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Adopting Green Building Codes to Mitigate the Effects of Climate Change and Improve Environmental Health Hazards for Public Housing Residents: A Case Study of Environmental Justice and Climate Justice in Bridgeport CT

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This report is dedicated to my grandfather, Kaye Williams. He is a true inspiration for future creativity, innovation, and progress in Bridgeport.

Abstract

There is a lack of environmental justice in the public housing sector in the United States today. Prejudice in public housing policy and environmental hazards over the last 20th century have disproportionately affected populations based on race, ethnicity, and income. As global climate change becomes a reality, we need to protect the most vulnerable populations from direct and indirect effects of extreme weather events such as hurricanes and heat waves. We can protect residents of public housing by strengthening their homes structurally using green building techniques. Buildings are a huge drain on our nation's energy sector. If we use green building strategies we can make buildings more efficient, lowering costs and emissions. Green building strategies work to create healthier indoor environments for occupants, using environmentally benign and healthy materials for buildings to improve the safety and well being of occupants. Governments at the local level can implement building policies that employ aspects of green design to reduce environmental health hazards for residents of public housing as well as future risks from climate change. Such building policies are known as green building codes and standards. The city of Bridgeport, Connecticut will be studied as a case of environmental and climate change justice. Bridgeport should develop green building codes of its own to mitigate the health and environmental injustice externalities that are a product of the standard building practices and materials used today and to minimize the impact of deleterious environmental, social, and structural damages resulting from climate change for future generations.

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Chapter 1

Introduction

"Anytime a hurricane hit or anything my house looses electricity. This last time was not as bad, we we're only out a couple of days…last year I was out for an entire week. Good old UI and that blasted pollution and meanwhile the lights are going out. It's funny because everyone has artistically looked at the UI tower and drawn paintings of it."

(Mary Witkowski 2013)

25,000 homes in the coastal city of Bridgeport, Connecticut were left without power for more than five days when destructive Hurricane Sandy hit the northeastern seaboard. United Illuminating Co. made the decision to shut down Bridgeport's power substation to prevent damage to the facility from flooding. Most of the houses without power were located in the poorest areas of the city. At a press conference, Bridgeport Mayor Bill Finch alleged that the UI Company had purposely serviced the more affluent and politically influential towns while leaving Bridgeport residents without power. He argued that Bridgeport needs more assistance than other towns and cities in Connecticut. Extra attention, said Finch, should be paid to single parent families and low-income households in Bridgeport's inner-city ghettoes as they are in greater need than wealthy families living in the suburbs. "I'm sick and tired of being shortchanged," explained Finch at the press conference (Finch 2012). This situation illustrates the concept of environmental justice, or the disproportionate environmental and health hazards facing poor and low-income communities. Chapter 1 begins by explaining environmental justice conceptually and as a movement. Then, a look at climate change in Bridgeport will

introduce the idea of climate justice. Finally, we look at environmental justice through the lens of the green building movement to introduce the idea of affordable green housing and why it is important.

What is environmental justice?

This report is grounded in the ideals of environmental justice; a good understanding of this concept is necessary to appreciate the significance of this study. Environmental justice can be discussed in two different ways. Walker (2012) writes that conceptually, environmental justice lies at the junction of various social and environmental forces. Social dimensions governing environmental justice include race, class, ethnicity, income level, gender, and age. The environmental aspect encompasses air, water, and noise pollution, waste facilities, chemical/indoor pollutants (lead paint, asbestos, mold), resource extraction, contaminated land, and drinking water quality. An environmental injustice occurs when a segment of the population, marginalized by one or more of the previously mentioned social factors, experiences negative environmental and health effects disproportionate to the rest of the population. When these social and environmental forces combine, they create more than just a social or an environmental issue.

Walker (2012) adds that environmental justice can also refer to the social movement beginning in the 1980s when groups of concerned minority populations across the U.S. began to protest the disproportionate impacts of pollution from waste facilities and the industrial sector that their communities faced. This early focus on race has grown to include other social forces, such as class and income, and a wider range of environmental hazards.

The environmental justice movement

Initially concern with environmental justice came about as a response to minority communities that were plagued by industrial waste and contamination. Cole and Foster (2001) describe the history of the environmental justice movement. Riding on the coattails of the Civil Rights Movement, advocates for black communities struggling with the effects of toxic and waste facilities being sited near their homes emerged from church-based civil rights groups. Already having political experience, leaders such as Rev. Dr. Martin Luther King Jr. and Rev. Benjamin Chavis used their knowledge of grassroots activism to take on the inequality they saw in the unfair distribution of environmental hazards in black communities.

In Warren County, North Carolina, Chavis and other church leaders led protests against the dumping of toxic PCBs in the black community. The United Church of Christ Commission for Racial Justice's now famous publication entitled *Toxic Wastes and Race in the United States: A National Report on the Racial and Socio-Economic Characteristics of Communities with Hazardous Waste Sites* (1987) stirred up controversy as it suggested that toxic waste facilities were unfairly and unequally concentrated in poor and minority communities.

Cole and Foster (2001) go on to say that in the late 1970s, residents of a housing development built on a former chemical waste site in Love Canal, New York fought for justice against Hooker Chemical when they realized that the company's illegal disposal of hazardous waste was making residents sick. This encouraged other communities to take on large polluting companies with direct action lawsuits and protests. Sasa and Mohai (2005) found that growing public concern for air pollution, water pollution, and

waste disposal in the 1960s and 1970s led people in white communities to protest hazardous facilities in their neighborhoods. The not-in-my-backyard effect (NIMBY) left low-income and minority communities susceptible to housing these unwanted facilities.

Cole and Foster (2001) point out how reports publicized in the early 1990s suggesting that hazardous sites were disproportionately placed in minority and low-income communities also played a role in the development of the environmental justice movement. Dr. Robert Bullard began studying the unequally distributed effects of garbage dumping in black communities and became the leader among academic activists in the movement. A number of academics met at the University of Michigan in 1990 to talk about their discoveries. Bunyan Bryant and Paul Mohai (1992) write that the findings from the 1990 Conference on Race and the Incidence of Environmental Hazards at the University of Michigan helped spur the EPA into action with the creation of the Work Group on Environmental Equity.

According to Cole and Foster (2001), at the 1991 First National People of Color Environmental Leadership Summit, community leaders drafted a letter to the top environmental organizations in which they charged the groups themselves for using racist practices and developing discriminatory policies against minority populations. This revolutionary summit brought together Latinos, African Americans, Native Americans, and Mexican Americans. People of different races found strength in each other as they realized that they had shared similar experiences.

Later in 1992, the EPA released its *Environmental Equity: Reducing Risks for All Communities* in which the agency assessed the adverse health effects of pollution on low-income, minority populations (U.S. EPA 1992). Cole and Foster (2001) write that, in

1993, the Work Group on Environmental Equity was renamed the Office of Environmental Justice. By 1994, President Clinton signed *Executive Order 12898* which urged all U.S. government agencies to incorporate environmental justice into their policy making.

Nowadays the movement reaches far beyond preventing companies from putting factories into low-income, minority neighborhoods. Environmental justice activists also work to clean up existing contaminated sites, reduce occupational hazards, decrease the amounts of lead in communities, enforce environmental regulations, increase community representation in the environmental policy process, create green jobs and a sustainable economy, secure safe and inexpensive housing, and attain racial and social justice (Cole and Foster 2001). The environmental justice movement is recognized today as a global issue (Roberts and Parks 2007).

Global climate change and Bridgeport

Climate justice is also an increasingly prominent issue in today's world as evidence mounts in support of global climate change (Intergovernmental Panel on Climate Change 2007; Kasperson and Kasperson 2001; Adger, Paavola, Huq, and Mace 2006). Climate justice works to balance the unfair distribution of adaptation and mitigation climate change policies at local, national, and global levels. Climate justice occurs when policies do not address climate change, thus making vulnerable populations more vulnerable and passing on disproportionate climate burdens to future generations (IPCC 2012).

Climate change is regarded as the biggest threat to the city in *BGreen 2020: A Sustainability Report for Bridgeport, Connecticut* (Regional Plan Association 2008).

Particular concerns for Bridgeport are stronger storm surges and coastal flooding which will overwhelm water treatment facilities, rail systems, and roads. Temperature change is also a concern in Connecticut where temperatures are increasing at a faster rate compared with other New England states. The report predicts heat related illnesses, increases in diseases such as West Nile virus and Lyme disease carried by insects, a rise in the state's already high asthma rate. Decreased viability of Long Island sound as a result of warming waters or more frequently inundated storm sewers will have environmental and economic impacts on the ecosystem and fishing industries (Regional Plan Association 2008).

We would not have achieved climate justice if we didn't also work to prevent affecting future generations with the mess we make by overturning standard building practices and techniques that add to the greenhouse gas emissions that fuel anthropogenic climate change. Even those who argue that climate change isn't manmade or even occurring, society still needs to reduce our energy use or find a way to be more efficient because the carbon based fuels that we are so fond of are a finite resource.

Environmental justice and green buildings

Environmental injustice runs through the veins of public housing today. Sustainability and "going green" are becoming more and more prominent in society today. Affordable green public housing should be reviewed through the environmental justice perspective following along with the current trend toward environmentally friendly practices. Subsequently, it would be environmentally unjust to exclude a segment of the population from fair and equal environmental policies based on social forces. That is, environmental justice in housing policy will not be achieved until residents of public housing experience equally safe and healthy living conditions as the

rest of the population. This can be fulfilled by incorporating the principles of green architecture into public housing policy. For example, indoor air quality is an important facet of green design. According to the EPA's website (2012), indoor air pollutants that cause adverse health effects can be mitigated by using chemical-free, natural products in place of standard, cheap materials. Indoor air pollution can also be reduced by replacing outdated technology for high-efficiency models, for example with ventilation systems.

What is affordable green housing?

Daniel Williams (2007) writes in Sustainable Design: Ecology, Architecture, and Planning that the philosophy behind sustainable design is to bring together the spheres of community, economics, and the environment in order to reduce dependence on renewable resources, improve and protect the environment, and connect communities. Green design falls under the umbrella of sustainable design. The aspects of green building design emphasize the use of local and renewable building materials, the improvement of air quality in buildings, an increase in energy efficiency, the minimization of waste during construction, the use of passive solar heating, and the incorporation of natural landscape design. A "green" building satisfies the principles of sustainable design when the building is self-sufficient, meaning that its design eliminates the need to tie the building to the electric grid.

The case for implementing green practices into public housing design

Buildings and the construction of buildings account for almost half of all greenhouse gas emissions, energy consumption, and water consumption in the U.S. Sustainably designed buildings reduce these harmful emissions and cut energy costs (Williams 2007, Chambers 2011). Current building design practices are likely to meet

only the bare minimum standards in regards to energy, water, and waste because this cost-efficient measure is the norm in society today. The social and environmental costs of today's architectural practices are not often taken in to account in a traditional cost-benefit analysis.

The intersection of affordable housing and green building design practices is where this story begins. Low-cost housing units do not receive adequate attention from the green building movement, which focuses on commercial and institutional buildings. Affordable housing refers to homes that do not cost more than 30% of the combined monthly income of a low-income family. Green affordable housing encompasses the improvement of indoor air quality and quality of life for residents and a reduction in operating and maintenance costs (New Ecology Inc.). Vittori (2004) writes that affordable green housing is in the "proof-of-concept" phase. It is well known that certain building materials have adverse health effects. Vittori argues that a lack of labeling requirements for building materials is unfair to unsuspecting public housing tenants, moving this issue into the environmental justice realm.

Jacobs, Kelly, and Sobolewski (2007) point out that focus on buildings makes sense since Americans spend on average 90% of their time inside. Levels of air pollution are higher inside than they are outside. Today's houses are built tight and have poor ventilation, contributing to the buildup of indoor air pollutants by not allowing air to circulate. Niel Chambers (2011) states that older buildings are made with materials that release harmful chemicals, which often makes residents sick. This condition is known as Sick Building Syndrome (SBS). Carpeting, flooring, furniture, sealants, paints, glues, and insulation are laden with heavy chemicals that off-gas toxins (Chambers 2011). Studies

suggest that residents living in low-income housing units experience disproportionately high levels of asthma and other respiratory conditions, evidence indicative of Sick Building Syndrome (Jacobs, Kelly, and Sobolewski 2007). This becomes an environmental justice issue in low-income public housing units where the residents do not have the means to retrofit their living spaces with healthier alternatives. Residents who cannot afford to refurbish should not be put on the front lines of the chemical exposure guessing game.

Bridgeport makes for a curious case study because of its location on Long Island Sound. It is beneficial to the city to preserve the Sound for economic (aquaculture), recreational (fishing, boating, and swimming) and health reasons. A focus on saving the Sound has the unintended effect of shortchanging other environmental problems that arise in the city. As demonstrated above, residents of Fairfield County (Bridgeport aside) are highly white and affluent. They own the expensive yachts, motorboats, and sailboats that cruise the waters of the Sound, giving them incentive to preserve it. Bridgeport residents are commonly seen rummaging for shellfish at waterfront park Saint Mary's by the Sound despite the various warning signs written in English and Spanish that the shellfish is contaminated. Far from the affluent sports fishermen in the neighboring towns, these people eat or bring to fish markets the contaminated shellfish. This is an instance where an environmental hazard—contaminated water—has created an unfair disadvantage for a low-income minority population. The following paper discusses how socio-economic, environmental justice and climate change issues have converged to disproportionally affect low-income and minority populations in Bridgeport and how

those justice issues can be mitigated through the integration of the green building movement into the public housing sector.

Chapter 2

A Look at the History of Housing Policy and Socio-economic Conditions in the U.S. and Bridgeport

"Striking disparities exist across town lines, among racial and ethnic groups, and between urban and rural populations. These differences have engendered the concept of Two Connecticut's; one comprising people who live in the wealthiest state in the nation, and the other consisting of those who live in some of the most severe and concentrated pockets of poverty in the U.S." (Connecticut Department of Healthy Homes 2012)

We have seen how low-income and minority families experience unequal and unfair pollution burdens. The placement of burdens disproportionately affecting a minority or low-income community, from waste facilities to public housing, is largely dependent on the segments of society that can utilize various resources at their disposal to oppose such facilities. Socioeconomic status defines the quality of housing available to people with low incomes impeding social mobility potential. That is, low-income and minority populations do not have equal opportunities to affect social and legal change as wealthier segments of the population do. The clustering of many deteriorated housing units in low-income, minority communities negatively affects schools and businesses in the area. Public tax dollars pick up the pieces as more police are hired to patrol the area and more visits are made to the hospital as a result of unhealthy living environments. Families that can afford to move out of these poverty stricken areas do, taking investment opportunities with them as property values continue to decline. Property taxes burden middle-income families who choose to stay. In the following chapter, we will see how

public housing policy reflects the current race, ethnicity, and income prejudices/attitudes in society. Chapter 2 will start off by looking at the history of public housing prejudice and design in the U.S. followed by an industrial and social history of Bridgeport. In the second half of the chapter we examine socio-economic conditions in Bridgeport and look at former and current public housing projects in the city.

A history of public housing prejudice in the U.S.

A body of research examining the prejudice in public housing policy in the U.S. suggests that housing policy has historically and disproportionately benefited white populations (Gotham 2000). Some aspects of green building design—including thoughtful site selection, urban renewal projects, and a building design that is long-lasting and self-sustaining—provide evidence for discrimination in public housing design in the 20th century in the United States. Stoloff's article, in which he reviews different studies on the topic, states that racially discriminatory site selection and zoning practices were managed at the local level up until the 1960s when court cases citing this discrimination compelled the federal government to intervene. Before that, housing projects were designed "to be race-specific" with a preference towards units designed for white people (Massey 1990; Stoloff 2004).

The National Housing Act of 1934 established the Federal Housing Administration (FHA) in response to the Great Depression (Gotham 2000). Public housing was designed to aid working class families, not the most desolate populations. The Act lowered interest rates for mortgages and down payments on homes, allowing middle-income families to purchase a home of their own; however, the Act did not address those who were too poor to buy a home. The programs were geared towards

white families while black residents remained in the city. Evidence for environmental injustice is seen with the federal subsidies disproportionately benefiting the white working class (Stoloff 2004). The promotion of new construction of single family housing in the suburbs helped keep white neighborhoods white.

