Landscapes of Environmental Justice: A Post-Structural Analysis of Ecological Structures and Environmental Discourses

by

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Presented to the Faculty of the Graduate School of

The University of Texas at Arlington in Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PHILOSOPHY

THE UNIVERSITY OF TEXAS AT ARLINGTON

August 2016

Acknowledgments

I would like to thank my advisor, Enid Arvidson, whose insights helped me grow my scholarly interests and to whom I am sincerely grateful for excellent reading recommendations and unfailing willingness and patience to read and critique my work along the way. I would also like to acknowledge and thank the guidance I received from my committee members: Colleen Casey, Ivonne Audirac, and Yekang Ko who offered critical feedback during the proposal development.

I would also like to send my gratitude to Ard Anjomani, Ivonne Audirac, and Yekong Ko who have taught me valuable lessons on teaching during my terms as their teaching assistant and for being consistently supportive since I first arrived at the University of Texas at Arlington. I would also like to thank Ben Agger who encouraged me to think and engage with critical theory and post-structuralism more seriously.

I wish to also acknowledge a huge debt of gratitude to the School of Urban and Public Affairs and The University of Texas at Arlington for the scholarship that made my aspiration for pursuing the doctoral degree possible, and to the school of Architecture, Planning, and Public Affairs for granting me the Dissertation Writing Fellowship and several conference travel awards.

I would also like to thank all the respondents in Dallas and Boston for their willingness to take the time to participate in this research through different surveys, interviews, and mapping workshops, without whom this research would not be possible.

On the same note, I would like to thank my family for their support. And I wish to dedicate this writing to my sisters, Leila and Lida, for all their kind support during the years and their help throughout data collection in Boston.

Abstract

Although application of ecological concepts and looking at the city as an "ecological space" or ecosystem is not new in planning (e.g. Chicago school), in the context of environmental justice research there is a need for a more integrated approach towards the complex interrelations between human aspects of urban landscapes and urban ecology. Consequently, the first starting point of my research is that studying environmental justice also requires an understanding of environmental health. The second defining point of this research is influenced by the notion of questioning science and research as a "social construct." Drawing on Foucault's legacy of discourse analysis, I attempt to point out the importance of the political and social framings of environmental justice and health concerns. Therefore, highlighting one of the most-asked epistemological questions in environmental justice research, "whose knowledge," I attempt to establish a transdisciplinary framework to include local environmental and health knowledge and perception in the analysis in parallel with the ecological understanding of environmental and human health status.

I apply a landscape-based ecological approach in order to examine the cumulative impacts of landscapes across large areas. Also, I employ a participatory GIS technique along with other qualitative methods to move beyond the traditional geospatial analysis that often does not include participatory approaches and local discourses in its analytical process. Although this study introduces two case studies (South Dallas, TX, and Jamaica Plain, Boston, MA), the ultimate goal is not to provide policy recommendations for a specific case of environmental injustice, but, rather, to highlight the complexity of environmental justice discourse and the epistemological tensions in terms of research methodology in an attempt to attribute these ongoing debates to the politically plural and scientifically vague ontological status of EJ research.

Table of Contents

List of Illustrations

List of Tables

1) Introduction

The core research question in this research is: To what extent, if at all, environmental (in) justice can be explained through a transdisciplinary and participatory model assessing both biophysical and anthropic systems. Given the broad concept of environmental (in)justice, in this research, I particularly focus on health impacts and disparities associated with environmental inequalities. To accomplish this task, this research offers two empirical studies, one in South Dallas, TX, and one in Boston, MA, employing a multidisciplinary approach inspired by Participatory GIS (PGIS) and post-structural discourse analysis. In these introductory pages, I briefly explain the underlying points and the core discussions of this research. Finally, I highlight the methodological stand of the research and the possible contributions of the study in terms of advancing environmental justice research and contributing it to the policy-making arena.

Recent human health paradigms argue that health cannot be characterized by a single environmental hazard or pollution point; instead, health status should be described as a result of complex interrelations between socioeconomic and environmental factors (e.g. Tarocco, Amoruso, Caravello, 2011). Many scholars argue that these interrelations put an emphasis on the study of access to environmental services and environmental health (e.g. Daily, 1997), which requires an understanding of both biophysical/ecological and human factors. Accordingly, many scholars have discussed the difficulties of integrating both humanistic and naturalistic dimensions (e.g. Epstein & Rapport, 1996) and many have analyzed the relationships between environmental justice and environmental health (e.g. Sexton & Adgate, 1999).

Although application of ecological concepts and looking at the city as an "ecological space" is not new in planning (e.g. Chicago school) (Braun, 2005, p. 635), as Braun (2005) discusses, there are not many urban studies that include nonhuman

aspects of urban landscapes. Consequently, the first starting point of my research is that studying environmental justice, requires an understanding of environmental health too, as many researchers have found a relationship between human health and environmental/ecosystem health (e.g. Epstein & Rapport, 1996; Tarocco, Amoruso, Caravello, 2011; Maantay, 2007; Brulle & Pellow, 2006; National Health Promotion and Disease Prevention Objectives for 2020, 2004).

The second defining point of this research is influenced by the notion of questioning science and research as a "social construct" (e.g. Wyllys, 2003). Drawing on Foucault's legacy of discourse analysis, I attempt to point out the importance of the political and social framings of environmental justice and health concerns. Therefore, highlighting one of the most-asked epistemological questions in environmental justice research, "whose knowledge" (e.g. Allen, 2007; Escobar,1998), I attempt to establish a transdisciplinary framework to include local environmental and health knowledge and perception in the analysis in parallel with the ecological understanding of environmental and human health status.

While there are well-established frameworks in the literature for understanding human health and urban ecology separately, there is a gap in the literature related to empirical research on the ecological understanding of human health in urban areas. A logical response to this gap requires an understanding of the long-term dynamics of urban ecosystems as well as the varying aspects of environmental justice discourses in terms of policy making. I attempt to use a multiple interdisciplinary approach to explain the interrelations between urban ecosystems, the chain of discourses on environmental issues, and the changing states of environmental justice. I apply a landscape-based ecological approach in order to examine the cumulative impacts of landscapes across large areas. Also, I employ a participatory GIS technique along with other qualitative

methods to move beyond the traditional geospatial analysis that often does not include participatory approaches and local discourses in its analytical process. In an attempt to relate the findings of my research to the theoretical concept of environmental justice, I use discourse analysis inspired by post-structural political ecology in the qualitative analysis chapter.

Focusing on these two case studies in Texas and Massachusetts, different chapters of the dissertation aim to answer the following questions:

- What kind of discourse development exposes environmental injustices?
- What are the varying aspects of environmental justice discourse?
- How have local residents been portrayed and/or marginalized in the EJ discourses of different groups?
- How are the ecological understandings of the concept of environmental justice different from what is understood by local people? How can a participatory approach enrich the ecological studies in urban areas specifically those centered on environmental injustice?
- What implications might the findings of the research have for efforts to promote environmental justice in public policy?

I hope this research contributes to the current literature, particularly in terms of advancing the methodology of EJ research. Using landscape analysis techniques in the study of environmental justice is a relatively new approach. Additionally, unlike what might be expected, not many environmental justice studies use political ecology. This methodology, however, is quite popular among climate change advocates. The methodology introduced in this research has its roots in narrative methodologies popular among environmental justice activists and the application of Geographic Information Systems (GIS) in academia and government studies.

In the literature review (chapter 2), I review the academic literature related to environmental (in) justice and organize it into five sections: (1) competing environmental paradigms, (2) environmental justice and policy context (3) concept of justice within the EJ discourse, (4) review of methodologies in environmental justice, and (5) theorizing environmental justice. In the first section of chapter two, I review the process of paradigm change in environmental theories. I also explain the underlying assumptions, policy agenda, and the ecological theories behind each paradigm. I also briefly review environmental justice through the lens of policy evolution with an emphasis on the main turning points.

In the next sections of the chapter I review the policy evolution and different aspects of justice in the environmental justice movement. I also look at the possible approaches to theorizing about environmental injustices including political economy, political ecology, and post-modernism. Section 2-4 begins with a review of environmental justice research in the U.S. since the 1960s and 1970s. I introduce the main challenges in quantifying environmental injustice in terms of its effect on human health and the critiques of the EJ movement that are centered on the issue of methodology. I provide a general background on geospatial analysis approaches and the alternative landscape based approaches in environmental studies. Furthermore, looking at the social framing of environmental injustice and health disparities, I explain why post-structural political ecology with an emphasis on Foucauldian-inspired discourse analysis can be considerably helpful in advancing policy-oriented environmental justice research.

In chapter three, I introduce the conceptual framework of my methodology. Referring to Flyvbjerg (2006) and Campbell (1975), I argue that a comparison case study is a good approach to test the suggested methodology and to broaden the knowledge of environmental injustices in these areas. Figure 1 illustrates the origins of this research's

methodology more clearly by showing its link with the triple bottom line of sustainability research.

Although this study introduces two case studies (South Dallas, TX, and Jamaica Plain, Boston, MA.), the ultimate goal is not to provide policy recommendations for a specific case of environmental injustice, but rather, to highlight the complexity of environmental justice discourse and the epistemological tensions in terms of research methodology, in an attempt to attribute these ongoing debates to the politically plural and scientifically vague ontological status of EJ research.

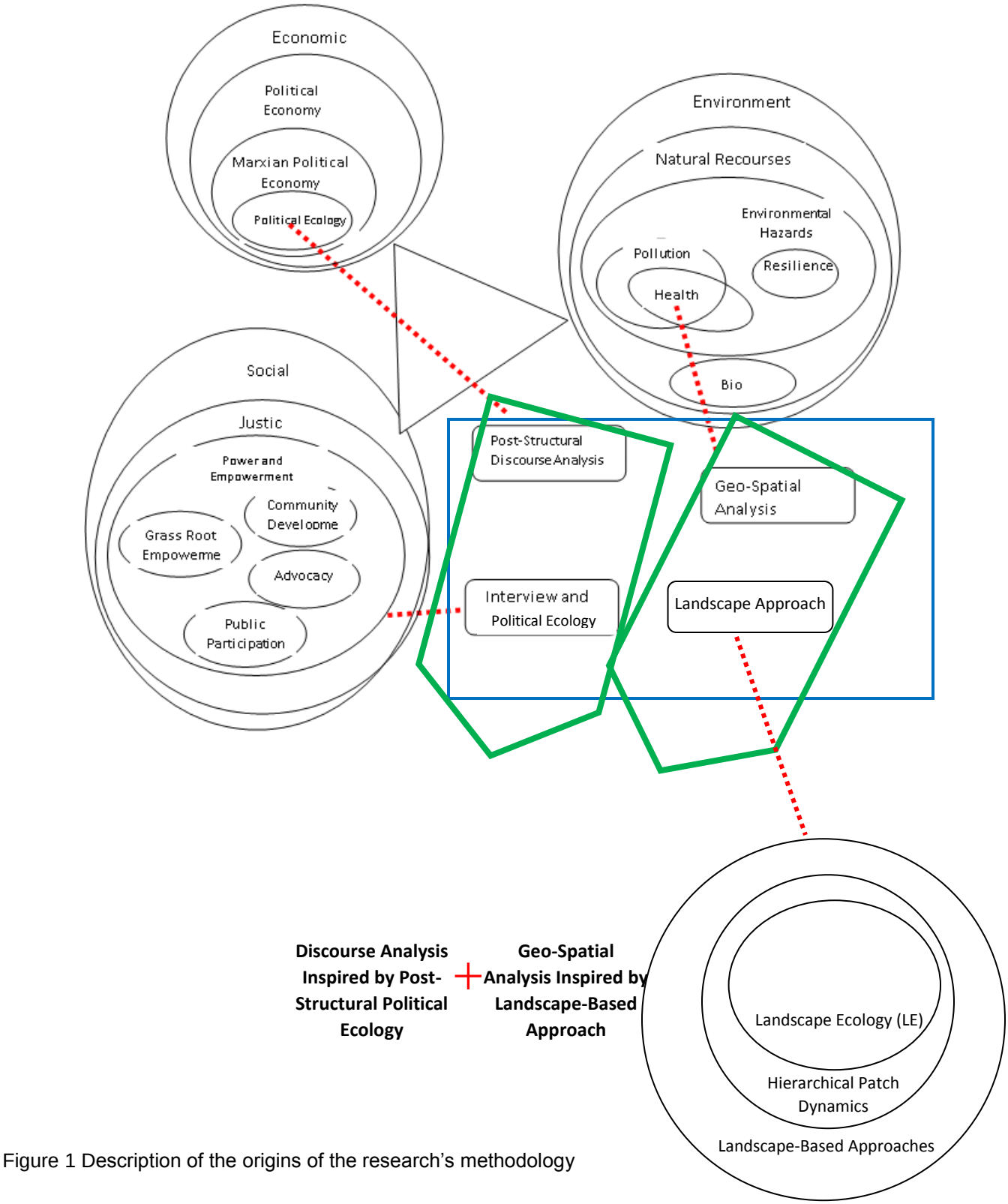


Figure 1 Description of the origins of the research's methodology

2) Literature Review

2-1) Environmental Theories and the Rise of Environmental Justice Paradigm

This section discusses the evolution of different environmental paradigms from an ecological perspective and compares the status quo of environmental justice paradigm with other current approaches and its possible relationships with current ecological approaches. First, I briefly review different environmental paradigms in terms of their underlying assumptions, policy agenda, and ecological theoretical base. Secondly, overlaying the process of evolution of both environmental theories and ecological theories, I highlight the possible advancements in the methodology of environmental justice research through application of the current ecological thoughts.

2-1-1) Introduction

Environmental injustice is not a new phenomenon and has occurred worldwide for centuries (Taylor, 2009). But environmental justice as a paradigm, and a school of thought, was born only decades ago after the issue gained attention in public purview (e.g. Love Canal in 1978 and Warren County, North Carolina in 1982) and scholars begun to study the cases across the country systematically (Hartley, 1995).

Most of the environmental justice (EJ) studies examine how environmental inequalities and the consequent health disparities arise from social, political, and environmental decision-making processes and investigate the interconnections between race, class, and institutional powers. Terms such as environmental equity, environmental racism, and environmental classism, which are frequently used in the literature of EJ, illustrate the importance and complexity of such interrelations.

Different studies analyze the causes of environmental injustice in terms of race, class, and gender (Foster, 1994; Kurtz, 2009). In general terms, the priority given to race

is essentially what differentiates the environmental justice paradigm from other environmental rights movements (Bullard, 1993; Byrne, Martinez, & Glover, 2002).

Studies on the historical roots of EJ in the USA can help reveal the sensitivity of some of the debates within the literature of EJ (e.g. Agyeman, Bullard, & Evans, 2002), most notably the discussion over race and class. However, dissecting such discussions is not the concerns of this research. Given the focus of this paper on methodological evolution of environmental paradigms, the most important historical aspect of environmental justice movement is its association with anti-toxics movements (see Cable and Benson, 1993; Capek, 1993; Szasz, 1994) that was to impart its principles on the EJ movement and to dictate the methodology of EJ research for decades.

However, this association is what helped the manifestation of environmental justice as a grass root movement and later on its rise as an environmental paradigm. Appalling tragedies, such as Love Canal, captured the media's attention and won political and official support, and more importantly contributed greatly to conceptualizing the environment as a context "where we live, work, and play" (Novotny, 2000, p. 3) rather than focusing on single risks.

The first wave of the mainstream environmental justice research appeared shortly after the case of Polychlorinated biphenyl landfills in Warren County, North Carolina in 1982 which led to a controversial debate over EJ rights and triggered studies on environmental discrimination across the US and the nature of distribution of environmental risks (Hartley, 1995). A General Accounting Office (GAO) study, *Siting Hazardous Waste Landfills and Their Correlation with Racial and Economic Status of Surrounding Communities*, was one of the first studies with such a focus which concluded that "blacks make up the majority of the population in three of the four communities where the landfills are located" (GAO, 1983, p. 1).

The main turning point in EJ as a movement, however, was the United Church of Christ sponsored study in 1986, *Toxic Wastes and Race in the U.S.A: A National Report on the Racial and Socioeconomic Characteristics of Communities with Hazardous Waste Sites*. This study found race to be the most significant variable in siting hazardous waste facilities and coined the term "environmental racism" in the EJ struggle (United Church of Christ, Commission for Racial Justice, 1987). Moreover, this study triggered a generation of EJ studies which proved a pattern that was not limited to Warren County (Bullard, 2007).

Until today the definition that best embodies the EJ concerns is the following:

"The environmental justice movement is the confluence of three of America's greatest challenges: the struggle against racism and poverty; the effort to preserve and improve the environment; and the compelling need to shift social institutions from class division and environmental depletion to social unity and global sustainability" (National People of Color Environmental Leadership Summit, 1991).

Through application of Kuhn's principles of paradigm shift, scholars have analyzed the evolution of environmental thoughts that led to the emergence of environmental justice movement (see Taylor, 2000). The new principles of environmental justice, however, have not been translated into either advocacy work or academic EJ research, mainly because of the loose connection between ecological theories and almost all environmental theories particularly environmental justice. In the next section I provide a short description of how, if at all, each of these theories is supported by an ecological theory.

2-1-2) Dominant Social Paradigm (DSP)

Dominant Social Paradigm (DSP) also known as "exploitative capitalism" was the dominant paradigm for much of the 19th century (Taylor, 2000). Within the context of

sociology, DSP competes with other contemporary sociological paradigms such as functionalism, symbolic interactionism, conflict theory, and so on (Catton & Dunlap, 1978). In terms of the environmental implications, this paradigm is comprised of three main themes : economic, policy, and technology (Kilbourne, 1998). It emphasizes anthropocentric values and includes three basic beliefs: (a) pursuit of industrial advancement will resolve the environmental crisis, (b) economic growth is the answer to societal problems, and (c) political representatives have the capability to handle policies (Rollfing, 1996) and to deal with market failures including environmental issues.

