?

9. How does the city government make sure the residents are not negatively impacted by green infrastructure and urban heat mitigation plans?

Appendix D: Analytic Memos

<u>Kim Lane Interview</u>: This was the first interview that I conducted, and it went well. I learned a lot about the interview process and what types of questions I should be asking. We talked about gentrification which seemed to be a touchy subject, although it is important to address. I feel like I can use a lot of the same questions when I talk to Bryant soon to have some sort of continuity between these interviews. I did learn a lot about the socioeconomic status of Pigtown from an inside perspective which was interesting because it will make for a good comparison against the DSL data, I have gathered for social vulnerability levels. Kim spoke about the character and socioeconomic status of Pigtown and how it is changing, yet there are no signs of gentrification… again making for some good discussion points later on.

<u>Bryant Smith Interview</u>: I spoke with Bryant from the Tree Trust regarding his position in the organization, how the Tree Trust prioritizes spaces for GI projects, and how they conduct community outreach efforts. There was a lot of overlap with Kim's interview when he discussed community outreach efforts and Covid. I have a feeling that Covid will be a common wrench in everyone's plans, particularly when it comes to conducting community outreach using traditional face-to-face methods. Bryant discussed the work force development program where the Tree Trust trains and employees community members year round which I thought was a really interesting thing the Tree Trust engages in. Overall, I think the interview spoke well to how this NGO heavily prioritizes the UHI and GI mitigation methods. I am interested in speaking with the Sustainability Office to compare how their organizations prioritize and plan for UHI mitigation through GI implementation.

<u>R Interview</u>: This was the first resident interview I conducted. I think it went okay, but I think it could have been better. I will be reordering some of my questions and rethinking how I phrase them with my next resident interview. This resident was not aware of the UHI before we talked, so a lot of the questions I had pertaining to urban heat did not really go over well. Next time I will have to rethink how I deliver those questions. However, I did have some interesting things, up from this discussion. We talked about social cohesion a lot, which was originally not part of my question list or something I really thought to ask about. It seemed to be a really important factor in how the UHI effects everyday life for Pigtown residents. While I thought this interview could have gone better, I think this was a really important part of the research process. This allowed me to reflect on my strategy for upcoming interviews so I can have the most thorough conversation and pull the best results for this project. I learned a lot through this interview process and I will be making some changes to my questions and my strategy for my next rounds of interviews.

<u>S Interview</u>: I conducted my second resident interview with S this evening and it went much better send my last resident interview did. I made some changes to my interview questions, the order that I asked them in, and the way they were delivered and it made for

a much better conversation and a much better interview in general. After my last interview, I went back to the drawing board to tweak my questions, especially pertaining to the UHI since the last resident I talked with was unfamiliar with the tirman really with the urban heat problem in the city. S Provided a similar narrative as my last interview, stating that social cohesion and everyday living is impacted by the extreme heat. S had one particularly powerful quote, saying "I am not the disenfranchised one." This was sad when we were discussing community outreach and green infrastructure implementation methods. This resident is aware that they are a middle-class individual with access to a lot more opportunity, economically and socially, than other residents of the neighborhood may be. I felt like this was a really important thing to note and to discuss in my research analysis.

B Interview: this was the first interview I conducted with a resident that was not on the tree trust list. This resident has heard of Pigtown Mainstreet before, but was not on their email list so they were unaware of the tree planting program. This resident was very aware of the extreme heat in the city as they have lived here all their life. They were able to speak about how the heat affects their daily living and their elderly neighbors as they have some underlying conditions that are exacerbated by the heat. When talking about GI, much like the other interviews it was a very positive discussion. The resident brought up some maintenance issues which were also talked about in the interviews with S and B, so it seems as if it is a common theme here. I am interested in talking with the final resident to see if this is something that comes up again. At the end of this discussion the resident asked for the Tree Trust's information so they could reach out to them regarding tree planting and hopefully spread the word to their neighbors as well.