These suburban homes attracted mostly white, middle-income families. This white flight phenomenon encouraged institutional segregation in American housing. Frey (1979) describes the significant rise in migration of African Americans from the rural communities of the South to cities in the North during the 1940s. After the war, black families with higher social status relative to the existing white residents moved into middle-class communities previously occupied by rich white families who had relocated to all-white communities in the suburbs. By the 1970s, other minorities immigrated into the city. As the economic and environmental quality of the inner city diminished, white flight continued. With housing and employment opportunities concentrated into the suburbs, the cities lost their industrial and high income tax base resulting in city residents paying higher taxes than suburban residents. The second wave of white flight in the 1970s is marked more by metropolitan residential segregation rather than the residential segregation seen with the first migration in the 1950s. Discriminatory housing practices and opposition from rich white communities in the United States throughout the 20th century worked to keep poor minorities out of affluent, white neighborhoods (Gotham 2000). Restrictive eligibility criteria to live in public housing units, such as income ceilings, concentrated the poorest segments of the population to the inner city.

Stoloff (2004) states that the 1937 Housing Act neglected to allocate adequate funding to cover operation and maintenance costs in housing units. Rent alone was not

enough to cover maintenance fees, leaving the aging buildings to deteriorate due to neglect. The 1971 Brooke Amendment to the 1969 Housing Act set aside subsides to cover maintenance costs not covered by rent. Subsides were unfairly awarded to housing units on a performance basis so that the old rundown units became more rundown with time, neglected in favor of newly built ones.

The Housing Act of 1949 created subsidized housing programs. The Act established maximum rents and income limits and was designed to aid the poorest families. This policy of institutional residential discrimination violates the terms of environmental justice by eliminating competition for private developers providing housing for the middle class (Stoloff 2004). The housing industry was united in their resistance to public housing, and there was no advocacy for low-income families. Thus began the cyclical placement of public housing projects in sites that were already stigmatized as ghettoes for local community opposition was a powerful delaying force in the attempt to redline units to protect against property value loss as a result of integration of the stigmatized units. This fostered the concentration of the poorest of the poor as those with upward social mobility potential avoided the slums (Stoloff 2004). Public housing projects were poorly built and maintained, resulting in a disproportionate epidemic of environmental health hazards for those living in the facilities (Jacobs, Kelly, and Sobolewski 2007).

Stoloff (2004) writes that lobbying from the business sector influenced the Housing Act of 1949, which promoted environmental injustice by restricting the construction of new public housing units to slums thus supporting business interests by eliminating competition. Urban renewal programs established by Title I of the Housing

Act of 1949 were the driving force behind the clear-cutting of slums in cities across America during the 1950s. The act did not require that the demolished housing in the slums be replaced, scattering patches of undeveloped areas throughout the city. Construction of new public housing units was to only to occur in the demolished slums or urban renewal areas as a result of the 1954 Housing Act. Public housing supply went unaffected by the urban renewal initiative, the number of units remaining stagnant as the new buildings only replaced old ones. The author adds that the former residents of the now non-existent slums were displaced at the mercy of the developers and contractors while the new housing units were under construction.

The civil rights movement and urban riots helped to change public housing policy in the 1960s continues Stoloff (2004). The 1964 Civil Rights Act prohibited segregation in housing projects, driving away white residents who could afford to live outside of the city thanks to subsidies provided by government. The same hope of homeownership was not geared toward the disadvantaged, the disabled, and the poor. Income limits ensured the continued residency for the poorest of the poor by evicting families whose income rose above a certain amount.

Gotham (2000) writes that in the early 1970s, the FHA came under fire by the media, the court system, and Congressional investigations for the unintended consequences of the Housing Act of 1968 in that the new criteria fostered private exploitation. Programs such as Section 235 and Section 236 benefited private developers through tax breaks, inexpensive mortgages, and rent subsidies. The U.S. Commission on Civil Rights' 1971 study "Home ownership for lower income families: a report on the racial and ethnic impact of the section 235 program" suggested that the Section 235

program furthered racial residential segregation. He continues to say that the act relaxed standards so that low-income families could live in affordable housing through mortgages (Section 235) or renting subsidies (Section 236). Real estate entrepreneurs abused the system by selling poorly rehabilitated houses to unknowing poor people.

Gotham (2000) states that the Section 235 program subsidized white flight into the suburbs, leaving African American families with poorly maintained housing units. Families did not have the means to make the repairs nor were the repair costs covered by the government subsidy, leading to abandonment and foreclosure. Hays (1985) writes that short-term cost cutting during construction resulted in the foreclosure of 18% of the 500,000 housing projects by 1979. The abandonment resulted in non-quantifiable negative social implications. A series of court cases put pressure on Nixon to order federal agencies to consider equity in policy decisions involving housing. The U.S. Department of Housing and Urban Development (HUD) subsequently issued site-selection regulations which were virtually impossible to implement in affluent, white communities (Hays 1985).

In 1973, Nixon put a Moratorium on housing activity to direct the public housing policy in the conservative direction. HUD's 1973 report *Housing in the Seventies* reoriented the government's role in public housing to be much more limited with the idea of the "housing allowance", a grant to a low-income family based on percent of income allowing the household to rent or buy a better quality housing unit than they could afford without the grant (Hays 1985). Liberals who advocated against the concentration of the poor in in the ghettoes were satisfied with the idea of "deconcentrating" the poor by

scattering smaller units throughout the city, although the principles of NIMBY soon came into play even with the smaller units (Hays 1985).

Hays (1985) continues, stating that President Ford passed the Housing and Community Development Act of 1974 which would directly subsidize individual rent as 25% of income with broad eligibility ceilings so as to serve the poorest and the moderately poor under the Section 8 program. Despite the nation's growing discontent with spending and deficits and the lack of congressional and executive leadership during the Carter Administration of the late seventies, Section 8 flew under the radar as other issues took national center stage. Section 8 shifted the focus of public housing policy away from minorities and the inner city towards the elderly and into the suburbs. Large scale federal funding for construction of new public housing units has not been seen since 1981, replaced by scattered units built by local governments.

"National disgrace" was the diction chosen by the National Commission on Severely Distressed Public Housing to describe public housing in the U.S. in 1992. The Commission (1992) reports that 6% (86,000 units) of public housing in the U.S. as of 1992 was utterly deteriorated and in need of repair and that these deteriorated units would be remedied by the year 2000. High hopes indeed, the commission played on the publication's title "The Final Report: of the National Commission on Severely Distressed Public Housing," boldly stating that this will be the final report on the issue as the problem will be alleviated. This report investigates the secondary and tertiary effects of physical deterioration of the buildings in terms of occupant safety and health issues as well as surrounding neighborhood quality, underscoring the importance of a multi-faceted solution. Many public housing units have been operating past their life

expectancy. Buildings constructed in the 1950s and 1960s were designed to house smaller families than those who live there today (National Commission on Severely Distressed Public Housing 1992).

Today, federal housing funding takes the form of tenant-based housing vouchers in which the resident puts 30% of their income towards rent. “Housing Choice Vouchers”, previously known as Section 8, fund the remaining difference; however, this program doesn’t quench the growing demand for affordable housing

Design of public housing units in 20th century

Stoloff (2004) writes that high-rise buildings were the popular form of public housing design in the 1940s because they made efficient use of the lack of space in cities. They are more expensive to build than other styles of housing, but make sense in the city where land is not abundant and land costs are high. The cost of purchasing land for constructing new public housing units was expensive, and the site was of poor quality. More often than not the land was so expensive that architectural plans could not be completed, resulting in a lower quality of design and a generally unpleasant appearance. Public housing units were purposefully designed to lack amenities to save money and to instill a drive to motivate residents to improve their lives by relying on themselves. Those amenities that could be cut from the budget to save money were cut, resulting in low-quality housing units; however, society blamed the residents of the units for the state of their living conditions.

Hays (1985) writes that the FHA underestimated the cost of constructing new units, forcing units to be made cheaply and quickly with no consideration and allocation for maintenance management. Public housing units were inferior, unattractive, and poorly

built with little to no basic amenities and negligent, prejudicial management thus perpetuating the cycle of negative stigma associated with public housing and life in the inner city (Hays 1985).

Many public housing units today reflect the hasty construction and cost-cutting measures used to build them add Turner, Popkin, and Kingsley (2005). These poorly maintained houses are targets of vandalism. Managers do not properly maintain the dwellings and repairs go unfixed, putting residents at risk for health problems. Many environments surrounding public housing units are breeding grounds for violence and crime. Structurally, many houses are deteriorating. Homes run on old mechanical and electric systems. They point out that materials used to build the homes were not durable. A study conducted by the Harvard Graduate School of Design (2003) found that the cost of operating a building that is twenty-six years or older costs 10 percent more to run than newly constructed buildings.

A history of industry, race, and housing in Bridgeport

Now that we have looked at prejudice in public housing at the national level, we will discuss the economic and social rise and fall of Bridgeport throughout the past century. We will introduce Bridgeport as a case study by developing a historical context to help understand how environmental injustices that affect city today came to be. Finally we will investigate the status of public housing in the city today.

Bridgeport's history is full of firsts— the first powered flight, the first Subway Restaurant, the first public housing project in New England, and the first housing authority in the U.S. to be taken over by private management (Bridgeport Housing Authority 2012; Reardon and Thornton 1987). How did a booming industrialized city

such as Bridgeport, in 1939 boasting the sixth largest public housing complex in the nation, come to be pressured by the U.S. Department of Housing and Urban Development into a privately managed public housing authority? The following section looks at labor, industry, race, and housing in Bridgeport from 1836 to the present. It is a necessary prelude to understanding the current public housing situation in the city today.

Early days - WWI

This story begins in 1836 when the Connecticut General Assembly incorporated Bridgeport as an independent city. The population at the time was 3,000 (Roy Wenzlick & Co 1944). The waterfront community became an important commercial port for trade and shipping between inland farmers and other major ports such as New York and Boston. By the 1840s railroads were carrying freight through Bridgeport, setting the city up to become a major center of commerce and industry (Advameg Inc, 2009).

The economy shifted from shipbuilding and whaling to manufacturing in the late 1800s. From sewing machines and typewriters to rifles to pianos, Bridgeport became a leader in manufacturing with thousands of immigrants coming to find work in the city. In 1890, Bridgeport's population totaled 48,886 residents; ten years later, the largely blue-collar population reached 70,996. Immigrants comprised more than half of the population by this time. By 1910 the city was home to a remarkable 102,054 residents (Bridgeport Public Library). The largest number of immigrants came from Ireland with Hungarians making up the second largest nationality in Bridgeport by 1910 (Bridgeport Public Library).

With the onset of World War I, arms manufacturing in Bridgeport skyrocketed. It is estimated that Bridgeport produced more than two-thirds of the arms used by the

Allies. By 1914, employment rates in Bridgeport increased by 48.4%, salaries by 188.6%, and citywide capital by 121.9% (Bridgeport Public Library). French Strother (1916) describes how vacant lots and houses were transformed into factories, making space for the Union Metallic Cartridge Company. Three back-to-back shifts nearly tripled employment in the factory. Real estate values rose and bank deposits increased. Local businesses and the entertainment and hotel industries flourished. Bridgeport's skilled workforce and available housing made the city an ideal location for the new Remington Arms Company. Once again, unused lots and old housing structures were converted into factories employing three thousand mechanics to pump out more rifles and bayonets. Strother (1916) continues, noting that Bridgeport's metal manufacturers could barely produce machines and tools for the arms factories quickly enough. Investments poured into the city, perpetuating a steady stream of work for thousands. Over a thousand new employees were hired every month to work in the factories of the arms company. With housing becoming scarce, the Remington Arms Company began filling the void. Ranging from two-family houses to six house duplex apartments, the new five or six room homes had furnace heat and electric lights. Employment rose for the shell producing Bridgeport Brass Company and the army truck manufacturing Locomobile Company. The Bridgeport Projectile Company even produced ammunitions for the Central Powers (Strother 1916). By 1916, Bridgeport's industry was so crucial to the war effort that the city was nicknamed the "Arsenal of Democracy".

Roy Wenzlick & Co (1944) writes that from 1910 to 1920 that Bridgeport exceeded the national average growth rate of metropolitan cities by 25%. Bridgeport continued to prosper, with populations reaching 143,555 by 1920, nearly triple what it

had been only thirty years ago! World War I was over, and demand for ammunitions and weapons decreased taking with it the demand for employment in Bridgeport factories. From 1920 to 1940, the city's population grew slowly, reaching 147,121 persons by 1940. This was the situation occurring across America's urban centers. There was a greater push to move out of the inner city to the surrounding suburbs due to improved transportation and road infrastructure. Even as early as 1944, Roy Wenzlick & Co writes that the city had "experienced the larger part of [its] growth beyond the political and tax controls of the inner city". This is speaking to the rate of growth for surrounding towns Fairfield, Stratford, and Trumbull. Although the combined rate of growth has slowed in the surrounding cities since 1920, the growth rate was still rising compared to Bridgeport. The surrounding suburbs grew as families in higher income brackets could move out of crowded public housing in Bridgeport, leaving a higher concentration of low-income groups in the inner city (Wenzlick 1944).

1930-1940

Roy Wenzlick & Co (1944) continues, stating again that from 1930 to 1940, the growth rate exceeded the national average by 26%. Yet from 1940 to 1943, growth rate fell 15% below the national average, coinciding with war migrations. In 1939, "more manufacturing wage earners [were] employed in Bridgeport than in any other city in Connecticut" with 29,419 workers with $85,862,219 of value added by manufacturing. Bridgeport exceeded major metropolitan districts—Hartford, New Haven, even St. Louis—in terms of percent of employment in proportion to total population and percent of persons employed in the manufacturing sector. The point is that the prosperity and growth rate of Bridgeport are intrinsically related to employment in the manufacturing

sector. Roy Wenzlick & Co also notes that most of the manufacturing was taking place in Bridgeport while the surrounding communities were largely residential.

Although the number of African Americans living in Fairfield County in 1940 was small, most of the black populations were concentrated in Bridgeport says Roy Wenzlick & Co (1944). The city also had a larger percent of foreign born citizens in comparison with surrounding towns. Homeownership rates in Bridgeport in 1940 were 26.6%, compared to 56.3% in Fairfield, 72.5% in Trumbull, and 56.5 in Stratford. For renters, the average rent in 1940 was $29.61 in Bridgeport, $59.69 in Fairfield, $43.46 in Trumbull, and $40.79 in Stratford. This indicates a higher standard of living in the towns surrounding the industrial center of Bridgeport.

Roy Wenzlick & Co (1944) continues, stating that substandard or “slum” living conditions emanate from substandard incomes. Substandard housing is mistakenly blamed as the source of blight and crime. It can be inferred from the rhetoric of Roy Wenzlick & Co’s dated source that many people believed deteriorating public housing to be the source of “most crimes, most diseases, most juvenile delinquency, [and] immorality”. Housing quality depends on age and maintenance. By the early 1940s, about half of the dwellings in Bridgeport were more than 34 years old. The housing structures that were properly maintained made for perfectly fine housing. Yet a large portion of the housing stock, already old with added maintenance neglect, experienced excessive deterioration. In 1940, 5,438 housing structures in Bridgeport were in need of necessary repairs in comparison with 380 in Stratford and 1800 in Fairfield, Trumbull, and Milford. The 1,770 units in Bridgeport—known as “cold water flats” as cold running water and

public bathrooms were the only modern amenities offered—lacked common standards of decent living at the time.

Roy Wenzlick & Co (1944) writes that some of the worst quality housing was located along early horse car routes. These areas that were most densely populated during Bridgeport's earlier industrial boom became obsolete, vacant, and rundown. The families in the lowest income brackets who couldn't afford to move out to the suburbs and live in the newly constructed houses in surrounding suburban towns lived in the old and poorly maintained structures in Bridgeport.

In 1936, Jasper McLevy formed the Bridgeport Housing Authority (BHA) with Reverend Stephen Panik named as the authority's first chairman. In 1939 groundbreaking on the first public housing complex in New England, Yellow Mill Village, began in Bridgeport. Groundbreaking for the construction of Marina Village apartments began in 1940 (Bridgeport Housing Authority 2012). After the construction of Marina Village in 1940, 157 deteriorated dwellings were demolished. Many of the deteriorated properties in Bridgeport were repaired and painted. In fact the "old dilapidated squalid housing existing in most metropolitan cities" at the time existed in Bridgeport to a limited extent in comparison with other large metropolitan areas. Bridgeport revamped its deteriorating housing stock and with the help of the U.S. Housing Authority demolished substandard housing units, replacing these units with an equal number of units in the new Yellow Mill Village and Marina Village slum replacement projects.