Later on, this paradigm was largely criticized for using the natural resources extensively without taking the needs of the next generation into consideration. Potter (1954) is one of the first scholars who warns about the “unexamined” if not false assumptions shaping the Dominant Social Paradigm (Catton & Dunlap, 1978, p. 43). Catton & Dunlap (1978) also criticize DSP for neglecting the new findings in the field of ecology and basically ignoring carrying capacity and the issue of scarcity. Commitment to this paradigm, however, is rooted in a strong belief that there are no limits to technological improvements and therefore societies will not be bound to such limits as carrying capacity (see Hawley, 1975).

From a policy perspective, recently, the debates over this paradigm have become more political, which to some extent is due to the widespread use of euphemisms such as green capitalism, eco-capitalism, and so on. Such terminologies have caused a lot of controversies, and some scholars believe that the DSP has been largely induced by the media and cultural institutions (e.g. Fotopoulos, 2008) and that green capitalism has become the most advertised policy agenda of this paradigm. Moreover, some scholars believe that green capitalism is actually a political agenda to

present capitalism and environmentalism as being compatible (e.g. Haraway, 1997; Girdner & Smith, 2002).

The policy agendas introduced by this paradigm (such as green capitalism) have been largely criticized by ecologists and environmental activists for being ecologically unsustainable (e.g. Milbrath, 1993). In short, critiques of green capitalism are mainly centered on the capitalist logic of accumulation, known as metabolism critique (e.g. Prudham, 2009; Foster, 2009). Additionally, progress and accumulation of capital as identified by DSP (see Kilbourne, 2004) is in the service of accumulation for accumulation's sake and entails that no fixed limits will be upheld. Therefore, there is an inherent conflict between green marketing attempts and economic growth (see Kilbourne, 1998) in DSP which surpasses values such as community and individual health.

Since decades ago, however, the widely accepted notion is that any environmental paradigm should recognize the importance of “carrying capacity” and “ecosystem dependency” (Dunlap & Catton, 1979). Although, no current ecological paradigm supports the assumptions embedded in capitalism’s articulations of the dominant social paradigm, given its underlying assumption of the “domination of nature,” the idea of balance of nature (first generation of ecological paradigms) seems more compatible with the ideology of capitalism, the idea that nature itself would able to cope with the disturbances caused by humans and industrialization. Balance of nature was the implicit assumption of ecological thoughts for decades (Wu & Loucks, 1995) and influenced both the theory and practice of ecology (Picket, Parker, & Fiedler, 1992; Wu, 1992). The underlying assumption of balance of nature is that communities and ecosystems as self-regulating systems and their balance can be maintained by nature (Lovelock, 1987).

2-1-3) Romantic Environmental Paradigm (REP)

Romantic Environmental Paradigm (REP) is largely considered as a response (alternative) to DSP (Taylor, 2000; Milbrath, 1993) which aims at protection of natural resources and wildlife (Johnson & Bowker, 2004). When REP originated, ECP continued to prevail and it still dominates the policy arena; and yet, REP was an important turning point because it paved the way for a broader environmentalism that originated during the 1960s (King & McCarthy, 2005). From an environmental justice perspective, however, REP is mainly bio-centric and is not concerned with social and eco-justice issues.

Basic assumptions of REP are: (a) exhaustion of scarce resources; (b) creation of a national park system in order to protect the wild lands, and (c) Strong focus governmental control as a tool for preserving natural resources (Taylor, 2000). The most well-known figure influenced by REP was Theodore Roosevelt who established a utilitarian policy agenda to protect forests and wild lands through "wise use" (Sheffield, 2010), an approach that, for the first time, took carrying capacity into consideration and deeply influenced American Modern Environmentalism (Miller, 2001).

As for the ecological theories accepted or practiced by this movement, studying the timeline of the evolution of ecological thought indicates that this movement was fundamentally based on new perceptions about the balance of nature, including the recognition of scarcity of resources and the potentially devastating outcomes of environmental irresponsibility. Another key assumption was that the natural environment could stay undisturbed as long as there was a balance between the destructive and conservative forces, therefore aiming for an equilibrium point through the resistance or balance of all agents of change or disturbance (Wu & Loucks, 1995). Thus, we can conclude that this paradigm embodies early stages of theories of equilibrium. The

existence of a policy agenda focused on conservation strategies provides more evidence to support this claim.

The classical equilibrium paradigm prevailed during the 1960s and 1970s and is mainly centered on the assumption of steady state, stability, and the supposition that "nature knows best" (Wu & Loucks, 1995, p.442), all of which have largely been criticized during the past few decades (e.g. Holling, 1973).

2-1-4) New Environmental Paradigm

New Environmental Paradigm (NEP) is built on the basic ideologies of REP and has its roots in the U.S. environmental movement of the 1960s and 1970s (Anderson, 2012). Furthermore, many scholars point to Rachel Carson's classic (1962), *Silent Spring,* as the turning point in the process of paradigm shift, which resulted in the New Environmental Paradigm (e.g. Taylor, 2000; Rollfing, 1996; Catton & Dunlap, 1976).

NEP, as an eco-centric paradigm, challenges the underlying assumptions of the dominant social paradigm and puts a stronger focus on ecological disturbances caused by human activities and their consequent environmental quality concerns (Anderson, 2012; Pelstring, 1997). Thus, NEP highlights the necessity to reduce the negative ecological consequences associated with industrial development and population growth (Dunlap & Van Liere, 1978). The revised version of NEP introduced by Dunlap and Van Liere (1978) is still popular in the United States (Anderson, 2012).

NEP readily related to the policy arena because during the 1970s, for the first time, environmental issues had gained systematic attention in the national policy agenda. From a policy perspective, NEP puts a great emphasis on the complex relationship between industrialized societies, the environment, the policy complication (Stern, Young, & Druckmen, 1992) and the importance of ecologically conscious consumer behavior (Roberts & Bacon, 1997; Kollmuss & Agyeman, 2002). Thus, many NEP studies

recommend environmental policies that are centered on the importance of improving people's awareness and "ecological consciousness" (e.g. Ellis & Thompson, 1997).

During the time that NEP continued to influence people's thoughts on the environment, the timeline of evolution of ecological thoughts also indicates new findings that led to a new generation of non-equilibrium theories. During this time the (classic) equilibrium theory was being criticized excessively. For instance, some scholars questioned the equilibrium assumptions and their ability to account for the complexity of interrelated ecosystems (e.g. Holling, 1973).

These criticisms are embodied in paradigm transitions during the 1970s which led to a new generation of non-equilibrium and multiple equilibrium paradigms (Wu & Loucks, 1995). According to multiple equilibrium, there is no one equilibrium point and after each disturbance, an ecosystem follows a new trajectory (Naveh, 1987).

2-1-5) Environmental Justice

Many scholars believe that environmental justice is a new paradigm that particularly focuses on what is missing in mainstream environmental discourse (e.g. Taylor, 2000), the argument about race, gender, class, justice, empowerment and health disparities. Race and racism in particular, as an explanation for environmental health disparities, was a strong force that triggered the environmental justice movement (for example, Warren County, North Carolina). Principles of environmental justice, as compiled during the first National People of Color Environmental Leadership Summit in 1991, are evident of the most valuable ideological contributions that EJ paradigm has offered to broad environmental activism and environmental research (see Taylor, 2000). However, as I explain in the next section, the most important of these contributions, are not reflected in the mainstream environmental justice research. According to Taylor

(2000) the main themes of EJ principles are: ecology, justice, autonomy, corporate relations, political and economic processes.

The main policy agenda of EJ is the Integrated Federal Interagency Environmental Justice Action Agenda developed by the Environmental Protection Agency (EPA) (EPA, 2000). Although traditionally the role of federal government regulation has been considered a strong tool for protecting the environment, EJ studies put a great emphasis on the role of public participation and local governments' endeavors to achieve environmental justice. Therefore, many federal and state government entities have developed environmental justice public participation guidelines (e.g. Connecticut Department of Energy and Environmental Protection, 2012; The California Energy Commission, 2013).

Some scholars, however, believe that there is a need for a new policy agenda because, as Bullard & Johnson (2000) argue, "the dominant environmental protection paradigm" (p. 558) institutionalizes unequal political power, thus a new agenda should include adopting a public health model of prevention, shifting the burden on polluters, and addressing disproportionate impact through targeted actions. Moreover, some scholars argue that emerging linkages between sustainable development and EJ can also be beneficial for EJ policies, because as Agyeman et al. (2002) observe, most governments have adopted some kind of commitment to sustainable development while few have established frameworks to overcome environmental injustice.

From an ecological perspective, although we cannot associate a particular ecological theory to environmental justice, which is one of the main critiques of the environmental justice movement, it is logical that any potential EJ research should apply the latest accepted and widely practiced paradigm. Although GIS is such an effective tool for mapping and demonstrating environmental injustices (see Chakraborty & Maantay,

2011), environmental justice studies are neither GIS projects, nor are they limited to siting, proximity, and buffers.

In recent years scholars (e.g. Clark, Kates, Richards, Mathews, Meyer, Turner, Pickett, Boone, & Cadenasso. 2007) have studied the connection between environmental justice and ecological theories. From an ecological perspective, environmental injustice can be understood as unequal access to ecosystem services as well as unjust distribution of landscape disturbances such as pollution, thus uneven ecosystem health.

Adopting an ecological approach in environmental justice theory has three benefits that correspond to the main critiques of the environmental justice movement. First, the environmental justice paradigm has been criticized for lacking a theoretical framework (e.g. Foreman, 1998). In this sense an ecological theory can advance our understanding of the ecological conditions that lead to environmental injustice and can explain the patterns of environmental injustice from a landscape-based perspective rather than discrimination in siting.

Second, environmental justice has long been criticized for being an exclusively anthropocentric movement (e.g. Davis, 1995). Although the principles of environmental justice, as announced in the first National People of Color Environmental Leadership Summit in 1991, include eco-centric values, this has not been an aspect of environmental justice so far and can be regarded as an “unfinished journey” in environmental justice research (Gibson, 2004). Employing an ecological theory can help link the anthropocentric and eco justice issues and bring environmental justice closer to sustainability efforts.

And third, the American school of environmental justice is place-bound (due to the dominance of distributive justice in this field), but recent human health paradigms argue that health cannot be characterized by a single environmental hazard or pollution

point; instead, health status should be described as a result of complex interrelations between socioeconomic and environmental factors (e.g. Tarocco, Amoruso, Caravello, 2011). Having said all these points, this research is to some extent a journey of finding an ecological foundation that can advance the ecological understanding of environmental injustices and health disparities. The table below summarizes the evolution of both ecological theories and environmental paradigms.

Table 1 The Evolution of Environmental Theories

Ecological Theories	***Paradigm***	***Underlying assumptions***	***Popular policy agenda***
Balance of Nature	Dominant Social Paradigm (DSP)	Faith in technology, the economic growth solution, protecting society through legal system. A new set of assumptions focused on scarcity and equilibrium	From laissez faire to Green Capitalism
Equilibrium Theory	Romantic Environmental Paradigm	Exhaustion of scarce resources, necessity of a national park system, Strong need for governmental control A new set of eco-centric assumptions bend a questionable static equilibrium	Environmental conservation and wise use
Multiple equilibrium theory	New Environmental Paradigm	Ecological disturbances are caused by human activities that affect environmental quality Revealing a pattern of discrimination	Ecologically conscious consumer behavior
Landscape Approaches	Environmental Justice	Institutionalized unequal political power leads to unequal access to ecosystem services and health disparities	Integrated Federal Interagency Environmental Justice Action Agenda

2-2) Environmental Justice Through the Lens of Policy Evolution and the Milestones of the Movement in the USA

Given that one of the main critiques of the environmental justice movement is that it is not associated with particular ecological foundations, then another way we might consider the recent history of environmental justice is through the lens of policies. The American environmental movement flourished during the 1970s and for the first time a national environmental policy act was adopted and many important environmental laws and regulations were followed (e.g. clean air act, water pollution control act, and Toxic substance control act). However, in the next few decades until 2000, as many scholars observe there has been only incremental changes in environmental policy (Repetto, 2006) and as some scholars perceive environmental justice particularly is still in the process of establishing regulations (Nweke et al, 2011). Since the history of environmental justice movement is short, there are not many studies on environmental justice policy trends. Although broadly speaking, the EJ movement has been successful in pushing issues of environmental justice onto the agendas of policymakers, in this section I show that there are theoretical issues that undermine its success.

Building on previous research on environmental policy, here I highlight the environmental justice policies within the broader environmental policy arena. According to Rochon and Mazmanian (1993), affecting policy outcomes is possible through entering the policy process and therefore the future of any social movement is dependent on its ability to enter the policy arena. Consequently, one concern for the EJ movement is long-term involvement in the policy process. In this section, I provide a review of the main EJ milestones in the USA. No doubt some events, policies, and activities have been inadvertently left out. Additionally, drawing on the discussion in this section, in the case study chapter, I briefly examine the EJ policies in Texas and Massachusetts along with

the coverage of the environmental justice issues in south Dallas and Jamaica Plain neighborhoods in local news.

2-2-1) Introduction

In 1992, the Environmental Protection Agency (EPA) created the Office of Environmental Justice to oversee the agency's environmental justice work. It was an attempt to integrate environmental justice issues into the EPA's policies. Furthermore, the National Environmental Justice Advisory Council (NEJAC) was officially established on September 30, 1993 (EPA, 2006).

Two years after the establishment of the Office of Environmental Justice, due to increasing public awareness and scientific evidence piling up (Bullard, 2007), President Clinton signed Executive Order 12898, "*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,*" on February 11, 1994 (EPA, 1994). It was the first major public policy development for the environmental justice movement. This executive order ordered all federal government agencies that perform environmental related activities to incorporate environmental justice principles into their policies and ensure that everyone receives equal protection under environmental laws and regulations (EPA, 1994). Consequently, during the 1990s, state governments began to incorporate environmental justice principles into their environmental policies.

Although the delay in the EPA's response to EJ issues has been criticized by many scholars (e.g. Bullard, Mohai, Saha, and Wright, 2007), during the 1990s, the Clinton administration made attempts to address the priorities of EJ. No doubt the most important EJ policy-related event of the 1990s was Executive Order 12898, which, according to Bullard et al (2007), helped reinforce the Civil Rights Act of 1965 and put the focus back on the National Environmental Policy Act (NEPA) (1969). It should be noted that environmental assessment reports prepared under NEPA are now used to address

environmental justice concerns (Been & Gupta, 1997). Executive Order 12898 also paved the way for the creation of the Federal Interagency Working Group on Environmental Justice (IWG). The IWG's goal was to integrate environmental justice into all federal agencies' policies and to put environmental justice policies into action (EPA, 2003). Additionally, the EPA issued an environmental justice strategy in 1995, which outlined the goals of environmental justice policy and the EPA's approach to meeting the goals (EPA, 1995).

The EPA then formed the National Environmental Justice Advisory Council (NEJAC) in order to respond to environmental justice issues. The Council provides advice and recommendations about broad, cross-cutting issues related to environmental justice. It was an attempt to "integrate environmental justice into the EPA's overall environmental policies" (EPA, 1995, p. 5). In a strategic plan called *The New Generation of Environmental Protection*, the EPA referred to environmental justice as one of its main guiding principles (EPA, 1995). Furthermore, in order to provide examples for grass roots efforts, the EPA formulated Environmental Justice Model Projects including brownfield revitalization and public health pilot projects. (EPA, 1995).

In 2008, NEJAC compiled a new list of recommendations for the EPA highlighting future environmental justice policies and actions (National Environmental Justice Advisory Council (NEJAC), 2008). Based on these recommendations, the EPA's efforts should target states that have initiated more environmental justice projects. It also provides a mechanism by which states can achieve the necessary grants for EJ projects. It should be mentioned that up to this date the main policy agenda of EJ is the EPA-developed Integrated Federal Interagency Environmental Justice Action Agenda, which was established under Executive Order 12898 (EPA, 2000). Furthermore, the Federal Interagency Working Group on Environmental Justice (EJ IWG) was established in 1994

to enhance and to support federal environmental justice and community-based activities (EPA, 2013a).

In December 2011, the EPA published Plan EJ 2014: EJ Legal Tools (EPA, 2013b). Plan EJ 2014 is a four-year roadmap focused on developing stronger community relationships and increasing the EPA's efforts to improve environmental and health conditions in (especially minority) communities (EPA, 2013c). This plan identifies five cross-agency focus areas, including Fostering Administration-Wide Action on Environmental Justice (EPA, 2013c). According to the EPA (2013d), Plan EJ 2014 is not a rule or regulation; "it is a strategy to help integrate environmental justice into EPA's day to day activities" (EPA, 2013d, p.1).

Although traditionally the role of federal government regulation has been considered a strong tool in protecting the environment, recent EJ studies emphasize the role of public participation and local governments' endeavors to achieve environmental justice. The EPA has also initiated many plans to enhance public participation and community-based environmental plans. According to NEJAC (2008) one of the most serious flaws is how environmental agencies fail to engage the public in decision making. The National Environmental Policy Commission has also recognized public participation as one of the cornerstones of environmental justice (NEJAC, 2008).

Today, many federal and state government entities have developed environmental justice public participation guidelines (e.g. Connecticut Department of Energy and Environmental Protection, 2012; The California Energy Commission, 2013; Environmental Protection Agency (EPA), 1996). However as King et al. (1998) argue, public participation methods used by government agencies, including public hearings and public meetings, do not create conditions necessary for "authentic" public participation (King, Feltey, & Susel, 1998). They further argue that effective public participation

demands that government acts as a facilitator and a source of information instead of as an expert decision maker (King, Feltey, & Susel, 1998).

Debate over the shortcomings of the current EJ policy agendas, however, is not only focused on the issue of public participation. As I explain in the next section, many EJ studies have analyzed EJ policies in terms of race and socioeconomic factors. Additionally, some scholars believe that there is a need for a new policy agenda. According to Bullard (1996), the new EJ agenda should develop tools and strategies to eliminate unfair and inequitable decisions. And most importantly, the EJ agenda can benefit from a coalition between environmental and social concerns (Agyeman, Bullard, & Evans, 2002). Bullard and Johnson (2000) explain that the general characteristics of such an agenda should include: adopting a public health model of prevention, shifting the burden on polluters, and addressing disproportionate impact through targeted actions.