J Interview: before this interview was conducted, I was looking forward to it because this individual was quite different than my other participants. This resident also did not request a tree be planted in front of their home because they are older, do not use the Internet, and have not been attending regular meetings due to Covid. This was something that was a common theme throughout the interview process as mentioned earlier after I conducted the interview with Kim. Both NGOs and residents are having trouble engaging in community outreach efforts because of the circumstances of the pandemic. This was the most interesting interview when it came to resident experience because the participant talked about different aspects of green infrastructure than the other residents did. This resident wanted to see a lot of parks and open space for their grandchildren, as other residents wanted to see more trees. Also, this was the only resident who discussed not feeling welcome or as if the city was changing. They talked about how wealth and fancy businesses typically come along with greenspace and better amenities, boss feeling unwelcome and as if those spaces were not intended for their use. This was a really interesting perspective as no one else discussed this feeling towards green infrastructure or any sort of new development. This resident also did not want trees in front of their home. Maintenance issues and the presence of rats were the two biggest reasons why. Overall, I think this was a really successful interview and added an important narrative to my overall research.

Aubrey Germ Interview: today I interviewed Aubrey, climate and resilience planner from the Baltimore office of sustainability. Before our interview took place we were talking via email about her role in the department and she let me know that she does not specialize in green infrastructure planning but she could speak to the effects of the UHI in Baltimore City. She also let me know that there are no current green infrastructure initiatives that she is aware of going on in pigtown, really anywhere in the city. This conversation was so interesting because it was clear that the office of sustainability is aware of the extreme heat issue, especially from a public health perspective, but is not currently addressing it. To me, this almost comes from a position of power because residents place extreme heat and public health effects at the top of their priority list while the office of sustainability does not. Maybe because they are not the ones directly experiencing it? Or because there are so many other parts of planning that need to be addressed so it is difficult to touch on everything that needs to be fixed. Aubrey discussed the lack of funding which makes me think there are just so many environmental issues in the city that need to be addressed that urban heat has taken the back burner compared to other problems. We talked a lot about community outreach and equitable planning. Again Covid was brought up in the sense that it has really thrown the office for a loop when it comes to community outreach and traditional methods. We talked about the importance of the word of mouth network in the city and how it has been affected by the pandemic. This will make for an interesting discussion point when I talk about how the word of mouth network has been affected by the presence of urban heat as well. During this conversation, Aubrey suggested I speak with Meghan Hazer, Planner I, with the Baltimore City Department of Public works as she specializes in green infrastructure implementation.

Meghan Hazer Interview: I spoke with Meghan this evening, Planner I with the Baltimore City Department of Public works. We mainly discussed GI implementation in general because she told me that her office implements GI particularly for stormwater management purposes. While she agreed that green infrastructure is a multi-faceted tool that can have more than one purpose, her office uses it as a stormwater management function, particularly through bioretention gardens, bioswales, etc. when we talked about community outreach, again, covid was a sore spot for the Department of Public works. Meghan Discuss the changes that her agency were making to their community outreach efforts by trying to implement more equitable outreach strategies an implementation methods by placing the resident in the beginning of the planning process. Meghan Talked about the struggles of community meetings and how sometimes residents seem not to pay attention to what's going on unless they are angry or upset about something. This was an interesting point of view as no one else has mentioned this before and it highlights the experience from the opposite end of the spectrum. Overall, community engagement is challenging, regardless of if we are in a global pandemic. If planning and GI project implementation for urban heat island mitigation were easy, it would be done by now. Speaking with all the NGOs and city representatives really highlight how difficult some of these practices may be.

Coding Analytic Memos

Resident – Descriptive: I decided to code all of the interviews based on the category of participant: resident, NGOs, and city agencies. This was my first round of coding for the resident interviews. I like to start out with descriptive coding because it is very general and pulls general commonalities and key themes from across the interviews. After reading through all of the transcripts again, I coded for the symptoms of a lack of green infrastructure, beating the heat, positive and negative community engagement, resident wants, extreme heat, activities, vulnerability, effects on the community and on the individual, maintenance issues, positive and negatives associated with GI, and places and other neighborhoods. while this may seem like a broad range of codes, all of these codes or themes applied directly to answering my interview questions so I felt like it was a good fit for my first round of descriptive coding.