WWII

The United States amped up its arms production in 1940 after the fall of France and the fear of the collapse of England. The U.S. entered World War II in 1941 after the

Japanese attack on Pearl Harbor (Bridgeport Public Library). Roy Wenzlick & Co write that manufacturing in Bridgeport had dropped between 1937 and 1938, slowly rising until the early 1940s. Employment rates in Bridgeport increased faster than the national average. According to the 1940 census, 62,266 people were employed in Bridgeport. With the U.S. arming itself as quickly as possible, Bridgeport once again became one of the main industrial centers in the country. By March 1943, 74,600 people were employed in Bridgeport. The number of people employed in the "Bridgeport Area" which includes Bridgeport and surrounding towns increased from 87,063 in 1940 to 120,000 employed only three years later in 1943. "War workers" and their families looking for jobs as well as soldiers who had entered and returned from the war migrated into Bridgeport and surrounding towns, increasing the population in the Bridgeport Area by 8.2% from 1940 to 1946. The surplus housing in the Bridgeport Area (2,809 units) in 1940 was quickly absorbed one year later, creating a housing shortage until 1943. To handle the higher demand for housing, families were doubled up and rooming accommodations were expanded. During peak migration into the area, 3,500 families were doubled up in rooming houses. 359 housing units became available in the newly constructed Marina Village project.

From 1940 to 1943, 2,262 housing units, taking the form of apartments and single detached units, were built with funds from the Federal Housing Authority. Although these houses were built to minimum standards of the Federal Housing Authority at the time, functionality made the five room, one bath single detached unit very popular across the country. By 1942 the Federal Housing Authority had built 2,700 defense units under the Lanham Housing Act as permanent public housing projects. The overwhelming

majority of these units were built in Bridgeport in comparison with surrounding towns. “No one can question the legal right of the government during the emergency of war to choose the number, type and place of housing units to be built…” writes Roy Wenzlick & Co (1944), “However, it is within the right of the people of the Bridgeport Area to question the right of the Federal government to say whether such war housing is to be a part of the permanent supply of housing after the…war.” The trouble was that the hastily built “permanent” housing inserted into Bridgeport by the federal government was not built according to local zoning laws. Many units were poorly constructed and not built with local climate conditions and family needs in mind. These emergency permanent wartime units were meant to house not the most poor (living in the Marina Village and Yellow Mill Village projects) but rather the next income level up. In summary, the uniform design, inadequate space, and lack of modern conveniences made the units unfit for permanent use after the need for emergency housing passed.

Roy Wenzlick & Co writes that by 1944 the demand for rooming house accommodations declined, leaving a portion of permanent and temporary housing units vacant. In 1946, 3,839 out of Bridgeport’s 44,544 housing units were vacant. As the U.S. stepped up its defense effort, more housing was needed. Materials used to build houses were rationed for the war effort, increasing construction costs and resulting in poor quality, smaller houses. At the height of the federal war housing emergency, the Federal Housing Authority was building permanent as well as temporary housing which would be removed after the war. Temporary housing was dormitory style containing 1,900 units and 400 unit two and three room home development known as the West End Homes.

Many of these temporary units went unoccupied as the demand for emergency housing declined.

In 1940 Bridgeport had a population of 3,767 black people, or 2.56% of the city population (147,121 people). Bridgeport was home to 85.1% of the black population in surrounding towns Fairfield, Stratford, Milford, and Trumbull. This is a relatively small percentage in comparison with the percent of black people living in Connecticut (1.9%), Hartford (4.3%), St. Louis (13.3%), and Birmingham (40.7%). A large portion of Bridgeport's black population worked in domestic service jobs as servants and laborers. Labor shortages developed after the war effort gained speed for the second time that century. Many black families immigrated into Bridgeport. Some companies directly recruited workers from the South in large numbers. A dated source, Wenzlick and Co (1944) reveals interesting societal perspectives and prejudices at the time. Northern societal prejudice towards black people, although not as intense as in the South, still existed in areas with large black populations. Wenzlick and Co (1944) writes that the "co-mingling of the races in neighborhoods is found only among the lowest standard of living group of both races". Real estate values tended to be the lowest in these areas and highest in areas where neighborhoods are segregated into black or white. With black families migrating into the city, Bridgeport's black population was dispersed over a larger area compared to other cities. Instead of segregating housing developments by race, black families were settled across most developments. Black families were placed in the Yellow Mill Village and Marina Village slum clearance projects as opposed to the emergency "permanent" war housing provided by the federal government. The housing authority wanted to sell the increasingly vacant public defense projects to returning vets

under the impression that integrated units in combination with inadequate construction and cramped space will place even more stress on the already stressed units.

As early as 1944, Wenzlick and Co (1944) describe the decline of Bridgeport as the aging, former center of surrounding towns with increasing concentrations of families with lower standards of living in the city. Families with higher standards of living moved out of Bridgeport into neighboring towns, taking away with them a portion of Bridgeport's tax base. To make up for this, Bridgeport had to increase taxes on businesses and industries thus driving away businesses from the area. Residential towns around Bridgeport that were dependent on employment in the city were growing. Wenzlick and Co (1944) voice the need for better planning at the county level, advocating for common planning and zoning practices in Bridgeport and neighboring towns noting that such equity is difficult as each town has developed their own sense of pride and manner of doing business. In 1945, the BHA took over control of approximately 5,000 housing units in neighboring towns Stratford and Fairfield. Groundbreaking for the P.T. Barnum Apartments and the Charles F. Greene Homes began in 1950.

1950-1960

From 1941 to 1945, work orders for the war effort kept coming into Bridgeport. Layoffs began after the demand for supplies waned with the end of the war in 1945, and by December 1949 there were 15,900 people unemployed in the city. In 1950, the city peaked at a population of 158,709 (Bridgeport Public Library). Neighborhoods in the city expanded, becoming more stratified by ethnicity, race, and income. Yet there were still jobs in Bridgeport during peacetime. Bridgeport Brass broke all profit records in 1950,

employing 5,300 people. The federal government also renewed defense contracts with Sikorsky and other manufacturing companies in Bridgeport following outbreaks of hostility in Korea. From 1950 to 1955, factories in the city—including CASCO Products, Columbia Records, and the Acme Shear Company—were advertising in Puerto Rico for workers. From 1951-1952, the *Bridgeport Sunday Herald* ran a series of articles on the deplorable health conditions, unfair housing practices, and language barriers facing the 2,700 Puerto Rican immigrants living in Bridgeport projects (Bridgeport Public Library). Some factories such as Manning Maxwell and Moore moved out of Bridgeport to surrounding towns and others like Warners to Puerto Rico. Two years later in 1954, Avco, Singer, Underwood, and other factories laid off several hundred workers. By 1955, there was an estimated 5,000-7,000 Puerto Ricans living in the city. The Bridgeport Harbor Station Plant was fired up in 1961, a source of local air pollution with unfairly distributed health impacts that will be discussed later in the report (Hladky 2013).

Niebanck, Broun, and Pope (1965) write that in 1960, about 278,000 people lived in the Greater Bridgeport Region (GBR) with 156,748 people, or about 56% of the GBR, living in Bridgeport. The Greater Bridgeport Region consists of Bridgeport and surrounding suburbs Easton, Monroe, Stratford, and Trumbull. Niebanck et al. found that Bridgeport had a smaller percentage of households in which both parents are present, higher elderly populations, and fewer children in comparison with other towns in the GBR. Finally, Bridgeport was home to more than 90% of the regions black and Puerto Rican populations. Blacks and Puerto Ricans made up 13% of the population of Bridgeport while the two groups comprised less than 2% of surrounding suburban

populations. Bridgeport was home to over 75% of families in the GBR with annual incomes under $4,000 in 1960.

From 1950 to 1960, Niebanck et al. (1965) write about the out-migration of mostly whites to the surrounding spacious suburbs and in-migration of nonwhite populations to the city. Of the 84,000 housing units in the GBR, 52,000 are located in Bridgeport. The housing stock in Bridgeport is older, higher density, and less costly compared to the newly constructed larger, more expensive houses in surrounding suburbs. Bridgeport's inexpensive housing attracted low-income and minority populations while more affluent families made their homes in the surrounding towns. Less than 30% of Bridgeport's housing stock in the early 1960s was single-family, owner occupied compared to 80% for the neighboring suburban housing stock. Middle and upper class families with children preferred single-family homeownership over living in the city while nonwhite families lived in the city largely in multifamily, renter-occupied units out of economic necessity. From 1950 to 1962, nearly 8,200 acres of land in Bridgeport's suburban neighboring towns were converted for residential use, highlighting the popularity of single-family homes. Of the 13000 substandard housing units in the GBR, 10,000 were located in Bridgeport. Niebanck et al. (1965) site structural inferiority and lack of plumbing as two problems with Bridgeport public housing. These housing units are located mostly in multi-unit structures, concentrated in abandoned sections of the city. This lack of enforcement of minimum living standards and unequal distribution of wealth puts Bridgeport at a disadvantage.

1960-1990

While some factories were laying off workers in Bridgeport in the early 1960s, others started up, renovated, or expanded with 6,000 jobs generated in Bridgeport in 1963. The Vietnam War brought a surge of demand for the aviation industry, and in 1968 the city peaks in its employment rate. 1964 in the U.S. saw the passage of the Civil Rights Act, and later from 1965-67 race riots across the nation. By 1970, the population of Bridgeport was 156, 542. That same year, Connecticut legislatures met to create a plan to ease the economy from war to peacetime production while cutting as few jobs as possible. The transition was not so easy it turns out, with factories phasing out facilities in the city and major layoffs. The manufacturing industry in Bridgeport, which made up for 42.5% of the 63,350 people employed in the city in 1970, was waning. So much of the economy was based on defense and military orders that industry was struggling to survive after work orders stopped coming in with the end of the Vietnam War in 1975 (Bridgeport Public Library).

In 1980, the population of the city dropped to 142,546. By this time, manufacturers such as Bridgeport Brass and Remington that hadn't already moved their operations out of Bridgeport were shutting down and relocating because the plants and the factories had become obsolete, old, and inefficient compared to newly built factories in the Midwest, Singapore, Great Britain, and Puerto Rico. Jenkins Brothers is one example of a manufacturer that closed the doors to its facilities in Bridgeport as a result of unbeatable foreign competition and inadequate modernization investments in Bridgeport factories. Many companies also lost their independence as they were absorbed by larger ones throughout the 1980s. National unemployment rose to 9.5% in 1982, the highest rate since before WWII. The Southwestern Area Commerce and Industry

Association of Connecticut, Inc. reports a lack of skilled labor, steep energy prices, high taxes, and the rising cost of real estate as influences on the local manufacturing demise (Bridgeport Public Library). By 1982, conditions in the housing projects managed by the BHA were bad enough to earn the BHA a spot on HUD's public housing authority "troubled list". Throughout the mid '80s and early 90s, the BHA spent $75 million dollars on construction new of duplexes and renovations for existing housing projects (Rierden 1993). By 1991, the population of Bridgeport dropped again to 141,686. In 1991, Bridgeport became the first large city to file for municipal bankruptcy under Chapter 9 U.S. Bankruptcy Court in lieu of an 18% property tax increase to raise revenues. However, Federal Bankruptcy Court judges ruled the city was not insolvent and could not declare bankruptcy (Bridgeport Public Library).

1970-Today

According to Reardon and Bischoff (2011), family income segregation by neighborhood, or the "uneven geographic distribution of families of different income levels within a metropolitan area" has increased significantly across the nation since 1970. Families with high incomes are found in neighborhoods with other high-income families, while families with low-incomes tend to live in neighborhoods with low-income families. This creates educational, health, environmental, and crime disparities between income groups. Higher incomes mean a higher tax base, and more money to built better facilities. Low-income families have unequal access to these resources, limiting upward social and economic mobility and perpetuating the cycle of inequality.

When higher income families are more dispersed, there tends to be more equality in the distribution of resources. Reardon and Bischoff (2011) continue, writing that 65%

of families lived in middle income neighborhoods in 1970. In 2007 this number dropped to 44%. Across metropolitan areas in the U.S., the number of families living in middle-income neighborhoods decreased. This transition was mirrored by an increase in the proportion of families at the far ends of the income spectrum—that is, from 1970-2007 the number of families living in the richest and poorest neighborhoods doubled (respectively). To put this in another way, 15% of families lived in the most affluent or poorest neighborhoods in 1970 in comparison with 31% of families living in one extreme or the other in 2007. This data is consistent with the outmigration of affluent families into the rich surrounding suburbs of Bridgeport. Out of the 117 metropolitan areas studied in the report, the Bridgeport-Stamford-Norwalk area ranks number one in metropolitan areas with the highest level of family income segregation. 44.4% of families in the Bridgeport-Stamford-Norwalk area live in the extremes of the spectrum (or the poorest and richest neighborhoods).

Family income segregation is higher among minorities says Reardon and Bischoff (2011). That is, low-income Hispanic and black families are more segregated from middle income Hispanic and black families at a higher rate than low-income white families are segregated from middle and upper income white families. Middle-income black families are less likely to live in the same neighborhood as low-income black families and more likely to live in neighborhoods with high densities of low-income white families than middle-income white families. Income segregation for black families increased dramatically in the 1970s and 1980s as a result of decreased housing discrimination. The early 2000s brought less stringent mortgage practices, thus contributing to family income segregation as moderate income families could now live in

middle and upper income neighborhoods. Figures 1 and 2 provide a striking visual representation of the disparities in income and the concentration of minority populations in the Bridgeport and surrounding towns for the year 2000. The block groups with the lowest incomes as well as the majority of the local minority population are found in Bridgeport.

Poppa (2009) writes that Bridgeport has the highest home foreclosure rate in the state, and that the waiting list for public housing is growing, That waiting list is 2,000 to 3,000 people long according to Nick Calace, the Executive Director of the BHA. Burgeson (2011) writes about Linda Couch, senior VP of policy and research for the National Low Income Housing Coalition. According to Couch, the nation has seen a decrease in public housing units since the mid-1990s when it was no longer required that a housing unit which was displaced or demolished be replaced with another unit. Couch states “There's always this notion that low-income housing is going to be built `over there,' when, in fact, there's no `over there.' Often what happens is that these units just never get built." She adds that the average income for Bridgeport public housing residents is $13,000, enough to put a family on the streets (Burgeson 2011).

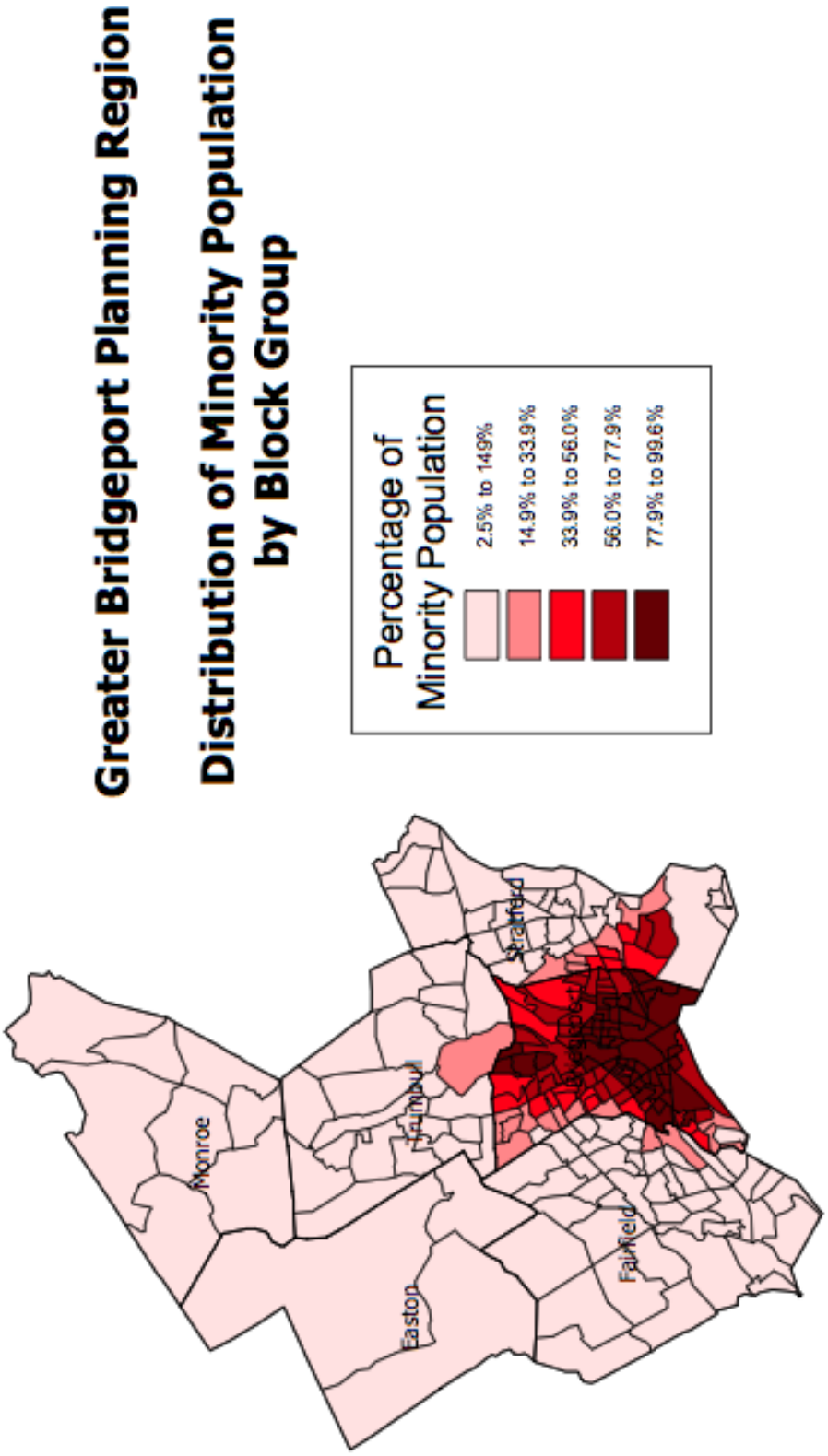

Figure 1, Greater Bridgeport Regional Planning Agency (2003).