2-2-2) Environmental Justice Policy Context in the U.S.A

To analyze the evolution of environmental justice policies in the U.S., it is important to understand that, at least in terms of intention, environmental justice is intertwined with broad environmental and health policies. Therefore, it would be logical to expect it to mirror the general trends in environmental policy arena. However, as figures 2 and 3 indicate, there is a gap between the policy response to health issues and environmental concerns. As I argue later in this chapter, this very fact undermines the future of environmental justice policy.

Aside from environment and health, there are other areas that can potentially cause increased attention to environmental justice issues (e.g. the aftermaths of natural disasters like Katerina), but here I choose to include only environmental pollution control and health. In figure 2, there is an obvious rise of attention in the early 1970s and it is

followed by series of smaller fluctuations until today. Federal spending on health has increase dramatically from 1970 to 2006; after this time more fluctuations are apparent.

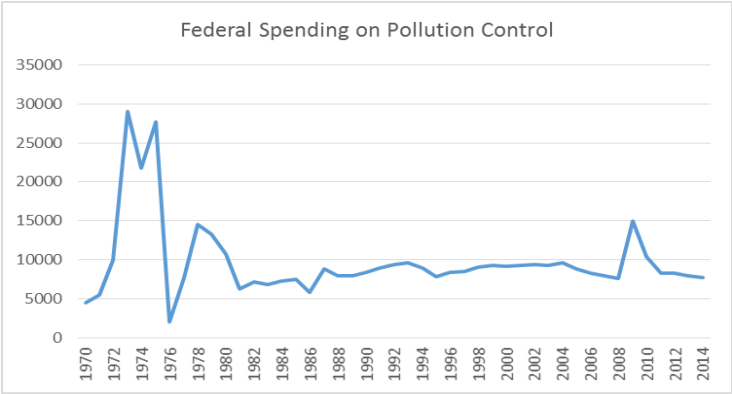


Figure 2 Federal Spending on Pollution Control, 1970-2014.

The data reflect constant FY 2009 dollars, in million. Source: Policy Agendas Project

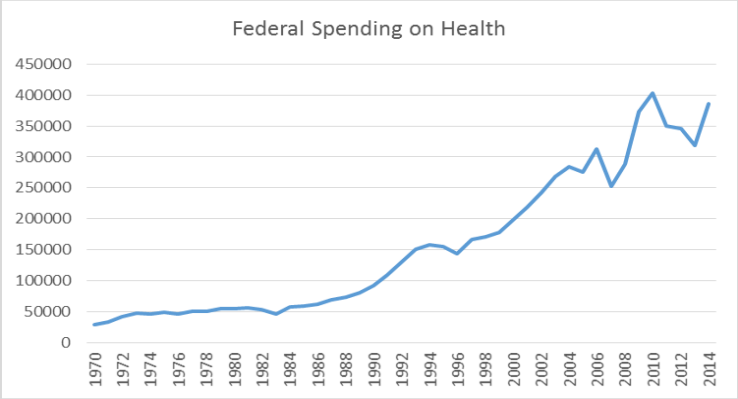


Figure 3 Federal Spending on Health, 1970-2014.

The data reflect constant FY 2009 dollars, in million. Source: Policy Agendas Project

Figure 4 and 5 show congressional hearings (as a measure for congressional attention) on environmental issues (all categories of environmental concerns) and health.

A rise in attention is clear in the 1970s that during the next few decades has generally increased. However in both categories the attention has recently fallen to the lowest point that it has been in the last 50 years. It is important to remember that maybe more than any other topic, environmental policies are challenged consistently (Repetto, 2006). Before more discussion on this matter, in the next few paragraphs I try to highlight environmental justice policies in this context.

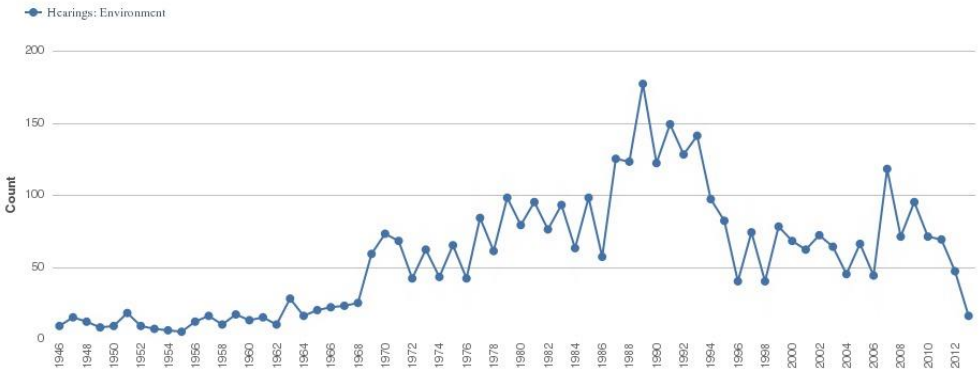


Figure 4 Congressional hearings on Environment, 1946-2013.

Source: Policy Agenda Project.

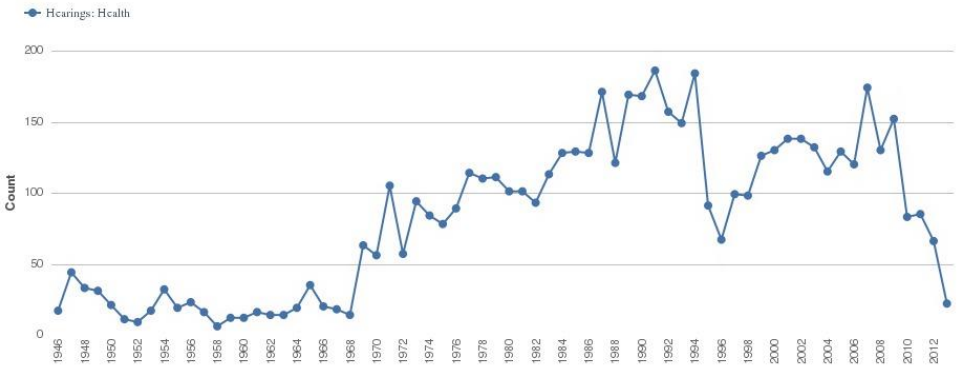


Figure 5 Congressional hearings on Health, 1946-2013.

Source: Policy Agenda Project.

First thing that should be reiterated is that the interconnections between environmental health and human health, which is in its essence the basis of environmental justice as both a movement and theory, have not consistently been acknowledged. The figures below (6) show the number of hearings (as a measure for congressional attention) on environmental issues that affect human health and when compared to the number of hearings on environmental issues and health issues separately emphasize the fact that the interrelations between environment health and human health are not a part of the dominant policy dialogue. And similar to the (general) environmental policy category despite its early start in the 1970, the attention has fallen tremendously afterward. During the last 40 years in less than 10 hearings the environmental factors that can potentially cause cancer have been discussed.

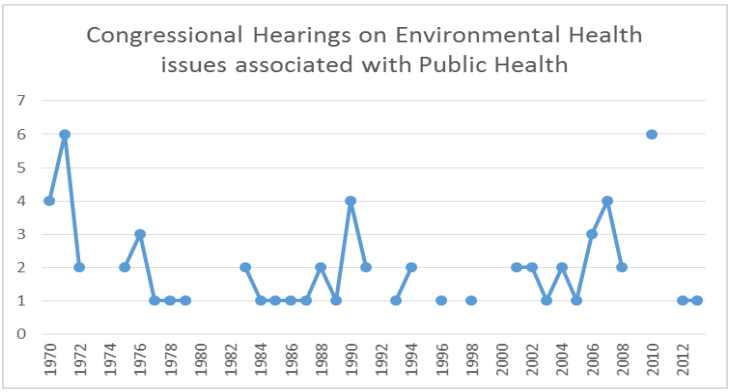


Figure 6 Congressional hearings on environmental health issues associated with public health, 1970-2013.

Based on Data Available at Policy Agenda Project.

Figure 7 shows environmental justice related bills introduced in Congress and the enacted bills are highlighted. The concepts of positive and negative feedback here are useful to explain the fluctuations. In the policy context, negative feedback refers to the forces that resist change and push for return to the original point. Positive feedback,

however, is a driving factor of change. The main categories of negative feedback in the U.S. are structural, institutional, and behavioral systems (Repetto, 2006). In the environmental justice policy arena the counter play between positive and negative feedback has long been recognized, and institutional discrimination and the structural problem of proof are the main sources of negative feedback.

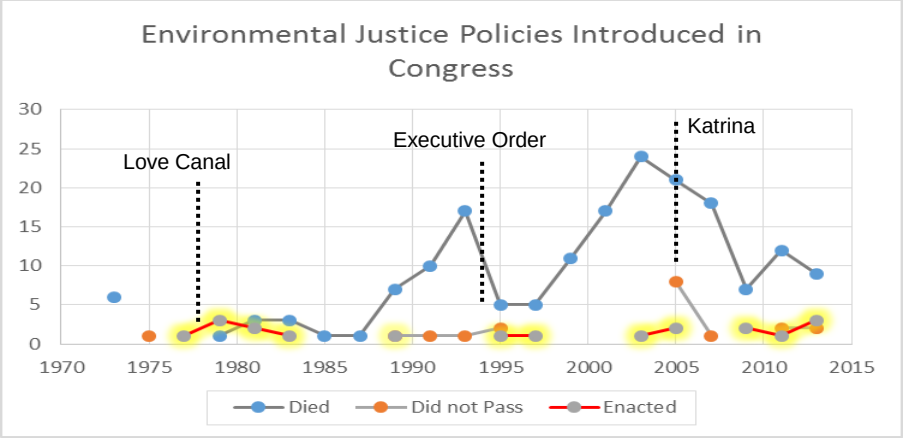


Figure 7 Environmental Justice Related Policies Introduced in Congress from 1970-2015.

Source: Based on the Data Available at www.congress.gov

Historically, environmental justice policies have been introduced after extreme and controversial cases across the country. And even Katrina's effect has not been as strong as one would expect (e.g. Bullard & Wright, 2009). Figure 8 shows that attention to climate change issues has been more consistent and effective. A logical conclusion is that integrating the agenda of environmental justice with climate justice and sustainability more broadly might be beneficial for the future of the movement.

Additionally, as I explain in section 2-4, the divorce between the field of urban ecology, thus ecological foundation, and EJ research further undermines the movement's ability to influence the policy-making processes and outcomes. However, it is not to suggest a complete shift in EJ research and devalue the historical and narrative accounts

on the issue. As I argue in the methodology section, there are reasons as to why EJ advocates have not initiated and are not particularly interested in the integration of the field of urban ecology and EJ research.

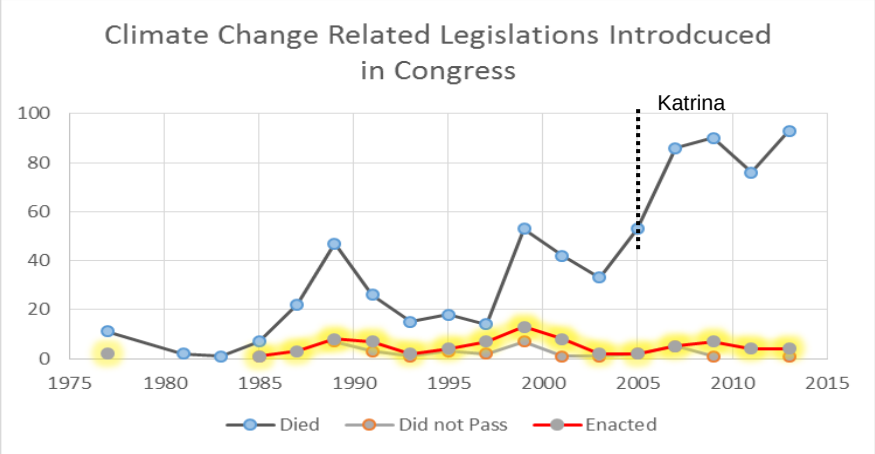


Figure 8 Climate Change Related Policies Introduced in Congress from 1970-2015.

Source: Based on the Data Available at www.congress.gov

The grass-roots movement in EJ has been successful in recruiting minority groups and communicating with local residents that otherwise would not join the environmental movement, partly because of its action-oriented nature that is not compatible with the slow and cautious nature of scientific inquiries and demand for measurable proof. But neither a solely qualitative or quantitative approach can advance EJ research in terms of its effectiveness in the policy arena. As Finch (1986) puts it " quantitative researchers are not simply in the position of having to persuade policy makers that their concept of objective research is a naïve one, but also have to cope with the reality that quantitative methods which provide objective research are exceedingly useful in relation to the daily task of maintaining the status quo…qualitative research, in contrast, is much more likely to offer up findings and insights which will disturb the status

quo, while at the same time the methods employed make it impossible to claim credibility on the grounds of objectivity." (Finch, 1986, p. 208)

That is why EJ has not witnessed strong grass-roots style of policy-oriented research (please see Finch, 1986). As I explain in section 2-4, EJ research is mostly descriptive accounts for EJ issues employing geo-statistical techniques. While I do not attempt to compare the quantitative and qualitative methods per se, I argue that EJ in its essence introduces a new environmental epistemology that asks for a mixed-method approach that can nurture the next generation of EJ research.

2-3) Whose Environmental Justice?

As mentioned earlier, different organizations with an environmental justice focus provide different definitions for environmental justice. As Schlosberg (2007) explains, this is mainly due to different perceptions of justice and how it should be implemented. Thus, acknowledging the plural nature of justice discourse should be the first step in studying EJ issues critically. In doing so, I begin this section by asking "what justice means in environmental justice?" To address this question, first, I explore what leading EJ scholars and activists mean by this term. Second, I look at some implications of the issue of justice in the arena of environmental policy making. Finally, I explain my approach in exploring the complex discourse of justice in environmental justice.

2-3-1) Introduction

While extreme cases such as polluted landfills and industrial hazardous waste dumping near residential areas with specific population profiles (e.g. Warren County, North Carolina, 1982; Mississippi Industrial Corner, Louisiana, 1987) emphasize the issue of inequality, these cases all provide ample evidence of maldistribution. It is important to recognize that the concept of "justice" in the environmental justice movement is not limited to "distributive justice" (e.g. Rawls, 2005; Barry, 1997). Distributive justice

has traditionally been the focus of environmental justice advocates, and many scholars (e.g. Schlosberg, 2007; Schroeder, 2000; Young, 1990) agree that distributive justice theories have been applied to environmental justice more than other new developments of justice theory. In recent years, however, some scholars have highlighted the importance of "procedural justice" in environmental justice that primarily is centered on the issues of recognition, participation, decision-making capabilities, and power (e.g. Capek, 1993; Amerasinghe et al, 2008; Clayton, 2000; Schlosberg, 2007).

Recognition is an important determining factor in contemporary justice theories, which can be considered either as an alternative or precondition for distributive justice (Schlosberg, 2007). As the central arguments within the literature of EJ suggest (e.g. debates over racism and classism), maldistribution in many cases is the result of misrecognition and consequently disempowerment. Furthermore, many EJ scholars believe that the questions of distribution cannot be separated from the variety of structural and social injustices inherent in misrecognition (Schlosberg, 2004; Pulido, 1996). Thus, the widely accepted explanation is "justice requires both redistribution and recognition" (Fraser, 1997, p.12). Fraser (2000) argues that such an understating of justice points to the bivalent nature of justice in EJ. The bivalent approach encourages EJ advocates to move beyond the traditional analysis of the distribution of environmental burdens and to incorporate cultural, economic, and locational relations into their analysis (Figueroa, 2003). The bivalent approach avoids the false dichotomy of social justice and cultural politics and instead unifies both redistribution and recognition (Fraser, 1997).

Some scholars have also discussed procedural justice that emphasizes the need for "fair and equitable institutional processes of state" (Schlosberg, 2007, p. 25). In other words, procedural justice is concerned with the political process that can potentially explain misdistribution and lack of recognition (Young, 1990). According to Young (1990),

examining the role of structural decision-making processes is the first step to addressing the existing injustices (whether distribution or recognition). Scholars who value procedural justice usually advocate for participatory, collaborative, and community-based approaches. Since maldistribution and misrecognition both have diverse effects on participation opportunities, Schlosberg (2007) states that the issue of justice in environmental justice is trivalent. The discussion here is that participatory mechanisms can improve the justice state in both maldistribution and misrecognition aspects. Moreover, self-determination as one of the key principals of the environmental justice movement requires both recognition and procedural justice. Furthermore, the study of political-economic structures and community empowerment are two important concerns of EJ researchers and activists.

Additionally, it is important to remember that as much as justice theories are focused on individual experiences, EJ discourse (following the legacy of the civil right movements) is centered on the rights of communities. The quest for justice for groups and communities is another reason why environmental justice advocates are more accepting of other elements of justice besides distribution justice. Such focus on communities is no surprise because as many cases of environmental injustice (e.g. Navajo nation in Northern Arizona and uranium mining) show, such inequalities are experienced across the community as opposed to being an individual experience (Sawyer, 2004). As Pulido (1996) states, this focus on existing communities in a spatial unit is one of the main characteristics that distinguishes EJ from mainstream environmentalism.

Therefore, going back to the concepts embedded in the term justice in EJ, for the EJ advocate, the fight for environmental justice is a battle to obtain equity, community recognition and respect, and community determination and autonomy (all of which are

included in the principals of environmental justice). So the quest to win environmental justice depends on all aspects of justice, because, without one, the others are simply impossible. Thus, building community capacity and community empowerment are important components of the EJ movement (e.g. Faber & McCarthy, 2003). Many scholars argue that EJ is deeply associated with the practice of democracy and the battle to come to voice (e.g. Hofricher, 1993). As Newman (1992) states: “the lesson of the [environmental justice] movement is that we are the power….This struggle is… about basic issues of justice and fairness, of rights and wrongs, of the have-nots….” (p. 53)

Last but not least, there is another, less embraced, aspect of justice in EJ: eco-justice, which according to some scholars, is an” unfinished journey” (Gibson, 2004). Although the principles of environmental justice are concerned with ecological issues and environmental sustainability, EJ as a movement basically incorporates the antitoxic movement and the movement against environmental racism and is usually perceived as a solely anthropocentric movement. Moreover, despite the fact that some recent scholarly works look at the benefits of combining the EJ movement with sustainability concerns (e.g. Dobson, 1998), the question remains: can EJ and eco-justice be addressed simultaneously? Although eco-justice is traditionally not a concern of justice discourse (Rawls, 2005), many environmental advocates point to the supposedly widely accepted notion that environmental justice for future generation depends on acknowledging the critical importance of eco-justice (Schlosberg, 2007; De-Shalit, 1995).