Resident – Process: I decided to use process codes while coding these interviews because I wanted to look at how residents experience the urban heat island and GI implementation. Looking for action words and activities spoke to the effect of the UHI and GI on the daily lives of individuals and also to the wants they may have for future planning initiatives. Social cohesion came up across my interviews a lot and especially during the descriptive coding process so I wanted to code for how residents interact with their community and with the current GI initiatives going on like the tree planting project in Pigtown.

Resident – In-vivo: For my last round of coding I decided to use in-vivo codes because the residents said such powerful things. I felt as if I truly couldn't capture some of the responses unless I took direct quotes from the transcript and in-vivo codes allowed me to do so. After I coded, I realized I took a lot more quotes than I may have needed to because they were powerful, but they did not really answer my research questions. I had to go through and clean up the codes because there were just so many and it didn't really add anything to the analysis of my project. These codes really showed the effects extreme heat and a lack of long term community engagement has on the community. With these codes in combination with the last two rounds of coding, I am more than confident that I will be able to thoroughly answer my research questions.

NGO – Descriptive: Again, this was my first round of coding for the NGOs as I figured it would allow me to gather common themes across the two interviews. I coded for positive and negative community reactions to the current tree planting project and to green infrastructure in general, community outreach strategies, GI implementation, Extreme heat, vulnerability, side effects of greening, the scope of work, neighborhood characteristics, equity, benefiting the community, and relationships across agencies. After reading the transcripts I coded based on my interview questions. I realized that Pigtown may not be a socially vulnerable neighborhood as it has been rated from the DSL. This is something to go back through the resident interviews and look for connections with as my whole project was framed around social vulnerability and the effects of the UHI.

NGO – Process: This round of coding really focused on community engagement and the implementation process for the tree planting project going on in Pigtown. I focused on the scope of work, community engagement, and community feedback. there were not many processed codes but the ones that I did pull out were important in answering my research questions. I'm interested to compare these process codes with the resident process codes as they experience the implementation process very differently from one another.

NGO – In-vivo: again, I used in-vivo codes to pick out specific things that were said that were really powerful. One of the most important things to note is the negative effect of extreme heat on the community and how it is recognized by the NGOs. Both agencies we're very adamant about urban heat and the effects it has on the community, particularly the tree trust as their main purpose is to replenish the urban tree canopy to mitigate environmental disamenities. These codes are particularly important as they really stress the importance of mitigating the UHI but also some of the reasons why residents would be against GI implementation from a planning perspective.

Baltimore City Government (BCG) – Descriptive: the first round of coding for city agency employees was descriptive coding. There was a lot to pick out here regarding community engagement strategies, the planning process, and the presence of the urban heat island. There was also a big discussion on equity. This makes me think about the uneven distribution of the UHI and how equity was a major point from both agencies. How can equity be a top priority if there really are no plans to mitigate the UHI, especially in incredibly vulnerable neighborhoods that need some sort of strategy? This round of coding makes me think about how equitable planning seems great on paper and through discussion, but on the ground planning initiatives are lacking.

BCG – Process: I used processed codes to look for positive and negative community engagement, extreme heat and its effects, equity, vulnerability, the planning process, obstacles, mitigation strategies, and sustainability. There was a lot of discussion based on the planning process, particularly how challenging it is to prioritize and secure funding for all of the projects that need to be in place. The UHI does not seem to be on the cities radar as a top priority, but that makes room for NGOs such as the tree trust to come in and playing an important role in the planning process. there does seem to be a lot of different strategies of community engagement utilized throughout the planning process which aligns with the NGOs but again, we are seeing a lack in communication towards the end of the planning process and around the responsibility of maintaining GI in the community.

BCG – In-vivo: There were a lot of really powerful quotes from both Aubrey and Meghan that I wanted to pick out. They mainly pertained to the community engagement process and the acknowledgement of urban heat. I want to emphasize the word acknowledgement because throughout reading the transcripts and the coding process, it is clear about there really is not a lot of "umph" around UHI planning and mitigation, at least right now and within the 2019 sustainability plan.