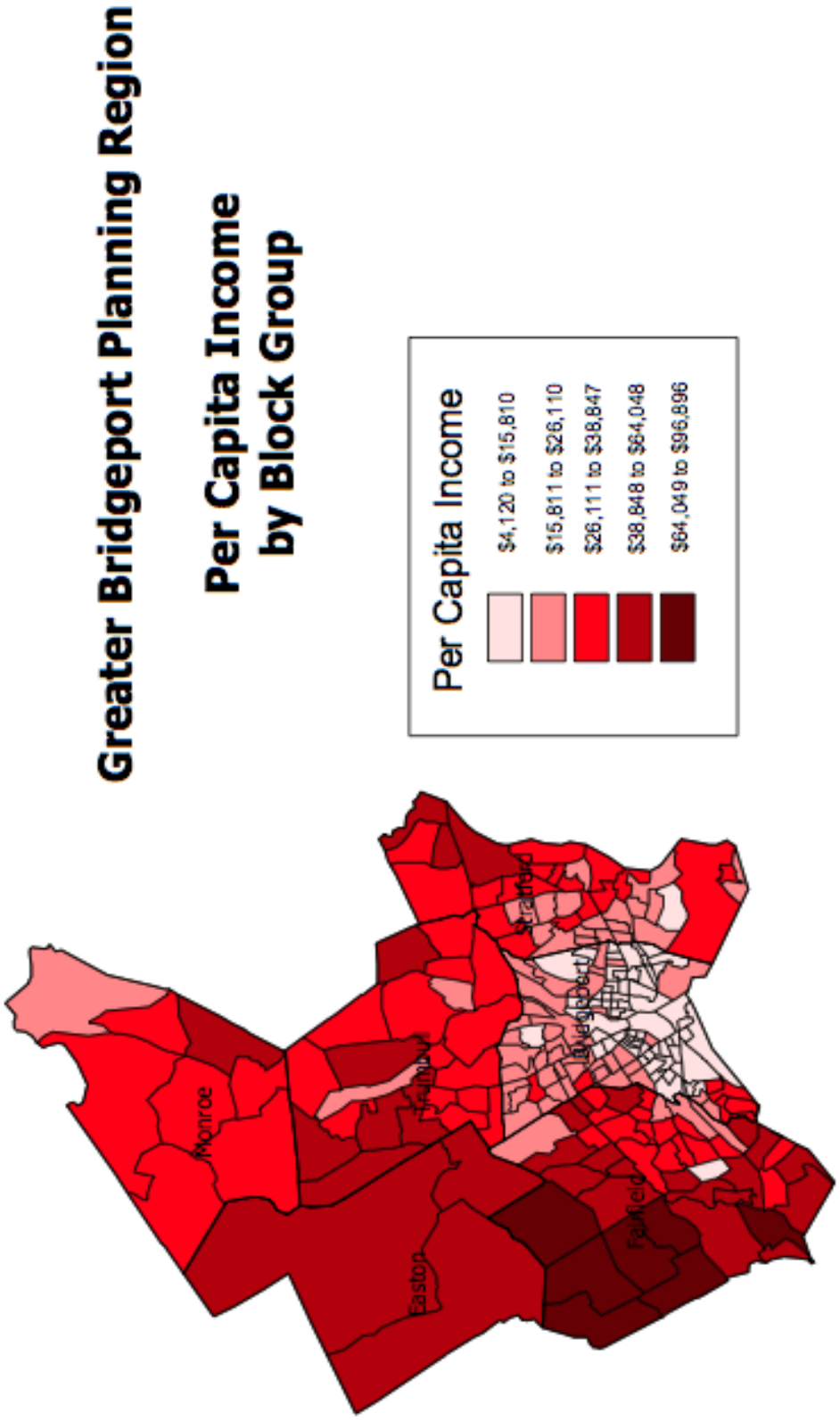

Figure 2, Greater Bridgeport Regional Planning Agency (2003).

Memorable public housing projects: Father Panik Village and the Pequonnock Apartments

There were between 2,000 and 3,000 families on the waiting list for public housing in 2011, writes John Burgeson of the *Connecticut Post*. This reflects the demolition of the city's infamous housing project, Father Panik Village. By the late 1930s, the old multifamily homes of the lower East Side were demolished. Working at a nearby church, Reverend Stephen Panik raised funds and made room for a new housing project in this poor neighborhood by encouraging property owners to sell their homes to the government as part of President Roosevelt's New Deal (Burgeson 2011). Yellow Mill Village (later renamed Father Panik Village), located on the lower East Side, opened in 1941. The $6.5 million dollar project housed 1,200 units, a gym, a community center, and a power plant. At 5,400 residents, it would have been the 51st largest town in the state at the time. In 1940, rent was about 20% of the average family income for five people (Only in Bridgeport 2012). Father Panik hoped this project could reduce crime, poverty, and disease in the lower East Side. From 1986 to 1993, Father Panik Village was demolished with good reason (Burgeson 2011).

Crack cocaine, stray bullets, and homicides sent Father Panik Village into a downward spiral from the 1970s to the early 1980s. According to Bridgeport Police Chief Thomas Sweeney, Father Panik Village was averaging four to five homicides a year in comparison with the statewide homicide rate of around 150. City officials demolished the blighted project in an effort to lift the city up from its deindustrialized fall. "Bridgeport's past plight has been linked to a big extent to the deterioration of public housing and

Father Panik Village was by far the most notable example," reiterates former Bridgeport Mayor Joseph P. Ganim (Rierden 1993).

The Pequonnock Apartments were constructed by the Connecticut Housing Authority for state family public housing in 1955 as a nine-story building housing 256 units. Rampant drug use, vandalism, and poor maintenance earned the project its negative reputation by the late 1970s (Burgeson 2011). In 1995, management was passed onto the Bridgeport Housing Authority. In 2000, HUD, BHA, and the city made arrangements with the residents to replace 100 units as “hard” units and 156 with “soft” units meaning project-based Section 8 vouchers. Demolition of the Pequonnock Apartments began in 2002. In 2003 the Bridgeport Neighborhood Trust was chosen by the city to manage the “hard units”. Some of the replacement units are new construction while others are retrofits to existing buildings. The Bridgeport Neighborhood Trust is working on three development projects ranging from new construction to maintenance in the East End, the South End, and downtown (Bridgeport Neighborhood Trust 2012). The city reduced the requirement of hard units to 60 and provided funding for Stable Families, a program that works to increase positive tenancy in public housing and Section 8 housing. The Pequonnock replacement program was completed in 2012. The old site is no more than a 2.75 acre lot used as parking for the Arena at Harbor Yard (Only in Bridgeport 2012).

In August 2012, the Father Panik Village and Pequonnock Apartments Replacement Housing Programs’ closing agreements were signed, ending 26 years of demolition and relocation. 1,063 displaced units were replaced with a combination of 791 hard replacement units built around the city and 272 soft units or Section 8 Housing Choice Vouchers (Only in Bridgeport 2012). The BHA managed the

replacement of three major housing projects through a combination of Section 8 housing and scattered site housing. The Bridgeport Housing Authority manages 2800 Section 8 units across the city. With Section 8 housing, renters give one third of their income as rent to the BHA. These units take the form of apartments and multi-family houses. The BHA also manages 580 "Scattered Site Housing" units throughout the city. Buildings range from mid-rises, row-houses, duplexes, condominium style complexes, multiple family houses, and single family houses. These units are scattered around the city, preventing high concentrations of low-income families in one neighborhood (Burgeson 2011).

The Albion Street project was the last leg of the Father Panik Village Housing Replacement Program. The project is designated as mixed-use supportive housing, combining 35 two bedroom housing units with dental and medical centers. The building features a LEED certified green roof (BHA 2012). Presidential Village, also known as New Pequonnock, is made up of 11 newly constructed apartments as part of the Pequonnock Apartment replacement program. The houses are built on former vacant lots which had been sites of illegal trash dumping (BHA 2012).

Socio-economic conditions in Bridgeport and public housing

In the remaining segment of this chapter we will become familiar with the public housing projects in Bridgeport and their respective neighborhoods to get a feeling for the socio-economic characteristics the city. The following statistics quantify social and economic conditions in a portion of Bridgeport's neighborhoods. However, many units are scattered site and would require studying the socio-economic conditions in different neighborhoods across the whole city. The statistics let us really immerse our thoughts

into Bridgeport's public housing conditions as a whole. First we will look at socio-economic conditions in Bridgeport as a whole followed by descriptions of public housing in Bridgeport today.

Bridgeport is a relatively small yet highly populated city located on Connecticut's southwestern shoreline. The city is located in Fairfield County, which also includes Greenwich, Fairfield, Stamford, Norwalk, Westport, and Ridgefield. An estimated population of 145,638 in 2011 makes Bridgeport the most populated city in the state. According to 2010 US Census data for the city 39.6% of citizens are Caucasian. This figure nearly doubles as Connecticut is surveyed as a whole with census data reporting that 77.6% of the population is white. Still the percent increases when comparing Bridgeport to the rest of Fairfield County where 80.9% of the county is white. The population of Bridgeport is 34.6% black, 38.2% Hispanic or Latino origin, and 22.7% reporting white but not Hispanic (note that for census data the numbers do not add up to 100% because Hispanic origin is not a race; therefore, people of Hispanic origin may be counted in multiple categories). This reflects Bridgeport's large and diversified immigrant population. Connecticut's racial profile consists of 10.1% black and 13.4% Hispanic or Latino origin. It is no surprise that Fairfield County's population composition is only 11.8% black and 17.4% Hispanic or Latino origin. In Greenwich, Caucasian citizens make up 80.9% of the population. Data for Westport reveals 92.6% of the population is white. It is important to remember that these aren't just numbers. The figures listed above reveal enormous differences between Bridgeport and the other towns that make up Fairfield County. There is also a large disparity in percent of the population living below the poverty level and per capita income in Fairfield County. 20.8% of

Bridgeport residents live below the poverty level as compared to 5.8% in Greenwich, 11.1% in Stamford, and 3.1% in Westport. 2010 US Census data puts per capita income in Bridgeport at $22,192, Fairfield at $54,052, Westport at $90,792, and Greenwich at $78,734 (ESRI 2011; US Census Bureau 2012). Marginalization of minority populations and high rates of poverty create the perfect conditions for environmental injustice in Bridgeport.

Life in Bridgeport public housing today

Affordable housing in Bridgeport takes many shapes. There is family housing and senior/disabled and supportive housing. A diverse collection of townhouses, high-rise towers, row-house complexes, multiple family houses, mid-rises, duplexes, single-family houses, and condominium style complexes are scattered throughout the city. The large-scale housing projects (with more than 500 units), so popular in the mid 20th century, are not desirable today. Nowadays, affordable housing units are scattered around the city to promote mixed use land planning. That means mixed income in neighborhoods more transit oriented development for the city (Burgeson 2011). This report looks at the four largest family housing complexes as well as "scattered site housing" in the city. The following section discusses the major housing projects in Bridgeport. The Connecticut Center for Economic Analysis (CCEA) has developed crime, education, and income rankings, known as Neighborhood Development Indexes, for each of Bridgeport's distinct neighborhoods. Crime and income levels are listed as well as population demographics and housing stock figures. Figure 3 is provided at the end of the section as a reference to the neighborhoods discussed in the report.

Trumbull Gardens

Trumbull Gardens is located in the North End neighborhood of Bridgeport. Today's Trumbull Gardens lies on the site of former project Beardsley Terrace. Operated by the Connecticut Housing Authority, the 1,400 unit project consisted of 16 buildings. The current housing complex consists of 55 two-story frame and brick veneer townhouses containing 274 units as well as two 8-story high-rise towers containing 128 units (Bridgeport Housing Authority 2012). The Trumbull Gardens apartments replaced a project called Beardsley Terrace. The Connecticut Housing Authority managed Beardsley Terrace's 16 building, 1,400 units structure (Burgeson 2011). The North End is bordered by the affluent towns of Fairfield and Trumbull. According to the *Bridgeport Master Plan of Development* (2008), 21,566 people live in the neighborhood. The majority of the housing stock is single family. There are 8,717 housing units, 27.5% of which are renter occupied. 84.5% of the housing stock was built more than twenty years ago. Average household income is $68,258 with 8% of people living below the poverty line.

The racial breakdown of the city is 60.7% white, 16.4% black, 16.1% Hispanic, and 6.9% Asian/other. About 21% of residents are foreign born. The unemployment rate in the North End was 6.7% in 2000. St. Vincent's Medical Center employs many North End residents. One third of residents work in the educational and medical sectors, earing $48000 a year. The North End ranks first in quality of life in comparison with the other neighborhoods in Bridgeport. There were 324 incidences of crime and 120 citations of blight in the neighborhood in 2006. High incomes, low crime rates, three large parks, and strong education performances make the North End a desirable residential neighborhood.

Charles F. Green Homes

The Charles F. Green Homes found in the Hollow neighborhood consist of a seven story high-rise complex. The units on the first floor are townhouses. There are 268 units in the five buildings. Bridgeport's smallest and densest neighborhood is the Hollow. Situated in the center of the city, 9,562 residents live in the 0.42 square miles of the neighborhood as of 2000 census data. The Hollow has a high unemployment rate of 11.3%. 25.2% of residents in this neighborhood live below the poverty line. The area was predominantly an English and Irish neighborhood as immigrants poured into the Hollow in the 1830s. Similarly, 30% of Hollow residents are foreign born today.

The race breakdown for the Hollow is 16.3% white, 27.7% black, 12.2% Asian/other, and 43.8% Hispanic. 52.3% of residents have less than a high school education. As of 2000, there were 3,477 housing units in the Hollow. Over 95% of the housing stock was built more than twenty years ago. The most common type of housing in the neighborhood is multifamily residential housing. 78.6% of the housing stock was renter occupied in 2000. There are no parks or open space land areas in the Hollow. The neighborhood ranks fifth out of Bridgeport's thirteen neighborhoods in terms of crime as measured by the CCEA crime index. Average household income in the Hollow is $48,486 with 25.2% of residents living below the poverty line. 455 felonies and 182 citations of blight were reported in the Hollow in 2006 (Bridgeport Master Plan of Development 2008).

Marina Village

Located in the South End, Marina Village consists of a two-story, row-house complex. According to the *Bridgeport Master Plan of Development* (2008), there are 37

buildings of which 389 units are on-line. The South End neighborhood is a peninsula located on Long Island Sound. 46.7% of the land use is parks and open space including the beautiful Seaside Park. 11.5% of land use is industrial. Residents of the neighborhood live in the northern section in medium and high densities. 35.4% of residents of the South End are unemployed. As of 2000, there were 4,697 people living in the neighborhood.

The racial composition in the South End is more balanced than other neighborhoods in Bridgeport with 17.3% white, 29.2% black, 17.1% Asian/other, and 36.4% Hispanic. About 20% of South End residents are foreign-born. Average household income in the South End was $40,236 in 2006. 38.2% of residents live below the poverty line. There were 135 felonies and 69 citations of blight reported in the neighborhood in 2006. As of 2000, there were 1740 housing units in the South End. 94.4% of the housing stock is more than twenty years old. The most common housing type in the neighborhood is multifamily residential which makes up 64.6% of housing. A prime location on Long Island Sound, assets such as Bridgeport University, and close proximity to Downtown, there is interest to develop the South End. Nowadays, vacant industrial buildings are being revamped (Bridgeport Master Plan of Development 2008).