Aside from all the environmental ethics debates, the main part of this literature is centered on the implications of combining eco-justice and EJ. There are especially concerns about the extent to which justice theories can be applied to ecological landscapes and the limitations of the distributive paradigm as a theory for eco-justice (Schlosberg, 2007; Dobson, 1998; Low & Gleeson, 1998). Schlosberg (2007), in his

attempt to find a common language (discourse) of justice in both EJ and eco-justice, discusses that eco-justice also has a trivalent nature including distributional, recognitional, and procedural justice. He draws on human dominations as patterns of non-recognition that necessitate an urgent need for accountability. Furthermore, many scholars (e.g. Nussbaum, 2006) have emphasized the importance of political processes in legitimating recognition needs. Building off of these arguments on the trivalent notion of justice in both EJ and eco-justice and the possibility of finding a common ground, I will examine the different discourses of EJ and eco-justice in an effort to answer the first three questions of my research that are centered on the patterns and emergence of different EJ discourses.

2-3-2) Environmental Justice and Race: The Usual Surprise

In this section, I review the most influential studies and arguments that assume race to be a specific factor with effects that can be isolated (at least to some extent) from other variables such as class. Although during the 1980s, the number of EJ studies increased considerably, records show that even in the 1970s a number of environmental inequalities in minority communities were studied and race was found to be a more significant variable when compared to income and class (Mohai & Bryant, 1992). During the 1980s, the application of regression analysis and other statistical exercises became popular methodologies in the study of environmental injustices to determine whether race or class is the most significant factor. Such studies usually examine the correlations between the location of Locally Undesirable Land Uses (LULUs) and the population characteristics such as race, income, and class (Been & Gupta, 1997).

One of the most influential nation-wide studies was the United Church of Christ research (1987) that clearly supported the race-pollution relationship, coining the term “Environmental Racism” (Mohai & Bryant, 1992). In this study a range of socio-economic

and racial variables were studied including race, mean household income, land price, historical land use, and the proximity to pollution agents (Hartley, 1995). According to this study, race had the strongest correlation with the location of pollutant waste landfills. Many scholars agree that this report, combined with a history of racial separation and discrimination in the United States promoted the number of EJ studies that focused on race during the 1980s (e.g. Kameri-Mbote & Cullet, 1996). Some of these publications even paved the way for EJ policy development as many environmental justice regulations were responses to observations of such correlations between racial, ethnic, and economic inequities throughout the 1980s and 1990s (Zimmerman, 1993).

Although the debate of race-based discriminatory siting has become one of the prominent arguments within the literature of environmental justice, to the point that the movement is sometimes also referred to as environmental racism, it has been criticized for misinterpreting the market mechanisms as intentional discrimination. For example, some scholars (e.g. Been & Gupta, 1997) argue that it is necessary to study market mechanisms to understand whether the siting of LULUs intentionally occurs in prominently poor and minority community. In other words, comparing the population characteristics at the time of siting and the present is necessary to examine the hypothesis of discriminatory siting (Been, 1994).

As much as this argument makes sense, it is somewhat a chicken-or-egg question and one might argue that as long as the outcome reveals a discriminatory pattern, it is a justice issue that can be traced back to power relations and economic and political vulnerabilities. Aside from all these arguments, the results of most quantitative studies support the scholarly argument (e.g. Mohai & Bryant, 1992; Goldman, 1994) that race is the most significant explanatory factor, although income also has a significant

impact on environmental injustice patterns. Thus, a considerable amount of literature on EJ is based on "race-based" discourses (Pulido, 1996).

It is not surprising that environmental justice, as a movement that has its roots in civil rights and anti-toxic movements, puts such a high value on social justice issues and a great focus on underrepresented communities, such as African Americans, that have historically been vulnerable (Bullard, 2007). Moreover, it should be mentioned that this emphasis on race is one of the main contributions of EJ to broad environmentalism and has particularly influenced mainstream environmentalism and the supposition that people of color are indifferent about environmental issues. Prior to the rise of the EJ movement in the 1980s, most environmental scholars and activists asserted that people of color were not interested in environmental issues and that this was mainly explained by social-demographic and educational differences, usually referred to as “environmental concern gap" (e.g. Hershey & Hill, 1978).

Many scholars, however, believe that such a claim is unconvincing, explaining that a series of events throughout the 1950s, 1960s, and 1970s and people of color’s engagement in struggles for civil and occupational rights prohibited them from being more involved in environmental activism (Jones & Carter, 1994). It is true, however, that EJ has been more successful in terms of recruiting African Americans compared to other environmental movements, mostly because the environmental justice movement set the stage for a new generation of environmental research focused on the convergence between civil rights, occupational hazards, and the environment (Taylor, 2000; Dunlap & Mertig, 1992). Still, people of color are underrepresented in mainstream environmentalism (Dunlap & Mertig, 1992). Some scholars highlight this fact as an opportunity for the environmental justice movement to reach out to this part of the

population with an emphasis on community-based mobilization efforts and local participation (Dunlap & Mertig, 1992; Kameri-Mbote & Cullet, 1996)

Many scholars agree that the devastating outcomes of Hurricane Katrina in New Orleans have played a particularly significant role in stimulating scholarly research on race and environmental justice (e.g. Hartman & Squires, 2006; Dyson, 2006). After Katrina, many scholarly works focused on how the dynamics of race and class determine the pre-existing conditions, the emergency responses, and a community's ability to receive financial aid (e.g. Small Business Administration Loans, SBA) to rebuild (Bullard & Wright, 2009; Hartman & Squires, 2006; Dyson, 2006; Pastor, Bullard, Boyce, Fotehrgill, Morello-Frosch, & Wright, 2006). Bullard (2005) particularly refers to government's failure to respond to the needs of African-American communities as a "second disaster." He explains this disaster as a "*Twenty-Point Plan to Destroy Black New Orleans,"* which is an itemized list of his post-hurricane observations that essentially reflect the discriminatory and selectivity processes driven by "racism, classism, elitism, paternalism, and old-fashion greed" (p. 1).

For Bullard (2005) and many other EJ scholars, Katrina was evidence of "structural racism," a racial dynamic during which discriminatory distribution of power and resources happens (Kurtz, 2009; Winant, 1994). Structural racism can happen through "institutional rules, regulations and policies of government or corporate decisions" that intentionally put the burden on victim communities (Bryant, 1995, p. 5). Thus, understanding the racialized nature of the state is also important to understanding the state's response to environmental justice issues (Kurtz, 2009). Many other scholars believe the state has a significant role in shaping the patterns of environmental injustice (Walker & Bulkeley, 2006; Cutter, 1995). Additionally, some (e.g. Bullard & Johnson, 2000; Pulido, 1996) discuss the role of structural power in maintaining the domination

and exploitation and institutionalizing the unequal political representation and legal enforcements.

2-3-3) Environmental Injustice: Racism or Capitalism?

As Pulido (1996) states, the question of race or class is a chicken-or-egg question. The outcome, however, is always a discriminatory pattern (Bullard, 1994b). In this section, I first attempt to take a closer look at class (capitalism) as a determining factor, and second, review the scholarly works that reject the separation of racism and capitalism (e.g. Kurtz, 2009) and assume "structural racism" operates within an economic system that helps produce and reproduce it (e.g. Massey & Denton, 1993). However prior to this discussion I lay out the foundation for Marxian critiques of capitalism in regard to environmental and social justice issues.

Although Marx was focused on humanity and not nature, his analysis of modern agriculture provides insights for Marxian-influenced scientists to critically analyze a variety of ecological crises (please see section 2-5). For example, Prudham (2009) points to a central contradiction in capitalism. He argues that the growth-dependent character of capitalism relies on a metabolic dynamism that in Marx's term is called accumulation for accumulation's sake and is by definition guided by a mere search for profitable realization of surplus value. This critique is traditionally referred to as the metabolism critique or metabolic rift theory (Prudham, 2009; Foster, 2009; Moor, 2010).

Marx argues capitalism has formed an "irreparable metabolic rift" that requires urgent restoration and rational regulation (Foster, 2009). The concept of metabolic rift is one of the foundations for classic environmental sociology. Additionally, it is the central argument of Marxian ecological critiques of capitalism because it helps analyze the transitions within capitalism (Moor, 2010). Marx's original metabolic rift theory is centered on the concept of social-ecological metabolism, which is rooted in his understanding of

the labor process and the way human metabolism with nature is regulated (Foster, 1999). Although this argument is from Marx's early work, many scholars (e.g. Foster, 1999) believe that it captures fundamental aspects of human existence and helps in understanding the associated processes. That is why Fischer-Kowalski (1997) refers to metabolism as "a rising conceptual star" in socio-ecological thoughts (p. 119). According to Marx, this metabolic rift causes the problem of unsustainability (Foster, 2013).

The Marxian approach to theorizing environmental injustice is also centered on these critiques of capitalism (Cutter & Solecki, 1996). Many political economists believe that environmental injustice derives from the dynamics of capitalism (Goldman, 1996; Harvey, 1996). Harvey (1996) states that "the fundamental problem [of environmental injustice] is of unrelenting capital accumulation and the extraordinary asymmetry of money and political power that are embedded in that process" (Harvey, 1996, p. 401). However, Kurtz (2009) argues that Harvey's perspective fails to take into consideration the relationship of the EJ movement to the American civil rights movement highlighting the legacy of civil rights struggles.

In my research I mainly draw on the part of the literature that rejects the analytical separation of racism and capitalism (e.g. Kurtz, 2009). Many scholars even argue that the race-versus-class debate misses the bigger picture (e.g. Kurtz, 2009). Although the EJ movement has a history of heavily focusing on environmental racism discourse, environmental injustice is about both race and class (Faber & Krieg, 2001). According to this critical view of EJ, the use of "static indicators of race" is problematic and, as Pulido (1996) discusses, racism should be studied in the context of social relations because a wide range of structural, institutional, and social forces contribute to the creation of a landscape of inequality (Pulido, 1996).

In sum, many environmental justice advocates have rejected the race- and class-neutral terms of the "fair-share principles" (First National People of Color Summit, 1991). Many scholars argue that environmental injustice should be viewed in a comprehensive way in the social, the economic, and the political realms (e.g. Bullard, 1993; Pellow, 2000) because it is the only way to articulate the complexity of the structural elements of environmental injustices.

2-4) A Review of Environmental Justice Research in the USA

As I discuss in previous sections of this chapter, there are different conceptions of environmental justice and consequently different research methodologies and as a result, no conventional methodology for EJ research exists (Nada-Rajah, 2010). Furthermore, many scholars agree that EJ is a highly interdisciplinary concept that entails complex interactions of social movement, urban ecology, planning, public health, and public policy (Sze & London, 2008, Rivera, Calderon-Ayala, Calle, Du, Gerald, Lanas, Lualhati, Moreno, Pérez, Sylvain, Vieira, & Armstrong, 2010). Thus, there are many different inquiries into EJ, but as much as it would help different areas of the concept flourish, some scholars argue that this lack of boundaries puts the researcher at risk of losing objectivity (Nada-Rajah, 2010). Consequently each EJ inquiry potentially has its promises and perils.

In order to locate and explain my approach to studying EJ, I provide an overview of the previous EJ research in the United States and the critiques offered on the commonly practiced methodologies in this field. To accomplish this task, I first provide an overview of the studies of EJ in the United States and, with a focus on methodology, I try to categorize different approaches of EJ research. Then, I look at the well-known and

widely used methodologies in more details, highlighting the strength and weaknesses of each, in terms of understanding the complexity of EJ discourse. In the following two sections, I look at methodological approaches for quantifying and ultimately mapping the health risks associated with environmental injustices with a particular focus on geospatial and geostatistical analysis.

2-4-1) Introduction

During the 1980s the first wave of environmental justice research inspired by civil rights and social movements (Sze & London, 2008) focused on single environmental health injustices (e.g. Warren County, NC, 1982; Love Canal, 1976), highlighting the unequal protection particularly in minority communities. The most influential study during the 1980s was the United Church of Christ (UCC) Study on toxic waste and race in the USA (1987).

The number of EJ studies looking at distribution function increased substantially during the 1990s (Goldman, 1994) and the use of statistical techniques became more popular. The key variables studied based on their geographic distribution and/or quantified values are (a) exposure to environmental pollutant sources, (b) vulnerable and underrepresented populations, (c) concentration and flow of environmental pollutants, (d) health disparities, and (e) regulatory costs or benefits among the populations (Waller, Louis, Carlin, 1999; Goldman, 1994).

Such statistically based research usually involves either risk-based or proximity-based assessments (Waller, Louis, Carlin, 1996) and their assessments focus on finding the correlation between the proximity to health risk agents and a range of socioeconomic and demographic characteristics of the residents. Most of these studies particularly emphasize race and class as the most important explanatory factors. There are pros and

cons to statistical-based approaches in EJ research in regard to both the use and the interpretation of the data which varies in different levels of geography.

One of the turning points in EJ research was the change in the scale of the data that made EJ analysis at the local level possible (Goldman, 1994). Goldman's review of environmental justice research from 1967 to 1993 points to the important changes in the level of geographic accuracy of the studies (at the national level) done in the late 1980s and 1990s due to the availability of the census for zip code areas. Although census tracts are probably the most obvious sources for any EJ research, some scholars raise questions about the validity of analysis outcomes. For example Mohai (1995) points to the fact that in many cases the relative size of zip codes and census tracts are very different (Yandle & Burton, 1996). Due to availability and affordability of zip code information, many EJ researchers still use them (Goldman, 1994); there are, however, some limitations regarding these data that need to be recognized.

Furthermore, the results of such studies have been questioned by some scholars (e.g. Anderton et al., 1994) based on their assumptions concerning the data and methodology (Mennis, 2002). In many cases, a parametric statistical model (e.g. Linear Regression, Logit, and Poisson regression) examines whether or not the spatial distribution of the risk agents is equitable using exposure data and demographic data (Waller, Louis & Carlin, 1999). This is while the assumption of EJ being limited to single risk agents has long been criticized by leading EJ scholars (e.g. Bullard, 1996). Additionally, dichotomous exposure measurements do not reflect the real nature of exposure (Waller, Louis, & Carlin, 1999). Also, the level of statistical significance of different variables changes with the use of different research methods (Mohai & Saha, 2006; Mohai, 1995).

In the early 1990s, many scholars discussed the issues of EJ research and the need for methodological improvements (Pastor, 2003). Thus, many scholars pointed to the necessity of using smaller geographic scales (criticizing national-level findings) and applying more multivariate work (Anderton et al. 1994). Since the late 1980s and early 1990s the application of Geographic Information Systems (GIS) influenced the EJ research enormously by providing more geographic accuracy and spatial realization of the interrelated factors (Chakraborty & Maantay, 2011). Therefore, it became much easier for researchers to map the evidence of injustice and, in some cases, such as the UCC study, the results were enough to foster EJ research and discourse. Recently most studies consider application of advanced statistical analysis for multiple pollutants along with geospatial analytical approaches, which has led to a new wave of GIS-based environmental justice research (Mennis, 2002).

Not surprisingly in most states, the Environmental Protection Agency (EPA) and Department of Transportation were the federal bodies that pioneered integrating GIS as a tool for EJ screening. The attempt to establish a more sophisticated tool for EJ screening began in 2010 by EPA and in 2015, the EPA released the EJSCREEN tool to the public. EJSCREEN can be considered the second landmark in EJ research (the first main turning point was availability of census track at zip code level) because, only a decade before that, in 2001 a nationwide U.S. EPA Environmental Justice Tools Survey pointed out the lack of sophisticated (statistical and spatial) tools for EJ screening (Kumar, 2002). Even today, some states have more elaborate tools for screening EJ issues, and in the case study section I review the EJ tools used in Massachusetts and Texas in more detail. Since the current wave of EJ research is basically GIS-based, in the next section, I explain geospatial-statistical methodologies in EJ and health research further.

2-4-2) Geospatial-statistical Analysis of Environmental (In) Justice and Health Impacts

The core function of GIS is its ability to integrate layers and different information sets so it can visually represent the complex results. In EJ research, this includes but is not limited to (a) geographic information on environmental risks and (b) population characteristics (Sheppard, Leitner, McMaster, & Tian, 1999). Not to state that there is any conventional methodology for EJ research, but, generally speaking, GIS-based research includes two main phases, (a) gathering indicators of cumulative impact and (b) introducing a screening method (Chakraborty & Maantay, 2011). In a simple GIS analysis the researcher only measures the degrees of correlation between the locations of selected environmental features (e.g. hazardous wastes) and demographic indices.

The use of geospatial analysis in the study of EJ and health has increased tremendously, leading to innovative approaches. Maantay & McLafferty (2011) distinguish three interconnected themes in GIS-based EJ research (a) hazard surveillance, (b) exposure surveillance, and (c) outcome surveillance. While hazard surveillance is focused on identifying, monitoring, and/or modeling the environmental hazards, exposure surveillance reveals the exposure patterns, and outcome surveillance is focused on recording and monitoring the evidence of health disparities (Maantay & McLafferty, 2011). Thus, geospatial analysis gives the researchers the ability to model and test the hypothetical connections between hazard, exposure, and outcome, so the health issues can be examined in spatial and temporal contexts (Mark, Egenhofer, Bian, Rogerson, & Vena, 1999).

Many of the newly emerged geospatial technologies (e.g. sensor grid and satellite data) help researchers monitor environmental hazards. Moreover, many scholars have developed specialized models to monitor the effects and movements of hazards (e.g. Chakraborty & Armstrong, 1995; Lovett, Parfitt & Brainard, 1997). In the study of

exposure surveillance, overlay and spatial buffering are probably the most commonly used techniques. Although accounting for population profile is essential to EJ research, GIS techniques have made it much easier to map the correlations between vulnerable populations and environmental hazards.