 All interviews – resident, NGO, and city agency – made it very clear about the problem of extreme heat is noted and felt in the community, but coding through the city employee interviews showed how little is being done to address the problem. Especially, the root of the problem. There is a lot of room within the literature to display a qualitative approach to this topic.

Appendix E: Sustainability Plan Authors and Contributors

2009 Baltimore Sustainability Plan Authors:

Baltimore Commission on Sustainability: Davis Bookhart, Cheryl Casciani: Chair, John Ciekot, Peter Doo, David Dunphy, Raymond Ehrlich, Lynn Heller, Brian Knight, Jim Kraft, Keith Losoya, Patrick McMahon, Ruth Ann Norton, John Quinn, Jake Ruppert, Josh Sharfstein, Tonya Simmons, Ali Smith, Scot Spencer, Tom Stosur, Alyson Taylor, Mary Washington

Sustainability Plan Project Manager: Sarah Zaleski

Baltimore Office of Sustainability Staff: Beth Strommen: Manager Office of Sustainability, Brett Buikema, Gary Letteron, Duncan Stewart, Sarah Zaleski: Sustainability Coordinator

Baltimore Office of Sustainability Interns: Matthew Bell, Amy Burch, Sophia Finfer, Elizabeth Fox, Kara Hubbard, Cassandra Kapsos-Scouten, Katherine Rainone, Paul Skorochod, Lindsay Tague

Sustainability Community Ambassadors: Miriam Avins, Dion Cartwright, Alan Cohen, Lisa Cox, Will Doane, Lorraine Doo, Anne Doyle, Olivia Farrow, Caroline Fichtenberg, Catherine Fleming, Brent Flickinger, Eva Glasgow, Odessa Hampton, Michael Hindle, Jill Lemke, Aaron Meyers, Regina Minniss, Bronwyn Phillips, Jolyn Rademacher, Hillary Reser, Inez Robb, Rebecca Ruggles, Aisha Samples, Madeleine Shea, Terrell Boston Smith, Laura Sundquist

2019 Baltimore Sustainability Plan Authors:

The Commission on Sustainability: Miriam Avins (Co-Chair), Rasheed Aziz, Rebecca Bakre (Co-Chair), Donzell Brown, John Ciekot, The Honorable Ryan Dorsey, Lisa Ferretto, Michael Furbish, Beth Harber, Charlotte James, Earl Johnson, The Honorable Robbyn Lewis, Barbara McMahon, John Quinn, Avis Ransom, Inez Robb, Gregory Sawtell, Kurt Sommer, Tracy Williams, Benjamin Zaitchik

Baltimore Office of Sustainability Staff: Lisa McNeilly (Director), Bruna Attila, Sarah Buzogany, Abby Cocke, Anne Draddy, Holly Freishtat, Aubrey Germ, Amy Gilder-Busatti, Alice Huang, Nia Jones, Kimberley M. Knox, Jeff LaNoue, Denzel Mitchell, Ava Richardson, Anika Richter, Victor Ukpolo Jr.

Sustainability Plan Project Manager: Anne Draddy

CURRICULUM VITAE

Sydnie Trionfo

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EDUCATION
Towson University, Towson, MD
M.A. Geography, December 2021
      Current GPA: 4.0
      Areas of interest: Environmental Justice, Sustainability, City Planning

B.S. Geography, August 2020
      Cumulative GPA: 3.86
      Areas of interest: Environmental Justice, Sustainability, City Planning

EMPLOYMENT

Assistant Planner, June 2021 – Current
City of Aberdeen, MD
      As an Assistant Planner, I review, process, and release all building permits within the City of Aberdeen. I also handle Livability Standards complaints, zoning violations, and assist with other city planning processes.

Teaching Assistant, August 2020 – May 2021
Towson University Department of Geography and Environmental Planning, Towson, MD
      Responsibilities include working directly with department faculty and staff, attending lectures, assisting the professor and their students, hosting office hours for student questions, creating learning and study material, and grading assignments while completing personal thesis research and pursuing a master's degree.