P.T. Barnum Apartments

The P.T. Barnum Apartments are located in the Black Rock neighborhood. The complex contains 19 townhouse/row-house buildings that house 360 units. 8,863 residents were living in Black Rock as of the year 2000 (Bridgeport Master Plan of Development 2008). 56.6% of residents in the neighborhood are white. Hispanics make up 19.6% with black non-Hispanics making up 18% of the neighborhood population. 19% of Black Rock residents are foreign born. Over 90% of the 4,322 housing units in

the neighborhood were built before 1980. Single-family homes are the most common type of housing in Black Rock. According to CCEA data, Black Rock has the lowest crime rates, the lowest elementary school test scores, and a higher income rate in comparison with Bridgeport's other neighborhoods. Average household income in Black Rock as of 2006 was $67,514 with 13.4% of residents below the poverty line. In 2006 there were 53 citations of blight in the neighborhood (Bridgeport Master Plan of Development 2008). 142 felonies were reported in Black Rock as of 2006. 69.8% of Black Rock's total land use is residential. 59% of housing structures are single-family homes. 30.4% is two to four family housing while 7.4% is housing five or more families.

Jay Poppa (2009) writes in an article for socialistworker.org about tragedy and housing conditions in the P.T. Barnum Apartments. A family of four was killed in a tragic kitchen fire. Some fire escapes and fire doors on the interior of the building were removed in 1992, a result of the remodeling of the project to accommodate more residents. As Poppa puts it, "the death of this family points to the utter disregard that working-class people and disproportionate numbers of working-class people of color face in the lack of decent and affordable housing today."

Indirect and direct racial, ethnic, and economic segregation in housing policy isolates communities in the physical, economic, and cultural senses. New directions in housing policy can help to bring about environmental justice for low-income and minority populations in public housing. In the next chapter we concentrate on environmental health in the home and how green building techniques can alleviate some of the disparities in health and quality of life for public housing residents. We will see how climate change is a source of environmental injustice for low-income populations as

they will not have the same preparedness and capacity to cope with its effects on weather systems.

Figure 3, bridgeport.ct.gov (2013).

Chapter 3

Health and Environmental Risks Stemming from Environmental Justice and Climate Change

"The citizens have complained for years about that power plant — even though people will say now, when you talk to [PSEG], that it's been cleaned up, it's a clean power plant. Well, you can't tell that to the families that live in the South End, because they can't open their windows in the summer without having soot coming through the windows, their cars are constantly covered with it." —Adrienne Farrar Houel, Bridgeport resident, on the Bridgeport Harbor Station Coal Plant (NAACP 2012)

Data from the American Housing Survey (2009) study puts the average age of public housing units in the national study in the 1970s. Out of 130,112 units studied in the survey, 2,020 units reported a hole in the roof. 3,850 units were reported to have broken windows while 3,552 units reported bars on the windows. 5586 units surveyed do not have complete kitchen features meaning they lack a kitchen sink, refrigerator, or a cooking stove/range. Astonishingly, 9,101 units reported not having a working smoke detector. 43,494 units report having a working carbon monoxide detector while only 6,401 homes report a sprinkler system. 2,822 units are lacking some plumbing facilities such as no hot piped water. 3,339 homes in the survey report interior broken plaster or peeling paint with 7,011 units reporting interior open cracks or holes. This survey only represents a fraction of public housing in the U.S. How many more units not included in the survey lack carbon monoxide detectors and working smoke detectors? Does the paint

peeling from the walls contain lead? This data quantifies the environmental injustices happening today in America's public housing units.

This section looks at retrofitting existing public housing units to improve health and quality of life for residents. In the first part of the chapter, we look at the negative health and well being effects of unhealthy homes. Then we look at what it takes to make a home a healthy living space. Next, we will make the case for mitigating health hazards in the home through green building strategies. Finally, multiple case studies are presented as examples of successful implementations of affordable green housing to show how specific improvements can really help mitigate health issues in the home. In the second part of the chapter, we look at environmental justice issues affecting Bridgeport residents. The final section deals with defining climate change and its physical and social effects. Examples are given of extreme weather events and climate injustice in Bridgeport.

Environmental health hazards in the home

Although asthma rates have increased across the nation in children and adults, it is most prevalent in low-income neighborhoods in the United States. A large body of scholarly research strongly suggests that children living in public housing are more likely to contract asthma than children who live in private housing. Northridge et al. (2010) suggested there is a relationship between housing quality and asthma in children living in urban neighborhoods. Children who lived in public housing were shown to have higher rates of asthma than those who lived in private homes. The poor condition of public housing—whether it be structural decay, lack of management, failure to maintain the building, or hazardous materials used to build the unit—can help to explain why asthma rates are higher in the inner-city.

Old plumbing, leaky roofs, and poor ventilation in moist areas such as the bathroom can lead to mold indoors. The mold is a result of poor housing conditions. Outdated heating systems and appliances and gas-burning stoves and ovens add nitrogen dioxide to the air. Some studies suggest that poor housing conditions are linked with a higher level of cockroaches. For low-income families living in older housing units with structural damage, lead exposure can also pose a risk. These environmental hazards are unequally distributed in society. Low-income families are exposed to more health risks than other segments of the population but don't have the same means as the rest of the population to pay for the consequences (Rauh, Landrigan, and Claudio 2008). This violates the principles of environmental justice; low-income and minority populations bear the burden of different environmental hazards—in this case in the form of pollution—because they are marginalized by society into some of the worst quality housing environments due to their low socioeconomic status.

Rauh, Landrigan, and Claudio (2008) show how living conditions affect a person’s quality of life. Residents of public housing experience a different quality of life than those who live in private homes. Maintaining a house requires a surplus of money which many low-income families do not have room for in their already tight budgets. Failure to maintain the house results in an unhealthy environment. This becomes an environmental justice issue because low-income populations are at greater risk for exposure than the rest of the population.

What is a healthy home?

We will look at how the National Center for Healthy Houses (Beatley 2011) outlines the aspects of a healthy home. Homes need to be dry and pest free to prevent

mold, mites, and other unwelcomed critters. Houses need to be “clean” in that they do not put residents at risk for exposure to indoor toxins. Homes should be safe in the structural sense, properly ventilated, and well maintained. Before renovation, the units showed signs of mold, mildew, and pests and were not properly ventilated or insulated. Windows and doors were in poor condition, water was not properly drained from the site, and carpets were old and unhygienic. Lack of public greenspace and insufficient lighting added to the poor state of the units. Residents suffered from respiratory illnesses such as asthma, hay fever, sinusitis, chronic bronchitis as well as skin allergies. The homes were retrofitted with better ventilation systems, exhaust fans in kitchens and bathrooms, integrated pest management programs, and low-VOC paints (Beatley 2011).

Improving health through green building design

Implementing green building practices can decrease environmental health risks. Improvements include using installing adequate insulation, putting plants native to the area in the building to filter the air, and using natural fiber carpets. For example, the EPA describes how proper ventilation practices can reduce the build up of moisture which leads to mold. Good ventilation reduces indoor air pollutants like cigarette smoke, off-gassing plywood, carbon monoxide, radon, and fumes from the fireplace and kitchen (EPA Indoor Air Pollution: An Introduction for Health Professionals).

Why aren’t all homes built to reduce environmental health hazards? Budgetary restrictions hinder the feasibility of exclusively using stronger and longer-lasting materials. Prioritization lies at the heart of green building; improvements should first be made on those materials with the worst performance, and materials that affect the lifespan of other products. For example, leaky pipes can cause wood to rot, poor ventilation can

cause mold build up in moist rooms such as the bathroom, and faulty heat exchangers can leak carbon monoxide into the air. In all of these scenarios, the health of unsuspecting residents is unfairly affected by the environmental hazards.

Examples of affordable green housing design to improve health

A report written by Noreen Beatley for the National Center for Healthy Houses (2011) looks at four case studies in which affordable housing units were retrofitted or built using green design principles. Results of the study suggest the health benefits of improving indoor air quality by replacing old materials with environmentally friendly ones. This was true for each of the four case studies. Residents living in the Viking Terrace housing units showed reduced levels of sinusitis, chronic bronchitis, allergies, ear infections, and asthma after the restoration. Residents also spent more time outside thanks to landscaping renovations. The High Point Breathe Easy Homes in Seattle, Washington are the first green houses in the U.S. to be specially designed to increase indoor air quality. Design features include high quality windows and insulated foundations to reduce moisture build up in the home, low-VOC cabinets and carpets to mitigate off gassing, and a heat exchange ventilation system to continuously filter in fresh air. The improvements resulted in significant reductions of asthma for children living there. The site also has a community garden in which residents grow fresh produce (Beatley 2011). For residents of Wheeler Terrace in Washington, DC, renovations such as increased exterior lighting fixtures and a fence bordering the unit's perimeter have improved the safety of occupants and discouraged criminal activity on the site. Landscape improvements increased social interaction between residents of the Nuevo Amanecer in

Woodburn, Oregon. Mold and mildew issues have been mitigated with a new ventilation system (Beatley 2011).

The Costs and Benefits of Green Affordable Housing (New Ecology Inc. and the Tellus Institute 2005) analyzes sixteen affordable housing units designed with green building principles. Each case study has a unique "green building focus" such as energy efficiency and indoor air quality, or durability, water efficiency, and waste management. Green building features consider sustainable site selection, water and energy efficiency, materials and resources, and indoor environmental quality. We will discuss some of the case studies as they relate to improving the health of occupants.

Reducing the amount of virgin natural resources used in the project falls into the materials and resources category. Melrose Commons II in the Bronx features carpeting made from recycled plastic bottles. Recycled content vinyl composition tile was used for flooring in the kitchen. In contrast, developers of San Francisco's Positive Match project refrained from using carpets in the building design to eliminate dust and particle build up which can affect respiratory health.

Residents of Erie Ellington in Boston see the health benefits of improved indoor air quality, reporting in informal interviews noticeable reductions in eight out of eighteen cases of children with asthma. Healthier air is the result of exhaust fans in the bathroom and kitchen as well as installation of enhanced ventilation systems. Bathroom mold removal improved air quality at the Johnson Creek Commons. Low-cost efforts to improve indoor air quality at the Linden Street Apartments of Somerville include nailing down carpets instead of using adhesives containing harmful VOCs to keep the carpet in place. Although indoor air quality was not the focus of the project, simple low-cost

improvements like this will improve occupant health. We will revisit other case studies from this report in Chapter 4.

Environmental Justice in Bridgeport

Bridgeport earned the title for *the most unequal city in America in 2010*, with the areas top quintile earning 57% of the income compared to the national average for the top quintile of 50.3% (Lubin 2010). Bridgeport was ranked the fourth most distressed municipality in the state after Hartford, New Britain, and Waterbury, respectively, in 2012 (Distressed Municipalities List 2012). The following section provides evidence for Bridgeport as a case of environmental justice. First, organizations that have identified Bridgeport as having environmental justice issues are described. Next, specific environmental concerns that disproportionally affect the population of the county and within the city itself are discussed.

EPA's EJ Showcase Pilot

The country's highest federal environmental authority, the EPA, recognized Bridgeport as having evidence and indicators of environmental justice. The EPA has allocated one million dollars to help ten cities across America as a part of their EJ Showcase Communities effort (EPA 2010). Bridgeport was chosen as the environmental justice *Showcase Community Pilot* by the EPA of the New England region. Bridgeport was selected as a project due to the disproportionate share of multiple environmental health burdens, the vulnerability of the population, the lack of community participation in decisions that environmental and health impacts, and the city's opportunity for collaborative efforts between federal, state, and NGO organizations to encourage green development. It is no surprise that the EPA selected Bridgeport for the program, with

18% of the population living below the federal poverty line and minorities making up 63% of the population. Medium household income ($39,751) is less than 75% of mean state incomes. Abandoned former factory sites litter the landscape. The EPA identifies environmental issues in the area as lack of green space, stormwater runoff management, hazardous waste incineration, vehicle idling, and water security. Health issues in the city include high rates of asthma and lead, cancer, endometriosis, and diabetes. High unemployment rates and language barriers are challenges to public involvement in political processes (EPA 2010).

The Connecticut Coalition for Environmental Justice (CCEJ) further identifies the city as an area of environmental justice. non-point source pollution from cars and diesel trucks traveling down Interstate 95 which runs through the city, old zoning regulations that allow heavy industrial land uses near residential areas, asbestos contamination, and the polluted waters of Bridgeport Harbor are examples of the 28 environmental health issues recognized by CCEJ in Bridgeport. In 2007, Bridgeport received a $100,000 grant from the EPA through CCEJ to address some of these issues in the city as a part of the EPA's Community Action for a Renewed Environment (CARE) program (Green Environment News 2007).

Brownfields and health issues

Next is an example of environmental justice in Bridgeport related to the city's industrial past. According to DuBay Horton and Associates (2010), many neighborhoods in Bridgeport are found in close proximity of the 200 brownfields that litter the city. Bridgeport was originally planned to have "walk to work" neighborhoods. Former industrial sites and factories in the city that are abandoned today are a source of

hazardous health and environmental pollutants. Figure 4 provides a map of brownfields in the city. The EPA has given grants to clean up brownfields—Mt. Trashmore, Pacelli Trucking, and Chrome Engineering—in the East End neighborhood. Illegal trash dumping is common in abandoned lots in the city's East End neighborhood. The chemical pollutants leftover from industrial activity pose inhalation and ground water contamination risks. Pollutants such as heavy metals and Poly Aromatic Hydrocarbons (PAHs) dust are absorbed as particulate matter in the air and can travel long distances. Volatile Organic Compounds (VOCs) enter the atmosphere as vapors, which cannot travel far from the polluted site. Table 1 gives an overview of contaminants found in the city's brownfields. Chronic obstructive pulmonary disease and childhood asthma rates are related to exposure to these pollutants.

DuBay Horton and Associates (2010) discuss the pollution of Long Island Sound, the Housatonic River and creeks and beaches in Bridgeport as a result of these chemicals are a big issue in a city where residents of all incomes and ethnicities fish just about everywhere at any time of the day except during high tide. Interviews conducted with local bait and tackle shops reveal that minorities, especially Hispanics, fish the most. A survey conducted by the CT DEEP Marine Resources Division and the NY DEC Division of Fish, Wildlife, and Marine Resources in 2006 found that Stripped bass, large bluefish (25 inches or longer), and American eel in Long Island Sound contained enough PCBs that they shouldn't be eaten by high risks groups and by the general population no more than once a month. The wide rage of ethnicities and races fishing in the area require education campaigns regarding consumption that target each group.

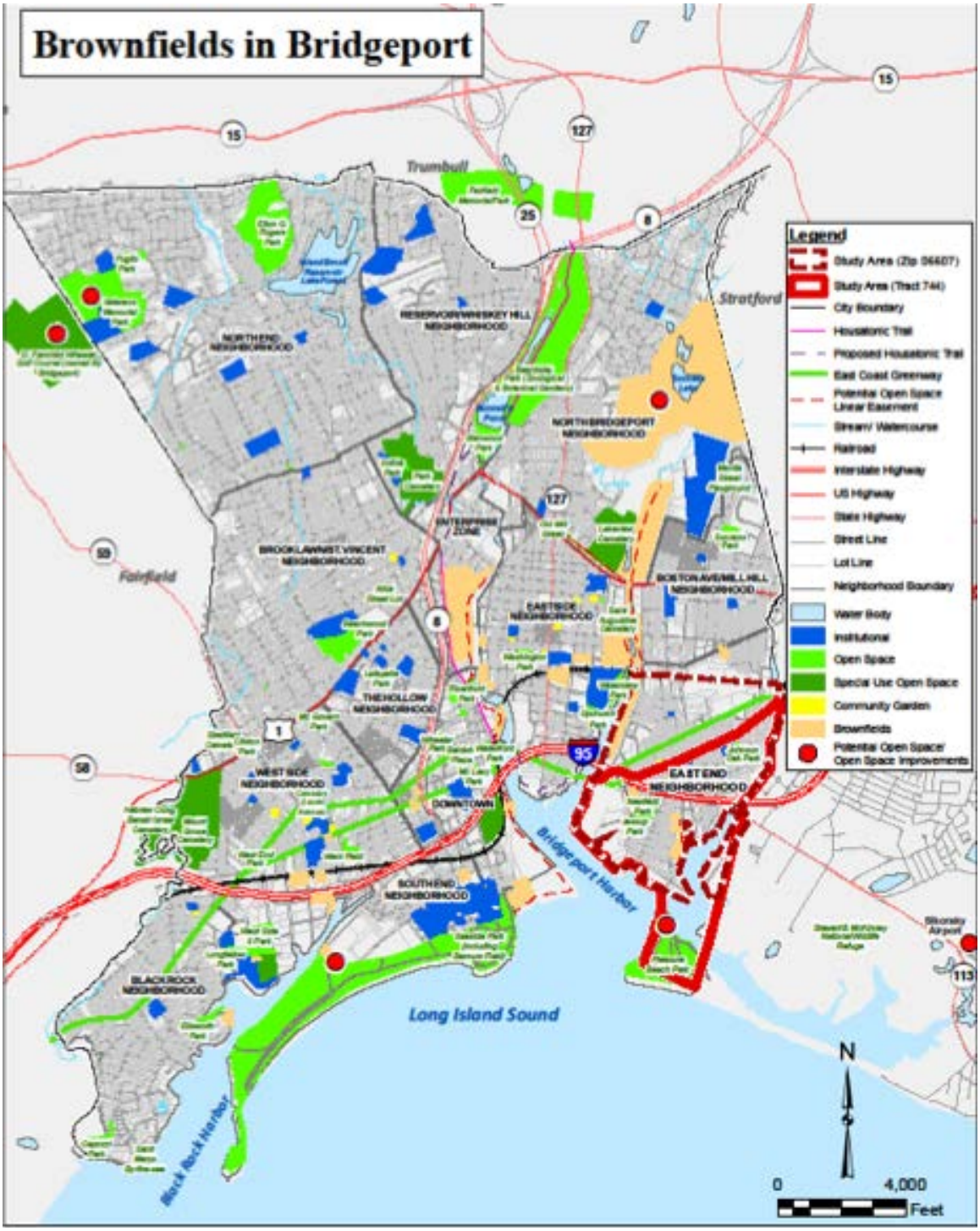

Figure 4, Health Monitoring: A Plan to Implement Brownfields in Bridgeport, Connecticut (2010).