However, geospatial techniques, like other methodologies, have limitations for EJ and health research. Broadly speaking these limitations can be categorized as follows: (a) data deficiencies (e.g. comprehensive health data, air quality estimations, artificial administrative units, accuracy of locational data), (b) technological limitations (e.g. high level of skill required, assumptions involved in modeling processes), and (c) constraints in using exposure proxies (e.g. actual pollutant concentrations) (Maantay & McLafferty, 2011). Furthermore, despite decades of work in applying GIS and other quantitative approaches for the study of urban ecology, there is little consensus on the most appropriate methodologies for research projects on environmental justice. For example, McMaster et al. (1997) point to the impact of methodological approaches on study findings and assessment of environmental risks. Williams (1999) also explains that results of environmental justice investigations are as different as the research approaches used.

Finally, empirical quantitative studies in EJ have also been criticized for their limited outcomes and contribution to a larger framework. As mentioned previously, EJ studies often use empirical data, regression, and other statistical measures to evaluate proximity to hazards, implementation of regulation, and the health effects of various projects and policies (Brown, 1995). Since these studies are focused on a specific location and hazard, it is difficult to use the results in other cases. Moreover, some scholars believe that the validity of EJ studies is even more questionable when the scale of the unit of analysis is large because of the complexity and spatial correlations between

social, political, and environmental factors (Lester, Allen, & Hill, 2001). Although addressing all of these limitations in this study is simply unrealistic, in the methodology chapter I argue that the combination of a landscape-based approach along with participatory GIS (PGIS) provides the opportunity for a more comprehensive analysis of the environmental inequalities and health impacts.

To conclude the brief discussion above on the basics and the general limitations of GIS-based research and before moving on to the next section, which is the starting point for my research methodology, I provide a more focused literature review on the application of ecological concepts and measures in EJ research. And in the next section (2-4-3), I draw on the results to emphasize the shortcomings in quantifying environmental health. The main objectives here are to (a) better understand the utilization of spatial-statistical metrics in EJ research in peer-reviewed literature and (b) to capture the overlaps and consistencies with urban ecology paradigms and specifically landscape indices. Throughout this research, I frequently emphasize the ontological pluralism and the epistemological ambiguity that exist in the field of environmental justice research. Table 2 shows a summary of the different strands in the field.

Urban planners' approach to environmental justice is usually on the crossroad of sociology and GIS utilization. Although GIS application can potentially be a window for understanding urban ecosystems in different levels of geography and innovative participation techniques (please see section 2-4-3), the fundamental role of urban ecology in EJ research is almost nonexistent and local knowledge remains underrepresented. Appendix A shows the results of my study of articles on EJ in 10 journals from January 2000 to January (or April depending on the journal) 2016.

Table 2 Different Strands in EJ Research

(inspired by Esbjörn-Hargens, 2011)

The Who: A Generic Profession	The How :A Representative Method	The What: A View of EJ
Political Analysts	Calculating policy impacts of environmental injustice at local and national level.	The current policies do not lead to equal distribution and access to environmental health and services
Discourse Analysts	Comparing rhetorical motifs in media stories regarding environmental injustice cases	The truth of environmental injustice depends on the framing
Computer Modeler	Developing models (e.g. GIS) about the distribution of environmental pollution points or the epidemiology of a disease	Different case studies at local and national scales show disparities in environmental justice status
Environmental Philosophers	Examining different arguments and claims about environmental injustice	Environmental injustice is interwoven with moral dilemmas (e.g. race, class, equity)
Ethnographer	Collecting local stories about environmental injustice	There is not a unified view on environmental injustices happening at local scales
Sociologists	In-depth interviews with residents and environmental advocates	Environmental justice and equal representation should enter the policy arena
Epidemiologists	Modeling and projecting the relationship between environmental pollution and human health	A specific disease or mortality rate will increase in particular neighborhoods

These journals were selected based on their overlaps with my research agenda and the articles selected in each journal contained the term “environmental justice” in their titles, keywords, and/or abstracts. An exception was made for two ecology journals (*Frontiers in Ecology and the Environment*, and the *Journal of Landscape Ecology*) where the existence of the word anywhere in the article qualified the article for further review. A list of the journals and the number of articles studied in each are as follow: *Journal of Geoforum* (n=35); *Environment and Planning A* (n=104); *Landscape and Urban Planning* (n=7); *Social Science Quarterly* (n=12); *Computers, Environment and Urban Systems*

(n=1); *Environmental Health Perspectives* (n=33); *Journal of Environmental Research* (n=4); *Journal of Environmental Health* (n=2); *Frontiers in Ecology and the Environment* (n=7); *Journal of Landscape Ecology* (n=4).

A further key-word search was done for the selected articles using 16 words on ecological understanding of environmental justice and health outcomes including: “health disparities/inequality”, “local/community/indigenous knowledge”, “conservation/restoration”, “environmental/ecological degradation”, “environmental/ecological quality”, “daily lives/experiences”, “(urban)ecology”, “environmental health”, “environmental history”, “environmental/ecological network”, “environmental/ecological service”, “pattern/heterogeneity”, “patch”, “fragmentation”, “disturbance”, “connectivity”. As the results show, ecological concepts appear in articles rarely and only after 2005 while words such as “pattern” and “fragmentation” are most often used to describe the human ecology of the case studies rather than the ecological/environmental states. While this trend is prominent in the peer-reviewed literature, ground-breaking discussions come from academic discussions in other arenas such as ecological societies and academic conferences (e.g. Dimensions of Political Ecology Conference) and symposiums (e.g. 2006 Annual Meeting Symposium of the Ecological Society of America (ESA)). The best example is the *Bulletin of the Ecological Society of America*, where the need for integration between environmental justice research and environmental/ecological health is openly emphasized (e.g. Jablonski & Poling, 2007; Howe, 2007, Clark et al., 2007). This trend has led to the introduction of the concept of “Action-Oriented Ecology” which focuses on translating ecological knowledge into sustainability and environmental justice practices (Rivera et al., 2010). This concept, however, has not entered the mainstream academic discussion yet. I discuss the important implications of this approach for EJ research later in the methodology chapter,

but first in the next section I discuss Participatory GIS (PGIS) and the current trends in both quantitative and qualitative EJ research.

2-4-3) Participatory GIS and Environmental Justice Research

Oxford's *A Dictionary of Geography* defines PGIS as "a more socially aware type of GIS which gives greater privilege and legitimacy to local or indigenous spatial knowledge… [and] context and [it is] issue-driven rather than technology-led and [seeking] to emphasize community involvement in the production and/or use of geographical information." As this definition highlights, PGIS moves beyond the traditional GIS both in terms of production and use which basically includes: data gathering, analysis, and decision making. In other words, it re-evaluates the process from the communities' point of view (Elwood & Leitner, 1998). As Forrester and Cinderby (2012) point out, the main difference between PGIS and the similar approaches (e.g. community mapping) occurs after the process of data gathering. In other words, after the data is created, who "owns" the data and who decides how it is used? (Forrester & Cinderby, 2012, p.8). PGIS, therefore differs from the traditional GIS both conceptually and technically. Technically, the core aspect of GIS is expanding the use of GIS to include residents (general public), non-governmental organizations, and advocates. This essentially challenges the classic top-down approach common in GIS projects (e.g. Harris & Weiner, 1998; Thompson, Prokopy, Floress, & Weinkuaf, 2011), but also provides participant-originated data that in many cases is the primary intention of PGIS. Conceptually, PGIS challenges the expert-driven practices of GIS and points out the other knowledge absent in the process of analysis. It integrates the local knowledge with the expert knowledge. However, the extent to which the local knowledge is used depends on the intentions of the PGIS approach.

Elwood (2006) discusses that there are two main groups of critiques in regard to GIS and the qualitative method (e.g. participation): “GIS with qualitative methods” and “GIS as qualitative methods” (p. 701). The methodology of this research, discussed in chapter 3, falls under the category of GIS with qualitative methods. This category refers to the application of qualitative methods along with GIS analysis, which leads to the application of mixed methods in order to integrate different sources of data (Elwood, 2006). However, it should be mentioned that there are some general critiques on the practices of PGIS. Therefore, I first introduce some of these general critiques. Second, drawing on the literature of PGIS and environmental justice, I explain two limitations of PGIS for environmental justice research: effective integration of local knowledge, which requires participants’ access to data and validating the data, and analysis of the interrelations between environmental justice status and the broader political and socioeconomic context.

Elwood (2002) states that limited time and inadequate training and financial resources are the main limitations of PGIS practices. Others are concerned that participation in PGIS can be manipulated in order to legitimize a decision-making process (Craig, Harris, & Weiner, 2002). The accuracy of the data also has also been questioned. For example, some scholars argue that the output from PGIS needs to be validated (e.g. Forrester & Cinderby, 2012). There is another group of critiques that focuses on PGIS methodologies in regard to their account for: knowledge, access, representation, and power (Elwood, 2006). Analyzing the potentials and limitations of PGIS, many scholars argue that GIS representation, access, integration of expert and local knowledge, and public participation are the fundamental issues in PGIS (e.g. Sheppard & Poiker, 1995; Pickles, 1995).

But there are still questions on how participatory GIS can incorporate different forms of knowledge and how it can facilitate knowledge (Elwood, 2006). This issue is particularly important for environmental justice research because, as Robbins (2003) points out, only through examination of all knowledge can a study provide a deep understanding of environmental justice. Some examples of methodologies for capturing local knowledge are: community mapping exercises, community review and critique of spatial data and analysis, collective field work, or community conflict mediation through a GIS application (Elwood, 2006). Many scholars argue that such strategies show the importance of incorporating local knowledge into the analysis and further participatory forms of knowledge production (e.g. Corburn, 2005; Pickles, 1997; Whyte, 1989). They also recognize the role of participatory GIS both as a methodology and a facilitator in the process of knowledge production and spatial representations of the results.

Local knowledge is one of the most important features in PGIS and some even define PGIS as the integration of local and expert knowledge (Quan, Oudwater, Pender, & Martin, 2001). Deficiencies in incorporating local knowledge, however, are one of the most noted critiques of PGIS (e.g. Harris & Weiner, 1998). For example, Laituri and Harvey (1995) suggest that while local knowledge and input are recognized, usually through translation into the language of the dominant practices, the integration of this information into analysis and decision making has been inadequate. Some scholars however, argue that these attempts will improve the environmental discourses by breaking through the dominant discourse (Corburn, 2005). On the other hand, in addition to multiple forms of knowledge, an environmental justice study should recognize multiple types of environmental justice communities (Holifield, 2014). For instance, some scholars question whose view and what type of environmental injustice are presented in the maps (e.g. Chambers, 2006).

Furthermore, the abstract representation of society and environment in GIS raises questions on how the interrelations between economic and social interactions are documented and incorporated into PGIS. Moreover, recognizing environmental injustice as a social construct (e.g. Taylor, 2000), points out the necessity of studying the interactions between physical and socioeconomic processes. Additionally, PGIS methodology does not provide the conceptual or theoretical framework for such analysis.

In sum, the main challenges of PGIS methodology in environmental justice are: (1) effectively incorporating local knowledge, which requires enhancing people's access to spatial data, improving representation through GIS and maps, and empowering local communities; and (2) analyzing the issue within a broader context (Alagan, 2007). In the methodology section, I discuss an approach to addressing these two challenges. And, I introduce political ecology as an approach that can provide a theoretical framework for analyzing environmental injustice within a broader context.

2-4-4) "What Matters Gets Measured": The Challenge of Environmental Justice Indicators

The relationship between environmental health and human health is among those unsettling truths that almost successfully came out in the 1970s but has been consistently pushed back (for examples of such discussions see Efron, 1984, and Davis, 2002). For decades, one of the challenges for EJ activists is to address the professional demand for proof that requires a proven relationship between environmental injustices and health. This conflicting issue is sometimes referred to as "etiological uncertainty," which means that the relationship between a specific disease and environmental effluents is unclear (Kroll-Smith, Brown, Gunter, 2000).

Furthermore, there is no conventional method or check list on what should be measured, especially when it comes to multi-causal diseases like cancer. However there are currently exiting controls through standards and models of surveillance and

evaluation for several environmental factors such as air, soil, and water. And there are some aspects of the environment that have attracted more attention from both EJ advocates and policy makers. In this section I provide a review of these indicators, their significance, and the main discussions on their health effects in urban areas.

Air pollution was one of the first environmental concerns and soon became a factor for EJ studies (Liu, 2001). Donora Pennsylvania's extreme air pollution in 1948 was the start of public attention to the air pollution problem. This case, along with other widely publicized cases, triggered scientific studies on air pollution and its health impacts, which ultimately led to the Clean Air Act Amendments and Clean Air Act (CAA) in 1970 (Environmental Protection Agency (EPA), 2012). CAA was revised in 1990 and according to the new amendments, the EPA was authorized to establish National Ambient Air Quality Standards (NAAQS) to limit the levels of pollutants in the air (EPA, 2012 a). The NAAQS standards have been used by many researchers to quantify environmental injustices (e.g. Liu, 2001). Most of these studies argue that air pollution is greater in deprived communities (Mitchell & Dorling, 2003; Bullard, 1993).

The presence of polluting industries, exposure to toxins in the air and in the ground, and transportation emissions are the main factors that almost all air pollution studies examine. The Clean Air Act has listed 187 pollutants (EPA, 2013f). All of the pollutants in this list are "known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or to cause adverse environmental effects" (EPA, 2013f, p.1). The EPA has compiled standards for 174 major sources of pollution, and 68 categories of small-area sources that together represent 90 percent of emissions of 30 priority pollutants for urban areas. (EPA, 2013f). The EPA also works with the states and has conducted numerous plans to help the states and communities address environmental problems.

The Air Quality Index (AQI) is the most widely used indicator that helps in monitoring daily air quality. The AQI is calculated based on the level of five major air pollutants including ground-level ozone, particle pollution, carbon monoxide, sulfur dioxide, and nitrogen dioxide. As mentioned before, EPA has established national air quality standards for all of these pollutants to protect public health (EPA, 2013f). EPA has promulgated NAAQS for “six air pollutants: sulfur dioxide (SO2), particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2), carbon monoxide (CO), ozone, and lead. The Act requires the EPA to “review the scientific data upon which the standards are based, and revise the standards, if necessary, every five years” (McCarthy, 2005). Based on these indicators each region is classified to be either in "attainment" or "non-attainment."

Under the Resource Conservation and Recovery Act (RCRA), the EPA has the authority “to control hazardous waste from the cradle-to-grave" (EPA, 2014, p.1). The 1986 amendments to RCRA gave EPA more authority to identify the hazard generators. According to RCRA, hazardous waste generators are divided into three categories, which are based on the quantity of waste that they produce. These categories are: Large Quantity Generator (LQG), Small Quantity Generator (SQG), and Conditionally Exempt Small Quantity Generators (CESQG) (EPA, 2014 a). Of course each class has its own set of requirements to comply with (EPA, 2014a). RCRAInfo is the inventory system used by the EPA “to support its implementation of RCRA, as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA)” (EPA, 2011, p.1). This amendment also increased the requirements of RCRA (The Office of Health, Safety and Security (HSS), 2014).

Other important amendments of RCRA include the Medical Waste Tracking Act of 1988, the Federal Facility Compliance Act enacted in 1992, and the Land Disposal

Program Flexibility Act of 1996 (HSS, 2014). One of the most recent documents on hazardous waste compiled by EPA is the 2020 vision: *Beyond RCRA: Waste and Materials Management in the Year 2020* published in 2002 (EPA, 2013g). But aside from the details of each of these documents the main goals of RCRA include: protecting human health and the environment, reducing waste while conserving energy and natural resources, and decreasing or eliminating the generation of hazardous waste (EPA, 2014 a).

In Texas, which is a part of EPA's region 6, the Texas Commission on Environmental Quality requires facilities to follow EPA's regulations regarding solid waste (EPA, 2011). The way that these acts and amendments relate to EJ is self-explanatory because of their obvious ties with human and environmental health. As mentioned previously, one of the aspects of RCRA is its established standards to protect human health that can be affected through inhalation, ingestion and dermal exposure (EPA, 2011). Higher concentrations of polluting industries and hazardous substances, as well as the violations of air quality, are probably the most studied issue in EJ literature.

The EPA's Brownfields Program also has its roots in environmental justice. Brownfields are abandoned areas that "may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant" (EPA, 2014b, p.1). Some scholars argue that the importance of brownfield redevelopment has been overlooked in EJ studies (Lee & Mohai, 2012). Furthermore, brownfields raise several questions regarding environmental justice; however, the results of inquiries on brownfields and EJ are conflicting.

In 2000, the Office of General Council at EPA announced that environmental justice issues may be addressed through permitting (and existing authorities) and in the context of the current environmental regulations such as the clean water and air acts

(EPA, 2007). In 2007, EPA published a white paper, *Factors for Identifying and Assessing Disproportionate Environmental Health Impacts* that offers a framework for assessing "disproportionate impacts" in communities. The importance of this paper is in its recognition of the complexity of *different factors that lead to environmental health disparities such as a* community's "ability to withstand or mitigate harms" (p. 3) and "deficient services or benefits" (p. 3).

But while the factors mentioned above are measurable, their effects on human health may be the most challenging issue in EJ research because uncertainty casts a shadow over the most important step of the analysis: proving the relationship between an environmental factor and human health, essentially proving the (environmental) injustice. Having overcome the challenge of finding the data for research, yet proving the relationship of the environmental indicators and human health, is simply not a battle that is easy to win. As Kriega & Faberb (2004) report, the scientific proof requires satisfying the following issues: demonstrating that (1) environmental hazards precede measurable declines in human health, (2) the certainty that the health impacts are not caused by other factors, and (3) the occurrence of the health issues is frequent and statistically significant.

As discussed in the previous section, most peer reviewed publications on EJ employ a series of geo-statistical indictors to mark environmental (in) justice. Such approaches in EJ research are mostly distance-based models that employ the following methods: 50% areal containment and centroid containment, boundary intersection methods, areal apportionment method (Mohai & Saha, 2006). As mentioned before, multiple/binary and logistic regression are the most popular amongst geo-statistical techniques.