Potential Health Outcomes to Toxin Exposure

Class of contaminant	Characteristic health responses to sporadic or very low doses	Health Monitoring parameters	Comments
Metals: lead chromium nickel vanadium	Neurological, renal and dermal effects associated with chronic or episodic exposures; Behavioral and learning difficulties.	Blood or urine measurements; Signs and symptoms of behavioral or kidney effects; Failure to thrive; Low birth weight.	Both specific and non-specific responses have been reported. Most require chronic exposures to relatively elevated doses.
Volatile organic hydrocarbons (VOCs) acetone aliphatic alcohols fuel constituents benzene toluene xylenes	Sensory responses of irritation, hepatic changes, renal and dermal effects; Very high exposures seen in factories (but not from environmental sites) induce central nervous system effects.	Liver and kidney function tests show non-specific responses; Chronic exposures induce neurological actions; Failure to thrive and lowered birth weights.	Both specific and non-specific responses are reported. Most require chronic exposures to relatively elevated doses.
Poly Aromatic Hydrocarbons (PAHs) Pyrenes Anthracene Napthalene	Respiratory and systemic actions including cancer and reproductive effects; Dermal responses.	Identification in blood, urine and breath samples in research studies; Certain aspects of lung and hepatic disease including cancer.	PAHS are a common ambient air pollutant. Found in water and food products. Exposure may be related to failure to thrive; exposure quantification complicated by smoking.

Table 1, Health Monitoring: A Plan to Implement Brownfields in Bridgeport, Connecticut (2010).

Bridgeport Harbor Station

Bridgeport is home to the Fairfield County's correctional center, two hospitals serving the county, and the last coal-fired power plant in the state. Built in 1968, the Bridgeport Harbor Station coal plant is the last coal-fired power plant left in the state (NAACP 2012). The plant is located between Downtown and South End neighborhoods; substantial adverse health effects have major impacts on citizens living within a thirty-mile radius of the plant. A myriad of pollutants including carbon dioxide, mercury, sulfur dioxide and nitrogen oxide are emitted from the plant, increasing asthma, bronchitis, and heart disease among local residents (Connecticut Fund for the Environment). An article in the Connecticut Post reveals that efforts to shut down the plant have recently been nullified with Public Service Enterprise Group (PSEG) instead securing a new five-year operational permit (Lockhart 2012).

The American Lung Association ranks Fairfield County as one of the twenty-five most ozone polluted counties in the country in the organization's 2012 State of the Air report (Healthy CT Alliance 2012). "I don't think you'd see that plant [still operating] in a suburban town," said Carolyn Vermont, president of Bridgeport's NAACP chapter (Hladky 2013). The NAACP ranks the Bridgeport Harbor Station plant as having the tenth worst environmental justice performance score out of the 378 coal-fired power plants in their study. According to the study, 309,478 residents live within a three-mile radius of the 400MW plant. The average per capita income within the same radius is $16,817. 67% of residents within the three-mile radius are minorities (30% Hispanic, 28% black, 9% other). The average per capita income of people living within one mile of the plant is $11,400. Minorities make up over 87% of the population within a one-mile radius (NAACP 2012).

CARE Survey

Table 2 lists the results of a CARE community environmental survey conducted in 2008 that lists the percentage of residents who thought that the given issue was "serious or very serious". Of the East End and Bridgeport residents, concerns range from bedbugs to recycling. Of the general Bridgeport residents, there is high concern for abandoned buildings and vacant lots, heavy traffic from nearby I-95, and pollution. It is important that these issues be addressed to further environmental justice efforts in Bridgeport. Now that we have a good understanding of environmental justices occurring in Bridgeport, we will spend the next section examining climate justice in Bridgeport.

	East End		Bridgeport
	Serious & Very Serious		Serious & Very Serious
Abandoned Buildings / Vacant Lots	83 %		71 %
Dumping of Garbage / Waste	79 %		54 %
Industry Near Communities	75 %		42 %
Limited bulky waste pickup	70 %		46 %
Heavy Traffic / Nearby Highways	70 %		70 %
Outdoor Air Pollution	67 %		73 %
O&G dir pile near highway	65 %		50 %
Pest (Rodents / Insects)	63 %		55 %
RESCO trash air pollution	63 %		78 %
Yellow Mill Pond Contamination	62 %		71 %
Noise from Construction	61 %		44 %
Lead Poisoning	61 %		47 %
Emissions from Vehicles	59 %		51 %
Harbor Power Plant Air Pollution	58 %		42 %
Lead Poisoning in Children	57 %		58 %
Traffic Congestion	54 %		47 %
Bedbug Infestation	54 %		60 %
Remington Arms	52 %		70%
Indoor Lead Contamination	50 %		42 %
Indoor mold and mildew	50 %		58 %
Remington Woods	50 %		53 %
Climate Change	48 %		55 %
Lack of Parks and Playgrounds	48 %		55 %
Wheel-chair accessible curb cuts	44 %		52 %
Mold in School	42 %		52 %
Bpt Energy Toxics Storage	42 %		38 %
Water Quality	39 %		39 %
Lack of Recycling	39 %		45 %
Water Contaminated with Sewage	33 %		40 %
Indoor Air Quality	21 %		50 %

Table 2, Health Monitoring: A Plan to Implement Brownfields in Bridgeport, Connecticut (2010).

A global climate change perspective

In the remaining pages of Chapter 3, we will define extreme weather and climate events. Next, we will see look at the physical effects of and societal response to climate change. The chapter ends with a look into recent extreme weather events associated with

climate injustice in Bridgeport. The final section deals with defining climate change and its effects. Examples are given of climate injustice in Bridgeport.

This section will investigate the relationship between global climate change, extreme weather events, and society. It is necessary to define what I mean by an extreme weather event. For the purpose of this study I will borrow from the Intergovernmental Panel on Climate Change's recently released report on extreme weather events. I chose to use IPCC (2013) definitions because the IPCC is an international, intergovernmental collaboration of climate change scientists in 195 countries. Established by the United Nations, this peer-reviewed organization provides a reputable stream of scientific information and is a great base for understanding the climate component of this paper. The IPCC (2012) report entitled *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change* defines an extreme weather or climate event as "the occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends ('tails') of the range of observed values of the variable." In simpler terms, extreme weather events are those which hit the highest and lowest ends of the spectrum for that particular weather event. More importantly, the IPCC expands this definition to include weather events with an *extreme* impact. That is, "weather or climate events, even if not extreme in a statistical sense, can still lead to extreme conditions or impacts, either by crossing a critical threshold in a social, ecological, or physical system, or by occurring simultaneously with other events (IPCC 2012)."

Here we will take a moment to point out the difference between weather and climate as extreme changes in both will be included in this report. Air temperature, sea

level, wind patterns, precipitation are all examples of the climate system. A climate is just that—the earth's way of circulating air and water across the planet. Weather—meaning the droughts, the wind storms, the hurricanes—hinges on climate. Examples of weather systems are hurricanes, heat waves, and droughts. Climate events could be sea level rise, temperature changes, or precipitation changes. What this study will focus on is extreme weather events that lead to severe impacts as they surpass the ability of residents with a low socio-economic status to deal with the effects themselves.

Physical effects of climate change

"A changing climate leads to changes in the frequency, intensity, spatial extent, duration, and timing of weather and climate extremes, and can result in unprecedented extremes," states the IPCC (2012). In other words, climate change science is really complicated with different models and interpretations of the data projecting a wide range of predictions about the consequences of global climate change. Climate models predict between 1°C and 5°C increase in global surface temperature by the end of the 21st century. The Intergovernmental Panel on Climate Change predicts heat waves, heavy rains, and tropical storms to increase in frequency. The IPCC also expects disappearing sea ice to give rise to higher sea levels. Alley (2000) states that the direct radiative effect of anthropogenic carbon dioxide increase in the atmosphere is expected to be about one degree of warming in the next century. However, it is uncertain exactly how these feedbacks will amplify changes. For example, warming will melt snow and ice leading to more absorption of sunlight due to the reduced albedo, or reflectivity of the surface of the earth. Another example would be snow melt. Snow will melt in some places if the atmosphere warms, but in places where it is cold enough that the now doesn't melt there

might be even more now in that area since warmer air can hold more moisture than cooler air.

Some predictions are more reliable than others, simply because certain events are just harder to predict. Large scale temperature predictions are then more certain than precipitation change predictions. The IPCC (2012) states that there is evidence from the past sixty years to suggest that it is "very likely" that there has been a general increase in the number of warm days and nights and general decrease in the amount of cold days and nights across the globe and "likely" that there is an increase in higher coastal waters as a result of rising mean sea level. The IPCC (2012) believes it is "likely" that anthropogenic action and inaction has affected these changes. While the cause of climate change is not the focus of this report—and whether or not the recent increases in the frequencies of floods, droughts, heat waves, and tropical storms are a result of rising air temperatures as some global climate change scientists believe—it is clear that these weather events have distinct impacts on disadvantaged populations. Marginalized by low-income levels to live in public housing units, poor and minority citizens are disproportionately affected by the economic, environmental, and health consequences of powerful weather events occurring more frequently.

Vulnerability and societal response to climate change

The IPCC (2012) states with "high confidence" that the magnitude of severity for extreme weather and climate events are depends on how vulnerable the affected population is. The uneven distribution of "economic, social, geographic, demographic, cultural, institutional, governance, and environmental factors" today and in the future places different people across the world in various circumstances. Communities will have

different degrees of vulnerability due to varying levels of income, education, race, ethnicity, class, and health. According to the IPCC (2012), the high probability of lower intensity extreme weather and climate events will likely decrease society's ability to cope with future events. The IPCC (2012) states that the most vulnerable communities are at higher risk due to poor environmental decisions, changes in demographics, unplanned development in vulnerable areas, weak or corrupt governments, and low living standards for the poor. The last condition can be extended to encompass high unemployment and low quality housing. Reducing the susceptibility of the most vulnerable areas to extreme weather and climate events is a key to any serious mitigation or adaptation policy.

However, Alley (2000) writes that adaptive strategies—beefing up the economy and infrastructure while passing on responsibility to future generations to deal with the consequences—are more favorable economic decisions in addressing the uncertainty of climate change than adopting expensive or unlikely mitigation strategies such as legislation, energy conservation, and carbon sequestration. Discounting the future means that money today is worth more to someone than that same money in the future, affecting society’s willingness to discount the value of mitigation in the present thus pushing it off on future generations. Alley (2000) writes that climate change will have various short and long term effects on people in different places on the planet. In the short term, humans with the resources to do so will adapt societal infrastructure to meet the growing needs of a changing climate. The same goes for the long-term outlook. More stable civilizations will be better equipped to protect their populations from climate stress than less economically or politically stable countries will be able to. The standard economic assessment of the threat of climate change is that it is too far in the future to deal with in a

costly manner today. Economic models deal with uncertainty by creating the biggest economy possible to let future generations deal with tomorrow's problems as they come. More developed countries will be more well off to face climate change in comparison with developing countries. Already fragile economies in developing countries will be more affected by disruptions associated with climate change (Alley 2000). This can be applied to unstable communities, for example in Bridgeport, as surrounding affluent towns will have more resources available and a bigger capacity to combat the effects of extreme weather and climate events in comparison with the city.

Some climate change scientists and meteorologists believe that the world is already beginning to feel the effects of the global climate change predictions. Across the world exceptional droughts, destructive hurricanes/monsoons, heavy floods, and record-breaking heat waves damage crops, kill thousands, and destroy homes and entire neighborhoods. The effects are far reaching and can be felt by everyone. However, low-income and minority populations will be more vulnerable to these extreme weather events because they do not posses the same resources or means to recover from the damages as moderate to high income populations do. In the next section Bridgeport will be presented as a case study of climate change justice with examples of extreme weather events that have affected the city in the past.

A local climate change perspective

The following section will provide evidence for climate justice issues in relation to extreme weather events by tracing different weather events and their physical and social impacts in Bridgeport. A look at some recent cases will help the reader appreciate how much climate change can exacerbate environmental justice issues in the city. Some

of the most pressing issues to residents of public housing are hurricanes, winter storms, and heat waves. They are prime examples of how a weather event can be extreme not in the sense of the event's magnitude, but rather in its disruption of the already delicate socio-economic status of public housing residents.

Hurricane Irene

Two years in a row, Bridgeport felt the wraths of Hurricane Irene and Hurricane Sandy. Hurricane Irene hit the coastal city in late August 2011. 8.4 million people in twenty states lost power (Fox News 2012). Irene was actually downgraded to a tropical storm by the time it reached the shoreline, but the eye of the storm passing through Bridgeport at high tide intensified the situation. 600,000 Connecticut residents were left without power, exceeding the 1985 Hurricane Gloria record (CT Post 2011). Falling trees caused rampant property damage. Huge sailboats were tossed like toys into backyards while entire docks were uplifted and smashed into the shore. Mayor Finch estimated $5 million in overtime and damages to public facilities and $5 million in the private and nonprofit sector damages writes Burgeson (2011). 1,400 housing structures and 691 larger buildings were damaged in the storm. At the height, 35,000 Bridgeport residents were left without power. Powerful and unforgiving Irene was a warm-up for Hurricane Sandy.

Hurricane Sandy, storm surges, and flooding

Chapter 1 introduces the strongest recent showing of climate injustice in Bridgeport. Recall that one year after Hurricane Irene struck the city, Superstorm (hurricane-nor'easter) Sandy pounded the northeastern coastline. Juliano (2013) writes that Bridgeport and surrounding towns situated on Long Island Sound saw intense

flooding causing damage to parks, beaches, and infrastructure with average restoration costs in the one to two million dollar range (respectively). According to Altimari (2013), the National Hurricane Center released a report stating that a 9.8-foot storm surge was recorded in Bridgeport during Superstorm Sandy, making it the second highest storm surge recorded during the hurricane and ten feet higher than the average high tide for the city's waters.

The National Hurricane Center's report ranks the superstorm as the second most costly hurricane after Hurricane Katrina in 2005. The storm claimed 147 lives and left more than 8.5 million people without power. In Connecticut, over 3,000 homes were affected with an estimated $360 million in damages to the state's coastline. Juliano (2013) describes the damage to the seawall and large standing pools of water in Seaside Park. Bridgeport expects to spend $10 million in storm related damages to facilities. Flooding in low laying areas such as the East End could disperse toxins present in and near the former brownfields (DuBay Horton and Associates 2010).

Sandy and the United Illuminating Co.

Looking back to the example of Hurricane Sandy, one recalls that Mayor Finch accused United Illuminating Co. of servicing the state's affluent regions and towns before servicing Bridgeport, choosing to leave thousands of Bridgeport's most vulnerable citizens without power (De Avila 2012). Finch describes the implications that this prejudice has on an economically struggling and under-resourced city. A warming station with the heat on and blankets and cots brought in was set up in the community center of one housing project. Police units took on double shifts, accompanied by National Guard troops, to keep the streets safe at night during the power outage. Finch is right—warming

stations and beefed up security details are not the norm in the wealthy towns surrounding Bridgeport. “We have the sewage plants,” exclaims Finch. “We have the hospitals!” Another city official voices his concerns for the city’s disproportionately higher amount of senior high-rise complexes compared other towns in the region and for inmates at the region’s correctional center, expectedly located in Bridgeport (Finch 2012). Fox News (2012) reports that Bridgeport residents demonstrated their frustrations through “verbal abuse” and by throwing eggs at the UI workers. The UI denies the major’s accusation that the company addressed its more affluent customers before servicing Bridgeport. The company is now under review by the Public Utilities Regulatory Authority to evaluate the UI’s response (Mayco 2012). Overall this is a great example of climate injustice, with vulnerable populations left without hot water and heating for longer than their affluent neighbors in surrounding towns.

2010-2013: A nor’easter, a heat wave, and a tornado

Lockhart (2013) writes that in February, Winter Storm Nemo dumped a record setting 30 inches of snow on Bridgeport resulting in $1.2-1.7 million in cleanup. McClam (2013) adds that gusts of wind up to 72 mph were reported in nearby Westport, CT claiming one life, creating power outages, and knocking down trees and power lines in Bridgeport. Connecticut declared an emergency for Bridgeport to help with cleanup funding as the city had only $100,000 reserved for the winter’s overtime snow removal budget (Lockhart 2013). In respect to climate change, a warmer atmosphere will hold more water in turn providing more fuel for storms. Although it is early to attribute a snowfall record not seen for over a hundred years to a warming climate, it is the city’s interest to fortify structures against the dangers associated with such storms.

The 2012 North American heat wave claimed 82 lives in the United States and Canada (MSNBC 2012). Freedman (2012) writes that the National Climatic Data Center reported 3282 daily high temperature records were tied or set across the US. In Bridgeport, a cooling center was set up at the Greater Bridgeport Transit bus terminal where the American Red Cross provided water to residents in need of cooling off (WTNH 2012). Four homicides occurred in Bridgeport in the span of one week, coinciding with a heat wave at the time in 2009 (Tepher 2009). Three of the four victims were killed in various projects, including the Greene Homes and Trumbull Gardens complexes. The police stated that the crimes had no correlation to the temperature. Mayor Finch points to the prosperous illegal gun trade in Bridgeport as an explanation (Tepher 2009). Time will tell whether hotter and/or longer heat waves will aggravate tensions and propel social deviance.

In 2010 a tornado zipped through the Downtown area causing some damage in the East End and East Side. Nine buildings partially collapsed with some people receiving minor injuries (Connecticut Post 2010). While tornado predictions are highly uncertain in climate change models, if nothing else, this is another example of addressing the city's vulnerability in response to any extreme weather event.

A city that is predisposed to environmental justice issues will see an increase in disproportionate environmental and health issues as the effects of climate change unfold in the upcoming century. The affordable green housing movement is slowly building up to be the next logical step in alleviating the nation's public housing and sustainability issues. Policy makers cannot ignore the environmental and health benefits of sustainable

affordable public housing as evidence for its success mounts with every new affordable green development built.

Chapter 4

Reducing Future Climate Change Vulnerability and Environmental Injustice Through Green Building Initiatives

"When you go to Black Rock Yacht Club, that whole area was destroyed…A lot of buildings were destroyed by the hurricane. The whole seawall was caved in, in bad shape. And Seaside Village, this particular storm, I've never seen Seaside Village as hurt…The people that were living there were really underwater…There's always been flooding in that area." (Mary Witkowski 2013)

Greenough et al. (2001) write that climate change will affect the duration, intensity, and frequency of extreme weather events. Death is a direct effect of natural disasters. Secondary effects can decrease society's capacity to cope by weakening the public health sector. The best protection against the upcoming uncertainties society faces is to fortify the most vulnerable populations in preparation for extreme weather events. Populations living in old, leaky, drafty, highly electricity dependent housing structures will decrease local preparedness. High rates of coastal development and urbanization put people in places where they shouldn't be. Urbanization has altered the ability of the land to absorb excess if not just the normal precipitation level. Floods in the home give rise to mold and fungi in basements and deteriorate wooden structures while standing pools of water in Seaside Park sit useless and become breeding grounds for mosquitos (Greenough et al. 2001). Development of coastal areas and floodplains places them right in the way of storm surges, high winds, and floods. When Black Rock Yacht Club was inundated by Hurricane Irene, it suffered structural damage. It was repaired in time for the next year's hurricane. It seems that if humans tend to keep building and repairing their structures in

vulnerable spaces then they should be building stronger, more durable homes with a reduced carbon footprint.

In this chapter, we will expand upon reasons for building green and look green building codes and standards in the United States today. Then we will see examples of federal affordable housing policies as well as efforts made within the private sector to improve health in public housing. We will see how interest in green building policy is growing in different states. Next we will look at how Bridgeport is already mitigating climate change through residential energy efficiency and green infrastructure. The remaining section of the chapter demonstrates the progress that the city has made by extending green building strategies to public housing. We must keep in mind that there are many great environmental projects advancing in Bridgeport. There are also important statewide and national environmental efforts being made, yet this report focuses on a narrow band of all environmental initiatives in two sectors as they relate to environmental justice as this report is not big enough to encompass all of them. Environmental initiatives will focus on those projects that involve green building and climate change.

Green building codes and standards

Across the U.S., public housing units are earning LEED and NGBS certification while local governments are establishing green building standards. There are various green building codes, energy codes, building rating systems/standards, and energy efficiency rating systems/standards already in existence and some in development in the U.S that work to increase energy efficiency and reduce carbon emissions in buildings.

In response to the lack of standards in the green building industry, a group of businessmen and architects created the US Green Building Council (USGBC) in 1993.

Since then, the sustainable design movement has solidified its position within mainstream architecture practices. The rating system designed by the council, Leadership in Energy Efficiency and Design (LEED), operates on the principle that there are different levels of sustainability (McLennan 2004). One critique of green design is the hierarchy that industry leaders such as the USGBC created to make up the criteria that buildings must meet to be certified as green (Weber 2005). Ranking different aspects of sustainability is a necessary evil; that said, not all guidelines will be adhered to because greening projects should be evaluated on an individual basis. Some aspects of green design may work for one project but not for another.

The National Green Building Standard, ICC 700-2008 building rating system applies to single and multi-family high and low rise apartments, condominiums, and attached/detached homes. There are four levels of achievement—Bronze, Silver, Gold, and Emerald (Home Innovation Research Labs. 2013). The standards look at site and lot design, resource, energy, and water efficiency, indoor environmental quality, operation and maintenance, and owner education. The NGBS requires minimum levels in each of its categories, as opposed to LEED's minimum point level requirement. Therefore NGBS is seen as a more balanced system than LEED because efficiency and improvements are made in each category (NAHB 2012).

Some of these codes are at the national level while others are state level programs. They can be voluntary or mandatory, making these programs very flexible. For example Baltimore, Maryland established commercial and multi-family residential (greater than 10,000 sq. ft.) green building standards in 2007. The standards of Council Bill 07-0602 apply to new construction and extensive renovation (Baltimore Housing 2013).

In 2011 the first mandatory green building codes in the U.S. became mandatory in California. Known as CalGreen, the green building codes call for 20% reduction in water consumption, 50% diversion of construction waste from landfills, and the installation of low VOC emitting materials inside the home. Mandatory minimum reductions are required in all newly constructed residential, government, commercial, school, and hospital buildings with the exception of federal buildings and buildings on Indian land. The green code only applies to new construction at this point in time with the intentions of expanding to include retrofits to existing buildings as the next "step". There has been some pushback from environmental groups who liken it to another LEED system, believing that another set of standards will be confusing. People who don't believe in anthropogenic climate change also criticized the program (Palmese n.d.).

Federal programs to improve life in public housing

Moving to Opportunity is a study conducted by HUD (2003) in which low-income families were given a voucher to move from public housing in the inner city to private housing in a wealthier neighborhood. Obesity rates declined and mental health rates were improved for those low-income families who moved into the wealthier neighborhoods. HUD's study suggested a strong correlation between negative health effects and type of housing (Jacobs, Kelly, and Sobolewski 2007).

Karen Brown et al.'s *A Decade of HOPE VI: Research Findings and Policy Challenges* (2004) details the origin of HOPE VI, a HUD program that grew out of the National Commission on Severely Distressed Public Housing which identified 86,000 of 1.3 million public housing units across the nation as "severely distressed". Severely distressed units that primarily house poor families are retrofitted or demolished and

rebuilt as mixed-income housing with some residents receiving Section 8 vouchers to rent apartments on the private market. HOPE VI was intended physically improve the units, improve management in the units, and implement social and community services for residents. No funds were allocated for HOPE VI in the fiscal year 2012 (US Department of Housing and Urban Development 2012).

Affordable green housing legislation

One way the U.S. Green Building Council can measure the growth of green building policy in the U.S. is by looking at proposed bills in state legislatures. The USGBC *(*2011) report found that thirty bills involving green building (out of the 400 bills that were followed) were passed across twenty-two states. These are pieces of legislation that deal with USGBC's "core priority areas" consisting of "Green Buildings for Climate Protection, Green Affordable Housing, Sustainable Cities, and Green Schools" (USGBC 2011). Green building policies are influencing legislation across a number of states as legislatures see how building green is healthier, can support developing green economies, and saves money/reduces carbon emissions through higher efficiencies.

For example in Florida, two bills (HB 639 and HB 7003) passed that will add a green building component to the criteria that affordable housing developers must meet to get a loan. In New Jersey, bill AB 3891 proposed that green building standards should be applied to new construction of affordable housing in order to receive credit under the Fair Housing Act (USGBC 2011). In Texas, state buildings and universities will lead other building sectors in the green movement thanks to the passage of bill HB 51 (USGBC 2011).

In 2011 Connecticut legislatures created the first "green bank" in the U.S. Known

as Public Act 11-80, the law established the Clean Energy Finance and Investment Authority to allocate funding for clean energy projects (USGBC 2011). The law also reflects the importance of expanding energy efficiency by consolidating the former Connecticut Department of Environmental Protection and Department of Public Utility Control to the Connecticut Department of Energy and Environmental Protection (Environment Northeast 2011). Proposed bill HB 5514 encouraged LEED certified buildings that meet LEED Silver standards as opposed to just basic LEED standards.

Affordable green housing initiatives in the private sector

Habitat for Humanity is incorporating aspects of green design into some of its homes. A house built in New Orleans in 2004 by Habitat for Humanity substituted green materials for conventional ones with impressive results. Using green materials helped the project stay within its budget boundaries. For example, energy efficient windows can lower solar heat gain in warm months and insulate the house in the colder months. This reduces demands on the HVAC system, which in turn reduces the cost of heating and cooling the house and passes on savings to future residents. Habitat for Humanity allocated the money saved by using a smaller HVAC system on PVC-free piping, sustainably harvested non-toxic wood, and low VOC paints throughout the house (Vittori 2004). This example shows how using green building guidelines can be cost effective, save energy, and reduce environmental health hazards.

Today's green building movement focuses on commercial and institutional buildings rather than affordable public housing (New Ecology Inc. 2005). Environmental justice is slowly growing in the green building community. Affordable green housing companies and organizations in the private sector are taking steps to restore justice to

residents of public housing. A handful of companies and organizations such as the National Center for Healthy Houses, the Green Affordable Housing Coalition, and Enterprise Communities Inc. are leading the way in the affordable green housing movement.

Some critiques of green building

There are contradictions within green building design. Contractors and developers must strike a balance between environmental protection, cost, and occupant health often at the expense of one of the aforementioned factors. Critics argue that replacing inefficient technology with newer technology nullifies sustainable intentions (Powell 2007). This point cannot be refuted as the manufacture of more sustainable products is intertwined with the use of virgin materials as much as any non-efficient product on the market. However, this can be avoided by sourcing materials that are local, abundant, renewable, and/or made from recycled materials thus reducing the embodied energy of materials used to construct or retrofit the building. Building green is more economically viable than ever before. A common critique of green design is that achieving total self-sustainability is too expensive to cover up-front investment costs (Musica 2008). However, green building materials are becoming less expensive as more eco-friendly products enter the market.

Mitigating climate change in Bridgeport through residential energy efficiency and green infrastructure

Bridgeport is already moving in the direction of revitalizing its economy through sustainable initiatives. Mayor Bill Finch has been a huge supporter of the green movement since his appointment to mayor in 2007. In “How Green is Mayor Bill Finch?”

Connecticut Post writer Vinti Singh looks at Finch's environmental record. In 2007 Finch signed Executive Order 08-001: BGreen 2020 (Finch 2008), a plan to substantially improve sustainability in Bridgeport. From brownfield remediation to energy audits, B-Green 2020 describes attainable goals specifically designed to meet the city's unique demands as a large impoverished waterfront community located in one of the richest counties in the nation. Since then, Finch has certainly held on to his promise by improving transportation, waste management, water management, energy, lifestyle, and development in the city.

BGreen 2020 (Regional Plan Association 2008) outlines a five part strategy to work towards a more sustainable future in the areas of land use/transportation, green spaces/recycling and water sources, green businesses/jobs and green purchasing, green marketing and education/outreach, and green energy and buildings. We will examine how the city plans to reduce climate change's effects through green building projects. Residential energy efficiency is regarded by the city as an important component to reducing costs and energy use (and the city's carbon footprint), yet it can also be thought of in the green building sense in that it will improve residential health and protect against extreme weather uncertainties facing Bridgeport in the future.

56.9% of Bridgeport's emissions stem from residential and commercial buildings, compared to 1.2% from waste, 33.3% from transportation, and 8.6% industrial (see the bottom pie chart in Figure 5). Buildings account for more than half of the city's emissions! To put it another way, greenhouse gas emissions from commercial and residential buildings account for more than half of the city's contribution to climate

change. We focus on buildings because they make up more than half of Bridgeport's climate change problem.

To make a meaningful reduction in emissions from energy consumption in buildings, the city must have new businesses and residents building sustainably as well as existing buildings receiving energy retrofits. One strategy of Bridgeport's sustainability plan is to "create a residential weatherization program and promote large residential building energy efficiency efforts" (Regional Plan Association 2008). Looking at Figure 5, one sees that the residential building sector accounts for 29.3% or nearly a third of carbon emissions in the city. This strategy benefits the environment by reducing carbon emissions and the economy by reducing energy bills. To do this, to identify weatherization opportunities and plan for future use are needed for residential homes. In fact, this is already being done in city buildings. Bridgeport has contracted Trane US Inc. to manage the city's energy supplies (Grabarz 2013). The company will help manage energy conservation and alternative energy solutions for the city. Energy audits were performed in 41 city buildings and 50 parks facilities. The estimated 20% per year savings rate equivalent to $516,800 in the first year will be taken out of the utility budget and put towards funding the upgrades identified in future audits (Grabarz 2013).

Another example is an outreach program called the Mayor's Conservation Corps, which goes door-to-door gauging interest in home energy audits. Lack of reliable funding for weatherization programs impedes the process. Low-income families meet the economic qualifications for energy efficiency programs through the great work done by the Action for Bridgeport Community Development (Regional Plan Association 2008). Middle income households do not qualify for the program but receive low interest

weatherization and renewable energy system loans through the DOE's Energy Efficiency Block Grant program.

An additional strategy is to "develop green building standards and promote healthy indoor environments" and "establish its own Green Building standards and green building initiatives to promote energy-efficient structures, fixtures, and appliances…" (Regional Plan Association 2008). The BGreen 2020 report notes that other cities are developing their own green building standards to improve indoor air quality in homes. The report calls for the formation of a group to study these programs and create green building standards for the city's public buildings, yet residential structures need to be held to a similar set of standards.

Another goal of Executive Order 08-001 entails the greening of materials that off gas harsh chemicals into air so that city buildings contain carpets, paints, and furniture with low VOC emissions and environmentally friendly cleaning supplies (Finch 2008). The time is right to apply these initiatives in a public housing setting. The ideas are there and now the connection just needs to be made. A guide to sustainability in Bridgeport's public housing units needs to be created to bring environmental justice to the city's low-income and minority residents.