To move beyond the widely used set of social-demographic variables used in mainstream EJ research, I draw on the theme of “One Health,” which emphasizes the importance of a holistic understanding of the relationships between environmental health and human health (e.g. Kennedy-Stoskopf, 2011). Based on this perspective the environment is “all the physical, chemical and biological factors external to a person, and all the related behaviors, excluding those natural environments that cannot reasonably be modified” (World Health Organization, 2006, p. 22). This definition includes the areas of interest in environmental justice research and (mainstream) urban planning and do not include the behavioral factors such as alcohol consumption and diet. Instead, it focuses on the built environment and landscape-based metrics as indicators of environmental health.

A socioecological model of health is most compatible with this approach to environmental health because it embodies people–environment transactions at different layers (Shortt, Rind, Pearce, & Mitchell, 2014) and emphasizes the essence of EJ beliefs that the inequalities in health are the results of inequality in access to basic prerequisites of health and also it is aligned with the concept of “one health.” I circle back to the discussion on health models in the methodology section where I focus on EJ as a social problem, the framing of which is closely associated with a complex chain of interactions between ‘‘claims makers’’ or ‘‘agents of framing” (Kriega & Faberb, 2004) that inevitably leads to the question of “public” in public health. To conclude the discussion above, figure 17 shows three main aspects of environmental health in the urban context and their main subcategories.

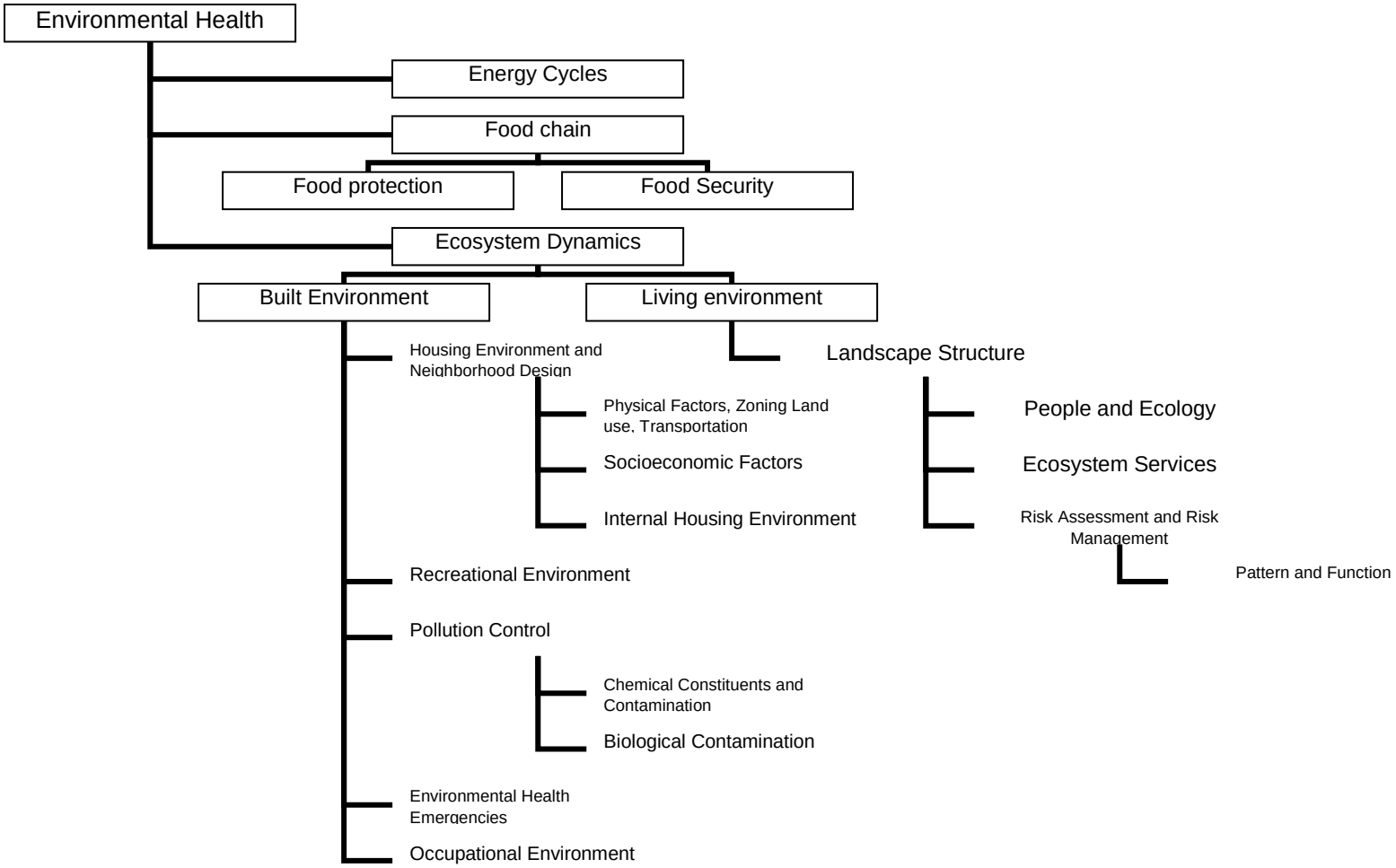


Figure 9 Environmental Health in Urban Context

Reference: Based on Koren, 1980, Koren, H., Bisesi, M. (2003), Coutts, 2010

2-5) Theorizing Environmental Justice: Political Economy, Political Ecology, Post-Modernism and the Future of a Grass Roots Movement

Although for decades many scholars (Pulido, 2000; Cutter, 1996; Bullard, 1994) have studied the socio-spatial patterns of environmental injustice, EJ has been criticized for lacking a theoretical framework (e.g. Foreman, 1998). The critics argue that EJ advocates have a tendency to describe injustice instead of providing a theoretical framework to analyze and prioritize the injustice patterns, which is partially due to the fact that EJ is a grass roots movement and has its roots in local environmental activism (Torres, 2002).

The argument in this section on the EJ theoretical framework is not to undermine the current discussions in the literature on classism or structural racism, nor is it to solely focus on an economic or ecological analysis. Instead, the purpose of the following sections is to examine the literature meticulously for the possibility of a post-structural research approach that can visualize the state of environmental health by considering a broader range of environmental factors in the dynamic landscape of the cities and the diverse narratives of people who interact with that landscape on a daily basis.

2-5-1) Introduction

The following sections are dedicated to political-economic and ecological perspectives that provide a context for understanding how and why environmental inequalities occur. Applying political economy and sociology to environmental justice research in not new; however, one can assert that it is among underrepresented theories in this field (Buttel, 1985). Moreover, the focus of the following sections is on theoretical frameworks of EJ and not the theoretical issues and concepts (e.g. justice, race, and class) discussed in the previous sections of the literature review. This discussion first focuses on political economy and political ecological approaches in an attempt to explore

theoretical bases for better understanding EJ issues. I use the discussion on post-structural political ecology to move on to an argument about the EJ and the postmodern condition to look at the concepts such as knowledge and health from a postmodern perspective.

2-5-2) Political Economy of Environmental Justice and Health

From the economic perspective, the major question regarding environmental justice is whether or not the environmental costs and the externalities of production dynamics burden all members of the society equally (Cable & Cable, 1995). Based on the previous discussion, particularly in chapter (2-3), the answer is no: the environmental health effects of production dynamics and unwanted land use locations more severely affect low-income and minority populations than people of higher socioeconomic backgrounds. Drawing upon the most common perspective used in the field of "environmental sociology," in this section, I review the discussions on environmental justice from a political economy perspective. Prior to this discussion, however, it is important to clarify that the term political economy here refers to "Marxian Political Economy," which is essentially a way of critically thinking about the capitalist economy and its socio-economic and environmental byproducts (Caporaso & Levine, 1992).

Political economy has two particular areas of concern: (a) the mechanisms and structures of production and (b) the process of accumulation of wealth and the distribution of the surplus between social classes (Johnston, Gregory, Pratt, & Watts 2000). According to the political economy perspective, in the United States, the state and corporations are the main forces of power in the decision-making processes (Domhoff, 2005). Such processes basically facilitate the fundamental functions of a capitalist state: accumulation and legitimization (O'Connor, 1973).

Additionally, the notion of (in) justice in political economy is embedded in unequal power and class relations. Thus, from this perspective, most environmental critiques of capitalism are rooted in the capitalist logic of accumulation and its supporting legal and structural components, a process by which nature bears the marks of production (Mészáros, 1970) and the economically weak and politically underrepresented the costs and burdens of the consequent pollutions and health effects (e.g. the intensity of air or water pollution) (Taylor, 2000). In other words, from the political economy perspective, environmental degradation in a capitalist economy is not only inevitable but is a prominent feature (Foster, 2002; Harvey, 1996). That is why despite all the attempts at green-washing capitalism, capitalism's only solution to the pollution problem is to move it around (Harvey, 1996). And in this process, vulnerable communities become sacrifice zones (sometimes referred to as "The Least Resistance Path") for environmental externalities of the production dynamics (e.g. toxic wastes) (Girdner& Smith, 2002). And this is why the political economy perspective provides a theoretical framework for analyzing EJ.

It should be mentioned that Marx's focus was not on nature; therefore, the abundant literature on the political economy of environment is mainly based on theoretical reconstructions (Foster, 1999). Additionally, application of political economy as a theoretical framework in the study of EJ requires an understanding of the spatial and geographical contexts of injustice (Swyngedouw, 2003) and therefore it is centered on economically, socially, and ecologically unequal urban landscapes (Swyngedouw & Heynen, 2003). In other words, as one of the well-known slogans of EJ activism, "coming to voice," suggests, inequality in power distribution and unequal class relations leads to environmental injustices that are more harshly reflected in parts of cities or particular neighborhoods.

Furthermore, many scholars argue that although the two functions of accumulation and legitimization are designed to result in a harmony among the interests of different classes of society, regulatory measures also are more biased toward serving the interest of corporate classes over the indigenous, low-income, and minority populations (e.g. Bullard, 2005). As Therborn, a Marxian influenced sociologist, points out, the interventions of the state in forms of laws and controls reproduce the exploitation and domination, class rule, and power distribution in society (Therborn, 1970). Thus, political economy is widely concerned with the relationship of the state and economy, a relationship that according to Marx forms a "superstructure" that essentially acts at the capitalist class's behest (Caporaso & Levine, 1992).

Health disparities can similarly be studied through a political economy perspective. However political ecology, which is the application of political economy to ecology, provides a more compatible context for studying environmental (in) justice and health inequalities in this research because of the possibility of integrating the ecological knowledge and broadening the perspective of analysis to urban landscapes.

2-5-3) Theoretical Political Ecology and Environmental Justice

The term "political ecology" was first coined in an article by Frank Throne in 1935 (Leff, 2013). The emergence of the political ecology discipline can be traced back to the historical dialectical materialism of Karl Marx and Friedrich Engels (Peet, 1998). In general terms, political ecology refers to the integration of the political economy debate and ecological studies (Forsyth, 2003). As a discipline, political ecology is fast growing and the most recent field discussing "the question of nature" (Escobar, 1999, p. 2).

There are different political ecology theories and, essentially, their different approaches toward the concepts of power and power relations (human-nature relations) are what differentiate the theories of political ecology (Khan, 2013). However, all theories

in political ecology share the understanding of ecological systems as being “power laden rather than politically inert” (Robbins, 2004. p.13). Given the fact that the term “ecology” has been used differently by many scholars, I should first distinguish the different meanings and, second, clarify the meaning that I apply in this discussion. Then, I provide a short review of the two main paradigms of political ecology: Neo-Marxian political ecology and (post-Marxian) post-structural political ecology.

As Forsyth (2003) discusses the term “ecology” in political ecology can refer to (a) biophysical processes that interact with human needs in a political context (e.g. Blaikie & Brookfield, 1987), (b) a focus on the green movement and deep environmentalism (e.g. Atkinson, 1991), (c) as a metaphor for policy realm and the interrelations between social and physical environments (e.g. Russett, 1967), (d) an exploration of Marxian debates on materialism and justice (e.g. Lipietz, 2000), and (e) politics of environmental problems without focus on ecology per se (e.g. Bryant & Bailey, 1997). Building off Forsyth’s analysis (2003), in this research I translate political ecology as the analysis of the political and social frameworks within which “a” reality of ecosystems and landscapes is represented that would ultimately contribute to “legitimatization of environmental policy” (p. 4).

While rational models of the study of ecology and environmental health tend to depoliticize the issue, political ecology theories aim to understand political influences that frame environmental science (Blaikie, 2001). In other words, understanding the evolution of environmental facts and knowledge is essential for any political debate about environmental policies because science and politics are mutually related (Forsyth, 2003). While from a positivist point of view, one might argue that environmental science is disconnected from political discourses and seeks the absolute truth of the real world, political ecology theory recognizes the social and political framing (constructions) of

environmental science and policies (Forsyth, 2003). As Harvey (1993, p. 25) notes "looking more closely at the way ecology and politics interrelate then becomes imperative if we are to get a better handle on how to approach environmental/ecological questions."

Although many scholars have used political ecology to study the relationships between humans and the environment and the interaction between different social units (e.g. Schubert, 2005), there is not much research on the application of political ecology in environmental justice studies (Lee, 2009). This is why political ecology puts much emphasis on the social justice and environmental disputes (especially in developing countries) (Forsyth, 2003). It should also be mentioned that within the literature of political ecology, there is a tendency to separate the political ecologies of developing countries and advanced capitalist countries. Although some scholars argue that this separation is problematic (e.g. Walker, 2003), I choose to only draw on the political ecology debate in North America.

Neo-Marxism perspectives, broadly speaking, criticize ongoing capitalist accumulation and the state's ability to control and to compensate the negative environmental effects (Mol, 2010).The approaches in this generation are in opposition to Neo-Malthusian approaches in regard to the human-nature relationship and the complexity of power relations (Khan, 2013) and are mainly centered on the contradictions of capitalism. In brief, the first contradiction of capitalism is centered on the economic crisis caused by capitalism, whereas the second contradiction discusses an inevitable environmental crisis (caused by capitalism) which again will lead to an economic crisis. There are different approaches within the Neo-Marxian perspective and they vary based on their focus and the extent of the analysis of each of the two contradictions of capitalism.

However, within this paradigm, all the theories follow the eco-socialist tradition and are critical of capitalism's expansion that makes the environment prone to destructive forces such as pollution and depletion. Additionally, they both strive for "sustainable decision-making" (Vernon, 2007, p. 64). Moreover, their perspective on environmental injustice is centered on the critiques of capitalism (Cutter & Solecki, 1996; Goldman, 1996; Harvey, 1996). Accordingly they all explain environmental justice by looking at a broader economic structure and its relations with socioeconomic factors.

Post-structural political ecology employed in this research is a post-Marxian approach that emerged in 1990s and shifted the focus toward more local scale studies, interrelations of power and knowledge, analysis of institutions (Escobar, 1999, 1996; Walker, 2005), and "non-materialist dimensions of power" (Khan, p. 463). Neo-Marxist theories, on the other hand, are focused on material power and global-local as well as regional scales. The concept of a power-laden feature of political ecology, however, is what all theoretical perspectives in political ecology agree on (Khan, 2013). Additionally, both Neo-Marxian and Post-Marxian perspectives emphasize the importance of social justice and equity issues for environmental explanation (e.g. Bryant, 1997; Forsyth, 2003).

Furthermore, different schools of thought in political ecology understand and analyze the concept of power and its manifestation in the interrelations between human and nature differently. For example, post-Marxist approaches have criticized Neo-Marxist approaches because of their focus on material power, economic reductionism, and production. Instead, they emphasize the understanding of nature and environmental sciences as social constructs with a focus on discursive approaches and non-material power (e.g. Escobar, 1996; 1999).

Moreover, post-structural political ecology understands the conditions of production differently from the Neo-Marxian schools. Post-structural political ecologists argue that conditions of production are not just transformed by capital; they can also be transformed through discourse (Escobar, 1999). This perspective also emphasizes a different understanding of nature and human/ nature relations (e.g. Haraway, 1999). This new understanding focuses on socially constructed entities and requires a deconstructive approach to analyze the dominant environmental discourses (Schubert, 2005).

Therefore, poststructuralist political ecology challenges the complex discourse articulations between natural and social systems (Escobar, 1996; Peet & Watts, 1996; Schubert, 2005). This tradition is mostly rooted in Foucauldian discourse analysis that provides insight into uncovering the power relations embedded in knowledge and in the institutional frameworks that can potentially constrain, repress, and subjugate knowledge (Leff, 2013). Drawing on this Foucauldian legacy, the post-structural political ecology perspective argues that the interactions between different forces and actors "co-construct environmental discourses and narratives" about environmental issues (Forsyth, 2003, p. 15). It should be mentioned that the poststructuralist analysis of discourse is not limited to linguistics but is a social theory, "a theory of the production of social reality which includes the analysis of representations as social facts, inseparable from what is commonly thought of as material reality" (Escobar, 1996, p. 326).

Form a post-structural ecology perspective even a materialist analysis should be also a discursive analysis (discursive materialism) (Escobar, 1996). Post-structural political ecologists point to the importance of "discursive turn" because it reveals the connection between the social and political framing of science and policies and the materialistic outcomes (Escobar, 1996; Peet & Watts, 1996; Forsyth, 2003).This strong

account of discourse and narrative is another difference between post-structural political ecology and the Neo-Marxian approaches.

Additionally, Escobar (1998) explains that what distinguishes post-structural political ecology from other schools is its theoretical position, known as constructivism and anti-essentialism. To explain this concept, I need to draw on the epistemological debate on nature in the field of political ecology. The epistemologies of nature can be divided into two groups: essentialism and constructivism, which are opposite in their views on relations between "knowledge and reality, thought and real" (Escobar, 1997, p.92). Constructivism (or anti-essentialism) is the view that recognizes the inevitable connectedness between "subject and object of knowledge," which results in a complex and problematic relationship between thought and reality (Escobar, 1998, p. 92).

Essentialism, however, is the belief that knowledge about things can be understood (known) independent of context and their relation with other things (Escobar, 1997). Post-structural political ecologists believe that political ecology should be anti-essentialist in order to analyze the complex relations of human and nature in the broader context of history and power (Escobar, 1999). Haraway (1988) emphasizing the anti-essentialist features, defines political ecology as "traffic across nature and culture" (p. 188). Furthermore, the anti-essentialist theory of nature suggests ways to rethink nature as not having any identity, and reevaluating what is taken as essential in different discourses (Escobar, 1999).

That is why post-structural political ecologists often base their methodology on Foucault's historic-analytical method to the study of discourse (e.g. Escobar, 1995; 1996; Peet & Watts, 1996). Some scholars, however, argue that studying environmental issues should rely on structuralist explanations rather than on deconstructive approaches toward

environmental discourses (Bernstein & Woodhouse, 2001). Moreover, Forsyth (2003) states that since this school has a great focus on local discourse and knowledge, it might lead to rationalization rather than critical assessment of the issues. But it should be mentioned that post-structural political ecology does not rely only on discourse.

For example, in post-structural political ecology, the non-equilibrium ecology approach toward “ecology” (which was mentioned in section 2-1) was popular where humans are more than disturbance factors; instead they are “contributors to ecological sustainability” (Walker, 2005, p. 7). As I mentioned in section 2-1, the move toward non-equilibrium theory happened after the limitations of classical equilibrium theories were largely discussed. This new notion empowered the political analysis of the environment because from a post-structural political ecology, the concept of non-equilibrium means that it is very hard to make statements about long-term ecological responsiveness “based on limited temporal and spatial data, and when the evaluations and measurements of ecology are influenced by humans in culturally specific ways” (Forsyth, 2008, p. 758).

Post-structuralist political ecologists also discuss environmental “truth” as a construction of environmental realities by scientific discourse. In regard to environmental (in) justice, drawing on the Foucauldian approach, Escobar (1996, 1998) argues that in all environmental social movements, the main questions to ask are whose knowledge? Whose nature? These two questions will reveal whether in the process of discourse development, some groups or actors have been marginalized. He further argues that analysis of matters about nature and humans (such as environmental injustice) requires a discursive approach because “ideas, matter, discourse, and power are intertwined in ways that virtually defy dissection" (Escobar, 1996, p. 326). In other words, post-structuralism puts a greater emphasis on politics compared to economics (Blaikie, 1999).

Although post-structural political ecology understands and defines nature differently from the Neo-Marxian schools, it shares similarities in its analysis of capitalism. Post-structural political ecology introduces two possible forms of capital, exploitative capital and conservationist capital, and argues that both require cultural and discursive analysis (Escobar, 1996). Drawing on the two contradictions of capitalism, post-structural political ecology acknowledges that capitalism is contradictory and crisis ridden. It also argues against the materialist effects of capitalism (Escobar, 1996).

Another legacy of Foucault (1980, 2002) for post-structural political ecology is the analysis of "ecological governmentality" that provides a critical understanding of environmental governance. This analysis basically focuses on discourses used by government agencies to control and regulate both individuals and their surrounding nature (Fisher, 2011). Thus, the application of discourse analysis informed by political ecology requires dissecting the local "micro-political struggles" (Bryant, 1998, p. 86) where the results include but are not limited to distributional inequalities (e.g. Watts, 1983) and misrecognition.

The question here is to what extent the political ecology theory can be beneficial in EJ research. Although political ecology is not commonly used in EJ research in the United States, Bryant's suggested term, "urban political ecology" (UPE) (1998, p. 90), emphasizes the need to explore the boundaries of political ecology beyond the "land centrism" (p. 89) that has dominated most of the political ecology literature and to understand the "unequal power relations" (p. 89) that ultimately lead to environmental justice and health disparities (Mayer, 1996). Although urban political ecology theory is still relatively new (Heynen, 2006a), many scholars have applied this theory to study different aspects of environmental injustices, for example urban hunger (Heynen, 2006b) and patterns of disease and mortality (Mayer, 1996). Moreover, the appreciation of "dynamics

of the politicized environment" (Bryant, 1998, p. 90) by many scholars is an indication of its potentials to deepen the understanding of environmental injustice in urban areas. In the methodology chapter, I employ post-structural political ecology as a theoretical framework to analyze environmental justice discourses.

2-5-4) Environmental Justice and the Post-modern Condition

As the father of environmental justice movement, Robert Bullard writes, "every decade or so Americans rediscover the city" (2007, p. 7), and in the process the consequent policies inspired by a new movement or a momentum/concern affect urban space and the environmental and community aspects of urban landscapes. There are, however, different approaches in studying these processes. As discussed in the previous chapters, environmental justice discourses and their ontological status are plural, and there is no one accepted way to dissect these issues. The focus of this research is a post-structural view of the narratives and various discourses, which is closely attributed to the postmodern figures such as Foucault (the method of social history writing and genealogy of power/knowledge), Derrida (anti-method methodology), and also borrows from others like Bourdieu (urban space as a field) in the search for different version in the field. To look at EJ in a postmodern context, I argue that that we should look at the literature on postmodernism and the environment and also postmodern writings on urban space.

There are two opposite stands about a postmodernist approach in environmental research. Some scholars criticize post-modernism for being anthropocentric (please see Davis, 1995) and some radical ecology scholars go even further to point out the contradictory essence of postmodernism and radical ecology (please see Sessions, 1996). However, as Glover (2006) suggests instead of dividing environmental thoughts based on their response to postmodernism, it is helpful to first categorize them as to their

position to modernity. He further argues that in the context of “nature-society relationship,” postmodernity represents an “environmental condition” with no need to return to much-criticized relativism (p. 244) that is apparent in its extremes in the Derridaian form of postmodernity. Although, in this context the core theme of postmodernism is that nature is a social construct; and of course the idea of objective truth is rejected.

Postmodernism’s most visible and discussed feature is “the politics of diversity” (Sessions, 1995), embodied in grass roots environmental groups, show a shift from mainstream environmentalism. The environmental justice movement as one of the most active grass roots movements has also changed the meaning of environment. As Gibbs states “the Environmental Justice Movement is about people and the places where they live, work and play” (1993, p. 2). But it is in the context of “environment as a social construct” that Beasley (1991) writes:” we perceive environmental issues as racial and social issues” (as cited in as DeLuca, 1999, p. 42). And as DeLuca (1999) argues environmental justice advocacy representing “diverse groups practicing an array of micropolitics” (p. 210) is an example of postmodern environmentalism acting through deconstructing the modern nature and creating unconventional rhetoric.

But many scholars, especially radical ecologists, have criticized postmodern environmental activism. These critics argue that postmodernism is not able to take a stand-point beyond anthropocentric values (Sessions, 1996). However, in practical terms, taking a postmodern approach means recognizing different voices and realities. As Zimmerman (1994) points out “postmodern theorists maintain that truth should result from negotiations in which as many voices as possible are heard” (p. 93).

In addition to these discussions on postmodernism and environmental studies, it is important to look at postmodern studies of urban spaces. Because as I explained in

section 2-1-5 the study of EJ should not be limited to single unwanted facilities but instead should expand its analysis to urban landscapes. Moreover in section 2-4 (the review of EJ research) I talked about different methodologies that help with spatial analysis in EJ. And while both postmodern literature on urban spaces (for examples please see Platt, 2014) and EJ studies promote spatial analysis, some postmodern writers argue for a new direction for temporal assessments (e.g. Huehls, 2009). The dominant spatiality approach in EJ research has also been criticized by human geography scholars (e.g. Teelucksingh, 2002).

The integration of spatial and temporal analysis of urban landscapes, as I explain in the methodology chapter, opens up the opportunity for integration of urban ecology and EJ studies (more effectively), which in turn aligns with post-structural political ecologies and provides a theoretical framework for analyzing the patterns and processes of EJ. Finally, a post-structural approach makes a more holistic understanding of the concept of “health” possible, where it is more than the opposite of disease (see Kelly, Davis, & Charlton, 1993) and accounts for socioecological model of health that can introduce a wider spectrum of discourses and knowledges. It should be mentioned that the extreme end of the spectrum of postmodernism is not common in public health research (please see Lupton, 1998) and is not relevant in this research.

3) Methodology

3-1) Introduction

Building upon the previous discussions about different methodologies and theoretical approaches in EJ research (please see sections 2-4 & 2-5), in this chapter I introduce the conceptual framework for my methodological approach. In order to clarify the mixed-methodology approach in this research, I categorize and explain the research questions and then I introduce a participatory approach for assessing both biophysical and anthropic systems. As discussed in section 2-5, post-structural political ecology is also employed to understand the main aspects of EJ in urban landscapes including capacity, sensitivity, and exposure (Eakin & Luers, 2006).

As mentioned before, environmental justice has long been criticized for being an exclusively anthropocentric discourse that primarily focuses on the description of distributive injustices (e.g. unwanted land uses) and the statistical relationship between environmental risks and sociodemographic factors (please see section 2-4-2). Moreover, some critics argue that EJ researchers enter communities with preconceived assumptions. The overall argument, however, is that EJ research lacks the foundations necessary to analyze environmental issues and their outcomes for human health and quality of life. For example, Dryzek (1997) argues that while a great deal of emphasis is placed upon anthropocentric values within the EJ literature, the complexity of ecosystems and the extent to which they affect the well-being of the human community has not been adequately studied. He also notes that: “Environmental Justice cannot provide a basis for the protection of aspects of the natural world that do not affect the well-being of the human community” (p. 221).

On the other hand, being a grass-roots movement, EJ research is different from mainstream environmentalism mainly as a result of its dominant anthropocentric

discourse but also because it is the only environmental paradigm where the idea of social construction is deeply rooted in its epistemology. That is why EJ can be perceived as a postmodern account for environmentalism (please see section 2-5-4). An example would be EJ's tendency to account for different narratives and local knowledge(s) that forces EJ advocates to constantly confront the scientific determinism and the burden of proof. It is also a good reason as to why political ecology is a useful theoretical approach for EJ research. Moreover, conceptually EJ is aligned with the post-structural understanding of urban landscapes, because such an approach requires us to look at urban landscapes and urban spaces as social constructs. To elaborate this argument I restate the research questions in this section and then I explain my approach in studying each of them. I conclude this chapter by discussing the limitation of this research and the reason(s) why I adopt a case-study approach in this study.

3-2) Research Questions, Theoretical Applications, and Methodological Directions

To clarify the methodology and my rationale, in this section I organize the research questions in two categories based on their conceptual and methodological similarities. The first category is mainly concerned with the understanding of different narratives and takes on EJ and the health outcomes. The second category of questions is a reflection of the research problem of this study, which is the separation between ecological and social approaches in EJ study.

Category (a): Understanding Different Narratives

Question 1: What are the varying aspects of environmental justice discourse? This question concerns the recent arguments in regard to the state of EJ in the case study areas. This includes planning documents, media coverage, introduced policies, and advocacy priorities. In section 2-2-2, I explained how reviewing policy trends can be helpful in terms of laying out the patterns of concern and public attention. And in section

2-5-3, I explained the importance of discursive approaches in political ecological studies of environmental (in) justices. Drawing on these arguments I rely mainly on archival research to analyze this question.

Question 2: What kind of discourse development exposes environmental injustices?

This question is mainly centered on the concept of power relations and the dynamics of environmental justice and public health advocacy. The context and nature of EJ discourse development in the case studies is the starting point for approaching this question.

Question 3: How have local residents been portrayed and/or marginalized in the EJ discourses of different groups?

This question primarily deals with procedural justice and recognition (please see section 2-3) and requires a historical analysis of the EJ trends. To understand the portrayal of EJ population, one should first analyze the planning documents, media coverage, introduced policies, and the extent of participation in prioritizing EJ issues.

As figure 10 shows for the first category of questions I mainly rely on archival research, surveys and interviews. First I look at the policy contexts and attitudes towards environmental health. I use the number of legislations introduced and the number and extent of media coverage as measures of attentions. I also conduct a survey analysis to understand residents' perception of environmental health and their understanding of the relationship between environmental health and human health and well-being.

Category (b): Participatory Framework for EJ Research

Question 4: How are the ecological understandings of the concept of environmental justice different from what is understood by local people?

This question aims at understanding the relationship between local knowledge, EJ perception, or the lack thereof, and the states of environmental justice and health outcomes. This requires an analysis of the ecological studies on EJ along with capturing people's perspective of EJ and the health outcomes.

Question 5: How can a participatory approach enrich the ecological studies in urban areas, specifically those centered on environmental injustice?

This question reflects on the research hypothesis that a transdisciplinary approach based on both a socioecological model of health and political ecological understanding of EJ study helps in identifying the states of EJ and improve the context of environmental and health advocacy.

Question 6: What implications might the findings of the research have for efforts to promote environmental justice in public policy?

This question looks at the potentials for integrating an action-oriented ecological approach (please see section 2-4-2) into participatory planning to improve the local understanding of EJ and its effects on human health. This also draws on the classic critique of EJ movement for its lack of ecological principles.

For the second category of research questions I change the scale of analysis and focus on a neighborhood (Bonton) in South Dallas. I revisit the questions after an analysis of the patterns and processes of change in the landscape and conducting a participatory GIS session. In the following sections I provide a little background and my rational for employing the variety of qualitative and quantitative methods used in this research.

However, it should be mentioned that this research does not aim to deal with etiological uncertainty (please see section 2-4-3); rather it looks at different perceptions of EJ and the possibility for a more integrated take on EJ research and human health. This

is why probably the most discussed critique of EJ research is its lack of rational and scientific proof. For instance, Foreman (1998) criticizes the EJ movement for these flaws: unsubstantiated claims, structural disorganization, unrealistic goals, and failure to prioritize goals. Regarding the issue of public health, Foreman argues that the movement has failed to prove the risks scientifically. He notes that EJ activists act on the basis of risk perception instead of scientific evidence. Although this critique is accepted and reveals some of the limitations of the environmental justice research (Krieg, 1998), employing a political ecology perspective in this research I apply a different epistemology in environmental research that accounts for local knowledge, chain of power, and the need for a participatory socioecological model for understanding health.

Moreover, the underlying purpose for the methodological design in this study is to expand the EJ discourse to include ecological considerations and to put the emphasis on the health outcomes of environmental inequalities. This approach provides the opportunity to apply the ecological principles which will result in an in-depth understanding of EJ issues. Additionally, integration of an ecological approach into EJ study can potentially enhance the opportunities to bridge to policy-making arenas because, as Pavlovskaya (2006) puts it, “quantitative language can retain authority in academic and policy worlds” (p. 2005).

3-2-1) Archival Research, Surveys, and Interviews

In this research I look at two case studies, the Jamaica Plain neighborhood in Boston and the Bonton neighborhood in Dallas. While a more extensive qualitative study is done in Bonton, archival research and surveys are conducted in both places. In order to conceptualize the current chain of explanations, I first study the local discourses that have been legitimized or delegitimized during the power struggles (Keil & Boudreau, 2006). To accomplish this task I conduct archival research, look at a few selected

newspapers in the case studies, and analyze the planning documents at both regional and local scales.

I also interview environmental justice and public health advocates and planning officials (please see appendix B for interview protocols). It should be noted that for data collection I acquired the approval of Institutional Review Board (IRB) at the University of Texas at Arlington (IRB No: 2015-0830). These interviews include open-ended questions on their experiences, environmental and political concerns, their attitude toward government regulations and policies, and the relationship between lay and expert knowledge of environmental justice and health. As the literature on the use of landscape metrics to study EJ is very limited, in this research I interview several urban ecologists involved in various urban ecological research across the country including: the Long Term Ecological Research (LTER), EPA's EJscreen and Enviroatlas, and Ecological Society of America (ESA). I ultimately rectify my quantitative analysis based on the opinions and insights that I receive through these interviews.

To design the focus group for participatory GIS, I use the coding results from the interviews along with the results of the survey, which is used as a measure for the attitude and priorities of the local residents (based on White & Hall, 2015) (please see appendix C for survey questions). All interviews are transcribed and are coded using Dedoose software. The next step is to compare the dynamics of different discourses with the patterns of environmental injustice. Figure 10 shows the overall interrelation between research questions and the methodology.

3-2-2) Participatory Landscape Analysis

During the mapping session, residents' comments on the ecological representation of environmental justice and health concerns is also recorded in order to fix the flaws of the maps and to compile a set of recommendations for future research.

The approach adopted for focus groups is based on participatory GIS inspired by participatory landscape ecology.

A participatory landscape-based approach helps reveal the patterns that support the EJ claims, and it can also influence its priority in the policy-making arena because such an approach can represent environmental justice issues in the broader picture of sustainable development. Creating this big picture requires combining environmental and ecological justices (please see section 2-3). Although ecological considerations are among the principles of EJ, most EJ research does not take eco-justice issues into consideration. To explain how a more comprehensive concept of justice can promote environmental justice policies, I argue that including eco-justice issues can potentially integrate EJ with sustainable development.

Some scholars have argued that sustainable development and environmental justice present conflictual natures because environmental justice is primarily focused on the issue of social equity, whereas sustainable development is focused on green issues (Dobson, 1999). Additionally, these two concepts have different origins. Some scholars agree that the amount of literature on EJ relations to race and class overshadows the environmental aspects of EJ research (Agyeman, Bullard, & Evans, 2002). But other scholars argue that such potential conflicts (social equity and green issue) might be avoided if the environmental justice movement was linked to broader movements devoted to human rights and exploitation of the environment (Faber, 1998).

Such linkages between these two concepts can also be beneficial in terms of public policy and decision making regarding the practice of EJ. As Agyeman et al. (2002) observe, most governments have adopted some kind of commitment to sustainable development while few have recognized the importance of placing sustainable practices within a context of social justice, equity, and human rights. Pellow and Brulle also agree

that environmental injustice should be studied within the larger “social dynamics of the social production of inequality and environmental degradation” (2005, p. 3).

Furthermore, linkages between sustainable development and EJ can also be beneficial for sustainable development practices. One of the strengths of the EJ movement is that it focuses on communities and the bottom-up leadership approach, whereas sustainable development focuses mainly on the role of states and individuals. According to Kameri-Mbote and Cullet (1996), EJ is the answer to the missing dimension of sustainable development: rights of communities. This is why a participatory model is essential for EJ studies. In section 2-4, I reviewed the common geospatial analysis in EJ studies, and here I argue that a landscape approach helps one understand the evolution (and processes) of urban environments in the study area and see the patterns of uneven urban landscapes.