Three green infrastructure scans regarding storm water management and distributed (local scale) energy generation have been conducted for Bridgeport. All plans mention installing permeable pavement, green and/or blue roofs, bioretention (bio swales) on existing buildings and streets. Bridgeport is already making use of green infrastructure on North Main Street where permeable pavement and rain gardens were installed along a portion of the street according to the *Low Impact Development Appendix*

to the Connecticut Stormwater Quality Manual (2011). *Green Infrastructure Feasibility Scan for Bridgeport and New Haven, CT: Evaluation of Green Technologies to Manage Wet Weather Flows* (Hazen and Sawyer 2012) is a publication of Connecticut Fund for the Environment and Save the Sound that evaluates the practicality of incorporating sustainable design in Bridgeport and New Haven to better control stormwater runoff. The report is unique in that the assessment is extended to public housing. The authors estimate that 50,000 gallons/year "savings" in stormwater (or the amount of water that is deferred to infrastructures other than the storm drain) could result by adding rain gardens and street-side bioretention. Rainwater harvesting through rain barrels or cisterns is also mentioned as a way of further conserving and redirecting stormwater. The authors encourage similar options on varying scales of size and cost to be considered in public housing and private residences throughout the city (Hazen and Sawyer 2012).

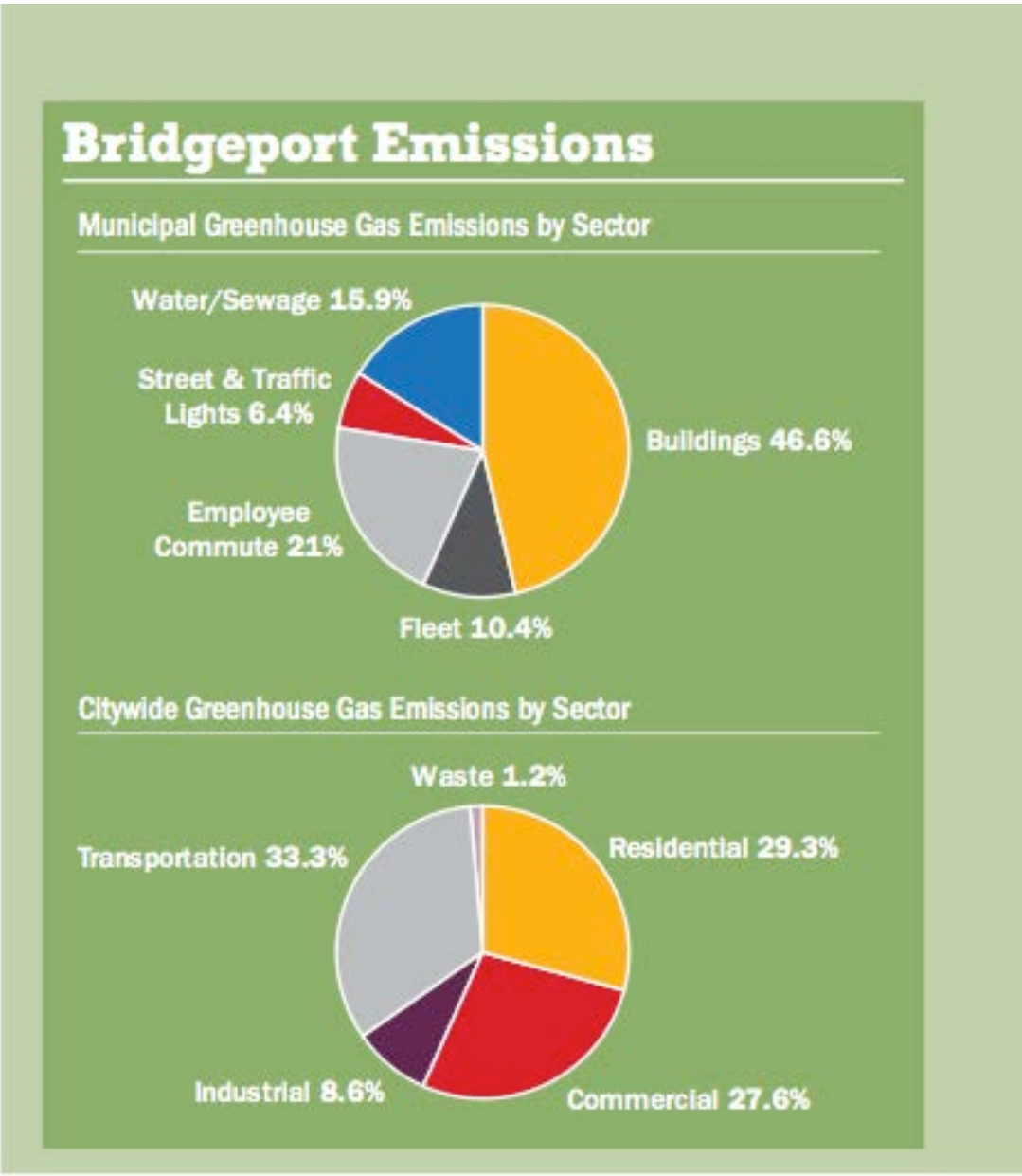

Figure 5. Regional Plan Association (2008).

Affordable green housing in Bridgeport

The Bridgeport Housing Authority is working on weatherization and energy/water saving projects in public housing units. With limited funding and an accumulation of building systems in need of repair, BHA entered into an Energy Savings Performance

Contract with Siemens Industry, Inc. to undergo the $16.3 million, 20 year project. $20 million was garnered from Siemens and HUD through stimulus money from the American Recovery and Reinvestment Act of 2009. The goals focus on energy savings and lowering energy bills. Major energy system upgrades were performed in 2,500 housing units (scattered site and major complexes) throughout the city (Siemens Industry Inc. 2010). For example, some projects involved exchanging inefficient boilers and refrigerators for energy efficient models. Another project involved putting sensor activated security lights outside of buildings. Siemens vaguely lists the replacement of inefficient windows "throughout many units" as well as general "weatherization strategies" in the housing structures. According to the contract, 800,000 kWh in energy savings each year— $1.3 million in "guaranteed" savings annually—will result from the energy and water efficiency measures. The retrofits are said to lower electricity consumption by 35%, natural gas by 24%, and water consumption by 45% over the next twenty years which would be "equivalent of removing 9,447 cars from the road, planting 13,145 acres of trees, or not consuming almost 5 million gallons of gas or more than 100,000 barrels of oil" (Siemens Industry Inc. 2010).

One of the current Bridgeport Neighborhood Trust's projects is the development of two green new construction duplexes known as the Holly Street Homes located in the East End. Sustainable construction techniques, low VOC paints and carpets, Energy Star appliances, rain barrels, and low E insulated windows filled with Argon will reduce energy costs and are expected to be paid back within five years. The Holly Street Homes are LEED certified, making them the city's first step towards (certified) affordable green housing (Bridgeport Neighborhood Trust 2012). The BNT is also rehabilitating other

scattered site, distressed affordable housing projects Downtown and in the South End. If all of the current BNT projects were renovated according to a set of green building codes that are compatible with national green building standards, then Bridgeport could achieve greater environmental justice in the public housing sector.

Green building techniques and materials are flexible; green building improvements include low-cost, moderate-cost, and expensive options. It cannot be stressed enough that green affordable housing is versatile, and that small improvements made in any sector of green building design will have measurable environmental, health, or economic benefits. We are seeing green building techniques become more and more popular in the standard building sector. For example, compact fluorescent light bulbs have become the industry standard for lighting (Powell 2007). We can alleviate the disproportionate environmental burden placed on low-income and minority populations by applying green building techniques to affordable housing projects. Bridgeport can reduce environmental and climate injustices by adopting green building codes to provide a much needed green standard for buildings in the city. Even climate change deniers can understand the need to reduce our energy use or find a way to be more efficient.

Chapter 5

Policy Recommendation and Conclusion

"Ultimately, however, Bridgeport's greatest environmental challenge is climate change…The problem is, of course, much greater than Bridgeport's alone, but it is our responsibility to do our share in reducing carbon emissions and to prepare for a changed climate." (Regional Plan Association 2008)

Green building solutions are meaningful and practical, there is already an existing structure to implement them in the city, and they can significantly reduce vulnerability of residents of public housing to future extreme weather and climate change events. In the following section it is argued that Bridgeport would be more prepared to protect its vulnerable residents from extreme weather and climate change events if the city adopted a set of green building codes. The paper concludes with a summary that ties together the take home messages of the report.

Policy Recommendation

The total projected job growth for the Bridgeport-Stamford-Norwalk region is 45,000 by 2020. If the goals of the city's Comprehensive Economic Development Strategies plan to absorb some of this growth are put into place, then Bridgeport could capture a third of the total projected job growth for the region by 2020 (Bridgeport Master Plan of Development 2008). Bridgeport already has a foundation for green building projects. Affordable green housing can lead the city into the green building movement if a structured procedure with a standard protocol is put in use. Adhering to a

set of green building codes will increase energy efficiency, thus lowering costs. Buying locally sourced materials from local green building suppliers will help incubate new green businesses and lower carbon emissions by reducing the distances that materials travel.

By drafting a set of green building codes, Bridgeport can bring climate justice to residents of public housing. We focus on buildings because they are such a large drain on the energy sector. The more electricity society needs, the more carbon is burned and the more the planet heats up. Climate change should be taken into consideration in the green building codes established by the city as carbon emissions and energy/water efficiency will feel the effects of each and every new construction or renovation project whether it be at the beginning of the process (i.e. sustainably harvested wood) or once the building is complete (i.e. solar panels integrated onto a roof that provide clean free energy for the building). While Bridgeport should apply green building codes to all new construction and renovation for residential, commercial, industrial, and city buildings, all the forms that public housing takes in the city should take precedence as these populations will be especially vulnerable to uncertain future climate and weather changes.

Bridgeport should adopt a set of green building codes based on California's CalGreen green building codes. CalGreen is a combination of existing national green building standards and will provide a great model for the city. The main difference with CalGreen and the following proposed green building codes for Bridgeport is that CalGreen started by only applying to all newly constructed buildings while Bridgeport's proposal should start by being applied to retrofits and renovations for existing buildings. Also, CalGreen applies to all newly constructed residential, government, commercial,

school, and hospital buildings whereas Bridgeport's green building code will first apply to low-income residential (public housing) then be expanded to include all buildings.

The green building codes should be voluntary and incentive based at first and start in multi-unit/scattered site public housing structures. The green building codes should start with retrofits and renovations to existing public housing structures. Once established, the green codes should be extended to include newly construction public housing. When the codes are extended to all residential, commercial, industrial, and city buildings, they should become mandatory. The following categories are borrowed from the mandates outlined in CalGreen (2012). The green building code will cover planning and design, energy efficiency, indoor and outdoor water efficiency/conservation, material conservation and resource efficiency (i.e. more durable products, less construction waste), operations and maintenance, indoor air quality, and indoor moisture control. The green building code should require a minimum water consumption reduction by installing plumbing fixtures that use less water, a minimum reduction waste generated during construction destined for landfills and limits for VOC emitting paints, carpets, flooring/drywall adhesives, and tub/tile coatings and sealants. The code should also include limits for formaldehyde emitting wood materials, incorporation of a water retention system, fortification against pests entering the home, increased level of material durability across the board, and stronger interior moisture control. The code should cover installation of exhaust fans for bathrooms and kitchens and HVAC standards, and much more.

Why should green building codes be applied to *existing* public housing? This paper is not arguing that the BHA renovates all of its units to LEED standards as this is

not a feasible nor a sensible use of the budget. This paper also does not attempt to discount or glaze over the work done by Siemens Industry Inc. in Bridgeport's affordable housing units. Therefore we can't overlook the great renovations that have already been made to these units in water and energy efficiency! If these renovations could satisfy efficiency increases called for by green codes, then they could be *labeled* as meeting green codes. That's the beauty of the affordable housing green codes. Bridgeport gets to decide them, so why not set the bar for some green measure at the already higher bar set by recent renovations? Although large-scale public housing units will not likely be built in Bridgeport again, smaller scattered site housing is always under construction. If the green codes are applied to existing public housing units as retrofits, then it wouldn't be as much of a jump as suddenly mandating that all new construction be built to these standards. People need time to digest and learn to appreciate the quantifiable value of building green. Give them time and they will. Start a media campaign—have the *Connecticut Post* highlight all the great green progress the city is making *starting* with public housing! If state buildings and universities are leading the green building movement in Texas, then why can't public housing be the driving force behind building green in all of Bridgeport's residential, commercial, institutional, and industrial buildings? If the city starts with public housing, then the green building codes "movement" will spread to other residential, commercial, industrial buildings. Therefore we started off trying to make public housing residents less vulnerable to climate change, but we end up with a domino effect change once the benefits of building green are recognized.

Conclusion

Bridgeport, CT was built on immigrants, industry, and opportunity. Wartime units erected by the federal government to house workers were hastily built. Low-income families lived in the newly constructed public housing projects. As the 21st century wore on, the housing built to withstand the strong influx of workers got older and the projects got scarier. More white people moved out of Bridgeport into its suburbs because they could afford to while more non-whites moved into the city because it was all they could afford. Many factories began closing their doors or relocating out of the city taking with it Bridgeport's tax base and manufacturing economy. Brownfields and vacant lots are reminders of the city's rich industrial past. Today, Mayor Finch is working to jumpstart the economy and tackle environmental issues created by heavy industrial processes through the development of a green economy.

We have looked at instances of environmental injustice in Bridgeport. Environmental injustices occur in society when a group—marginalized by race, ethnicity, or income—is subjected to an unfair share of environmental burdens. Similarly, climate justice refers to the unequal distribution of environmental burdens induced by extreme weather and climate events. So why buildings? If Americans really do spend so much of their time inside, logic would follow that these spaces should be healthy and safe environments. Buildings make up an enormous chunk of the nation's energy demands. Public housing is especially vulnerable to receiving the short end of the stick in terms of budgetary restrictions which lead to using cheap and sometimes harmful building materials.

The green building movement in America is gaining strength at the national, statewide, and local levels. Across the U.S., cities are adopting their own green building codes and standards. More and more case studies of affordable green housing are emerging as more and more housing authorities see the double benefit of saving money through greater energy efficiency and improving residential health. As the affordable green housing movement emerges in the building sector, more environmental and climate justice is brought to residents of public housing. Examples from around the country show housing authorities that are seeking to increase energy and water efficiency as well as occupant health in public housing units. Building green or doing green retrofits reduces emissions during production and transportation of materials thus not contributing more to climate change. Where the occupants are especially vulnerable due to social factors such as income and race/ethnicity, green building strategies can provide more protection against future extreme weather and climate events.

We have demonstrated how building and retrofitting using green materials/strategies can yield environmental and health benefits. There are many lessons to take away from green building techniques. High performance green materials do not have to be replaced as often as standard counterparts, reducing the amount of waste in landfills (thus reducing greenhouse gas emissions) when the products reach the end of their lives. Efficient systems lower energy and water consumption, lowering utility costs and easing strain on the electric grid and dwindling freshwater resources (Green Affordable Housing Coalition 2004). Manufacturers are making paint with less harmful volatile organic compounds (Weber 2005). Overall, non-toxic materials create healthier

living spaces for residents. Choosing to build with materials that are made/sourced locally, naturally, and sustainably reduce greenhouse gas emissions.

Climate injustice is likely to become more of a problem as the effects of climate change unfold. Cases of climate injustice have popped up with the two hurricanes that have hit the city within the past two years. Climate change will have direct and indirect physical effects on the environment as well as disproportionate secondary effects on different groups in society. It is a wise idea to draft mitigative and/or adaptive strategies to combat or lessen the effects of climate change now than to not take action and make the most vulnerable populations even more vulnerable in the future. The green building movement is the missing puzzle piece that brings environmental justice to vulnerable populations, has less of a negative effect on the environment (thus less of an effect on climate change), and can help rebuild the economy in Bridgeport.

This proposal is not a revolutionary, but it is practical. The purpose of this study was to offer a meaningful and practical renovation proposal for affordable housing units in Bridgeport, CT to be used by city's Department of Sustainability to use as a tool in their efforts to increase sustainability in Bridgeport. This study will encourage the city to take residential weatherization, energy efficiency, and indoor air quality programs one step further by demonstrating how retrofitting affordable housing structures using green materials can improve the health and safety of low-income and minority populations with prices comparable to those of traditional building materials. This study attempts to work towards the city's efforts to reduce its carbon footprint and protect in particular the most vulnerable citizens from the impacts of global climate change. Using locally sourced building materials with a low embodied energy will reduce carbon emissions because

green building materials are often made from recycled goods and add less pollution to the atmosphere (during production) than the typical materials used in the industry do today.

Building and retrofitting affordable housing units to green codes will better protect low-income and minority residents of Bridgeport from extreme weather and climate events in the future. Building green will improve safety and health as well as ensure equal environmental treatment for residents. Building green is the way of the future in which extreme weather events become more frequent as a result of rising surface temperatures. As the effects of a warming planet become more tangible, sustainable development will eventually replace current building practices that add carbon dioxide and other harmful green house gases to the atmosphere. Applying affordable green housing and climate justice practices to public housing policy today will promote environmental equality and climate justice for future generations in Bridgeport.

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