Participatory landscape ecology, similar to PGIS (please see section 2-4-3), in basic terms represents a bottom-up model of planning through application of the communicative approach to include people and lay knowledge. I did not dedicate a section to this approach in the literature review chapter because the concept of participatory landscape ecology is very new and still emerging. This approach requires the translation of ecological concepts both for decision makers and people (Luz, 2000) and is a fundamental step toward a holistic approach in understanding urban ecology (Luz, 2000) that can pave the way for successful action oriented ecology. Furthermore, participatory landscape ecology is the result of a shift in the traditional landscape ecology paradigm and methodology that is happening mostly under the influence of sustainable development literature (e.g. Potschin & Haines-Young, 2006).

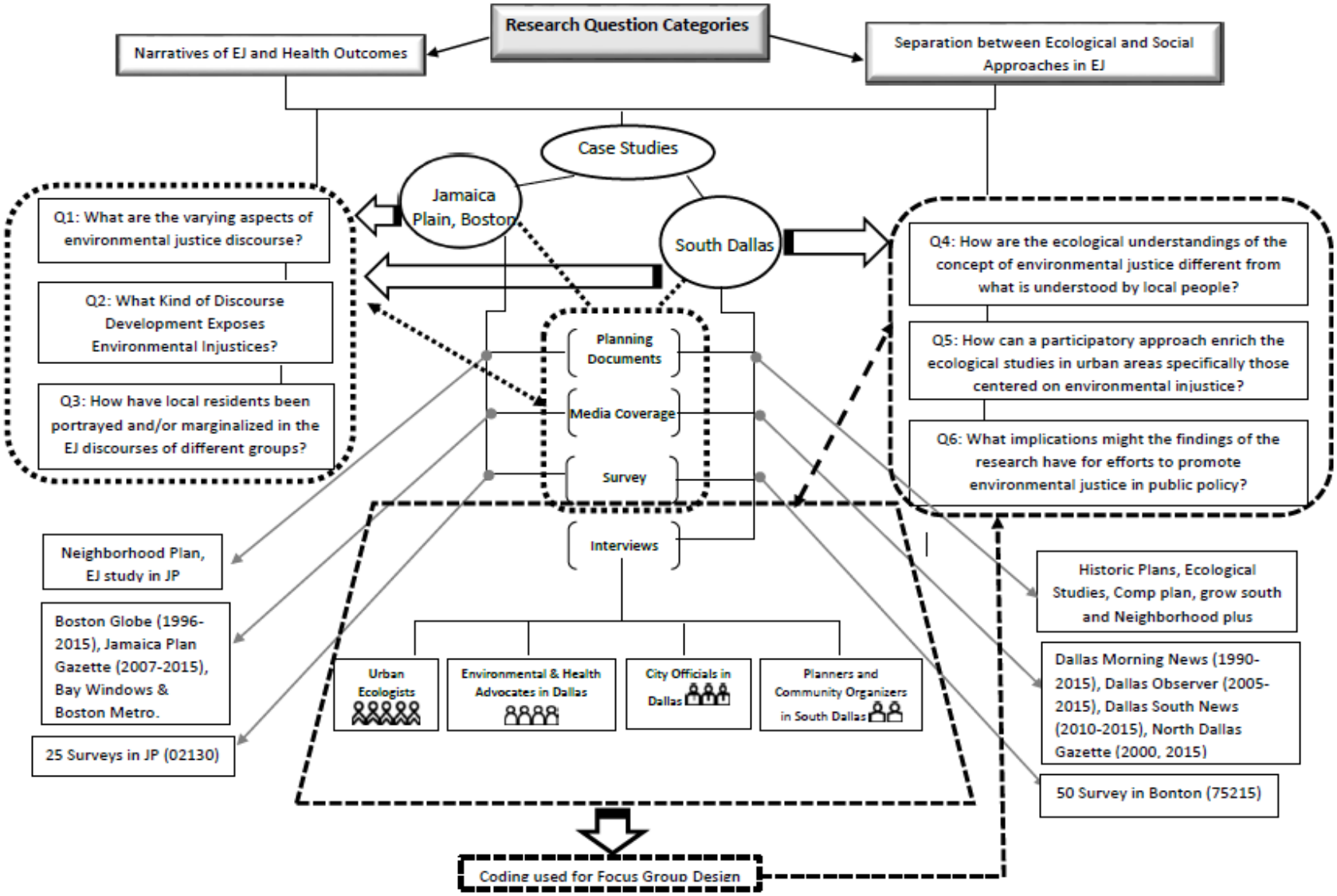


Figure 10 Research Questions and the Main Data Collection Approaches

Many scholars have examined the barriers for landscape ecology to become more applicable for sustainability research (e.g. Potschin & Haines-Young, 2006; Haines-Young, 2000; McAlpine, Seabrook, Morrison, Rhodes, 2013) and many have offered solutions to advance the landscape ecology paradigm (Opdam, Foppen & Vos, 2002). To employ this approach in EJ research there is a need for a paradigm shift because currently it is focused on the biophysical aspects of landscape but needs to also include the anthropocentric aspects. Especially when it comes to the issue of EJ and health in the cities, it is impossible to avoid anthropocentric values. These changes are necessary in order to understand the urban ecosystems. This new approach is usually referred to as transdisciplinary landscape ecology or postmodern landscape ecology. It allows for the construction of "a dialogue between science and society in relation to landscape" (Bastian, Steinhardt, Naveh, 2003. p. 37). Palanga, Mandera & Naveh (2000) state that participatory landscape ecology can be considered a holistic discipline only if "public awareness and participation play equal roles to those of the experiences of natural scientists and planners" (p. 5). Figure 11 illustrates the core concepts that shape the methodological approach in this research.

My ultimate goal in this research is to use the (landscape–oriented) participatory mapping to determine the vulnerability and resilience of different urban landscapes where humans are more than "disturbance factors" (Palanga, Mandera & Naveh, 2000) and to visualize and examine the environmental factors of most concern to the residents. Consequently, gathering participant-originated data is an important entry in my analysis. This requires identifying an effective medium for communicating knowledge. However choosing the methodology to receive the local knowledge depends on the context. Although, this research does not aim to overcome all the limitations of PGIS; in terms of integrating the local knowledge, I rely on interviews, surveys and focus groups. Since

access to spatial data is an important factor that increases a community's involvement, I post the results online along with interactive maps.

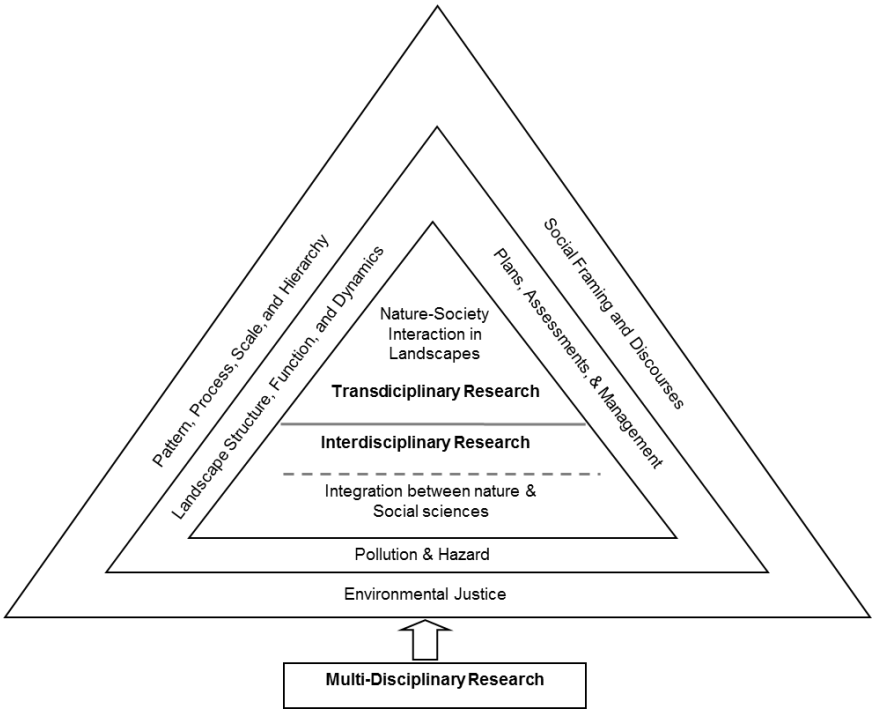


Figure 11 The Core Concepts of the Methodological Approach

Based on Wu, 2013

Focus groups and community mapping bring more to the primary data gathered during surveys and interviews. This data is digitalized in GIS and community mapping results and all the qualitative/interpretive results are included in the process of analysis by storing them in a GIS data-base. Also participants have access to the results for possible feedback. One of the requirements of effective integration of local knowledge is constant participation of the community in all phases, which is one of the limitations of my research mainly due to time and financial limits. In unsuccessful examples of PGIS, the community's involvement simply ends or decreases dramatically after the databases are created and is usually followed by expert-driven analysis in GIS and/or statistical

software. In this regard I hope that posting the results online will maintain a degree of involvement and interest from participants.

3-2-3) Political Ecology as a Theoretical Framework for PGIS

Discourse analysis is necessary to contextualize the ecological knowledge and to situate varying discourses. Thus, in the qualitative analysis of this research, I apply the post-structural political ecology that particularly emphasizes environmental discourses (Kaika, 2006). As Zimmer (2010) argues, this approach first questions the “chain of explanations” (p. 349) of urban environmental issues.

Therefore, in addition to PGIS as methodology, I employ political ecology (please see section 2-5-3) as the conceptual framework. In general terms, political ecology brings the political dimensions of environmental issues into the analysis (Blaikie & Brookfield, 1987). It helps understand the chain-of-power relation as it relates to environmental issues. In other words, political ecology draws attention to the socio-economic and political context of inequalities such as environmental injustice. Because PGIS and political ecology evolved out of different theories, they have different backgrounds. A decade ago, political ecology and EJ seemed too far away to be integrated (Nethengwe, 2007), but recently, many pioneering studies on environmental issues have employed different approaches of political ecology (e.g. disaster, environmental injustice, natural resources) (e.g. Cutter, 1996; Blaikie & Brookfield, 1987; Watts & Bohle, 1993). Some scholars argue that political ecology, is an important and influential framework for environmental justice studies (e.g. Swyngedouw & Heynen, 2003).

On the other hand, political ecology provides the framework for analyzing the interrelations between socioeconomic factors and the chain of power. The result of participatory mapping along with other qualitative data will be integrated with GIS and

ecological data. Survey and interview data are transferred into GIS as point layers representing sample surveys or factors to be included in the analysis. Figure 12 shows the schematic of the process of PGIS.

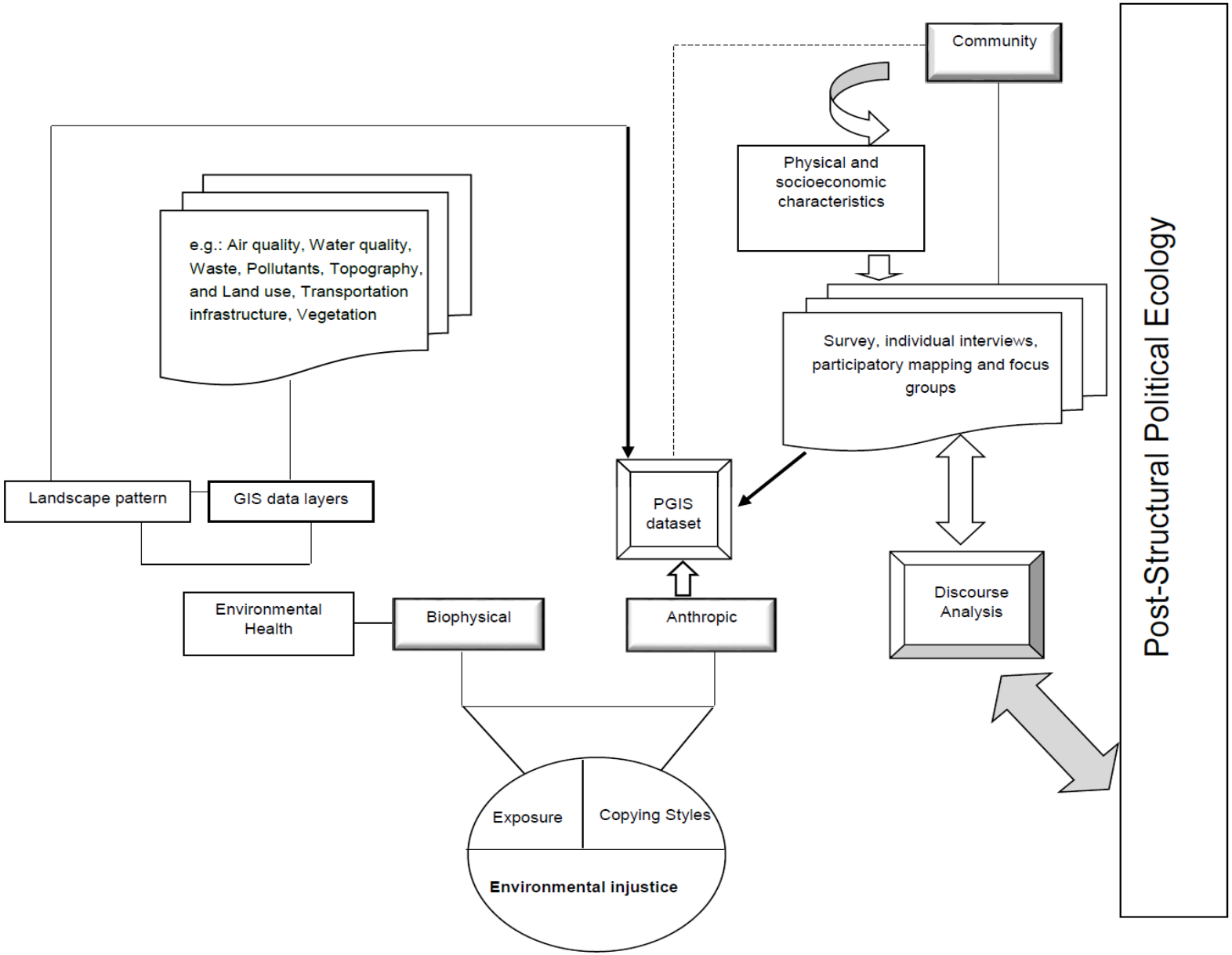


Figure 12 the Process of PGIS

3-3) Case Study Approach in Environmental Justice Research

In this section I explain case study as a research methodology and the main discussions on its theory, reliability, and validity. As Flyvbjerg (2006) explains context-dependent knowledge and experience are embodied in case study researches. Moreover, he emphasizes that case studies provide a suitable context in which the expert knowledge can mature and flourish. Furthermore, concrete knowledge, can only be achieved through interaction with the community under study to receive constructive feedbacks (Flyvbjerg, 2006).

One of the critiques of case study is that the results from a specific case cannot be generalized or applied to other cases. This is while some scholars question the mere possibility of predictive theory in social sciences (e.g. Flyvbjerg, 2006). It should be mentioned that many scholars agree on the value of case study in terms of acquiring context-dependent knowledge (e.g. Campbell, 1975). Additionally, in some cases the results of the strategically chosen case studies might be useful or applicable for similar studies and their in-depth approach can even lead to the best theories (Flyvbjerg, 2006; Walton, 1992).

Therefore, choosing a critical case is central for case study researches. As Flyvbjerg (2006) explains, choosing the most likely or less likely cases is a good start in attempting to find a critical case. Given the participatory nature of this research, there are several important considerations in choosing the case studies that can be categorized in two groups of internal and external factors. On the other hand, the participatory process employed in this research includes two phases of map production and map utilization (Kolagani, Ramu, Varghese, 2012). In deciding on a case study, both of these classifications should be considered. The table below shows the main external and internal considerations.

Table 3 The Main External and Internal Considerations in Choosing the Case Studies

	External	Internal
Map production	- Availability of data and spatial information	-The area contains potential participating communities and represents racial diversity -the presence of socioeconomically disadvantaged groups - The process will educate the residents and reveal the roots of the problems
Map utilization	-Community that is not dominated or highly influenced by an organization - Agency/NGO representatives played a limited role	-Can lend itself to generalization -community campaign/movement has been deployed -Likelihood that a site has released or has the potential to release a hazardous substances into the environment

Having pointed out these issues, I hope that the case studies chosen in this research are critical examples able to provide a broader knowledge of the reality of EJ. Last but not the least, the value of a case study is highly dependent on the validity of its claims (Flyvbjerg, 2006), which requires locating and sometimes comparing the results with the current discourses in the literature.

The justification for the use of case studies in this research, however, is less problematic because EJ is about the cases of injustice, and previous studies have already shown that the result of one case can at least be informative and constructive for future research in this field. Moreover, the importance of undiscovered public knowledge and bringing it into the decision-making process make case studies necessary for

grasping the in-depth knowledge of EJ status and underrepresented discourses. The collective case studies in this research are the Bonton neighborhood in south Dallas and Boston's Jamaica Plain neighborhood. Both of these cases are well-known EJ cases that to some extent share similar characteristics.

3-4) General Uncertainties and Limitations of Research

Uncertainty is inherent in any multipurpose planning (Ahern, 2005). In this research uncertainty exists in three main forms: data deficiency and uncertainty, uncertainty relative to the assumptions, and uncertainties produced due to limitations of methodology. In the next paragraphs, I briefly introduce these uncertainties. I should also mention that some of the uncertainties are not specific in this research, but rather are commonly acknowledged limitations of EJ research.

One of the main challenges for every researcher is access to quality data. Unfortunately, EJ research faces some limitations in this respect. Zip code information is probably the most obvious source of data for any EJ research; however, some scholars raise questions about the validity of analysis outcomes. For example Mohai (1995) points to the fact that in many cases the relative size of zip codes and census tracts are very different (Yandle & Burton, 1996). Also studying EJ at the zip code scale, poses some limitations and it is not a strong approximation to actual health risk; for example, EJ analyses can benefit from full-scale epidemiological studies. Due to availability and affordability of zip code information, many EJ researchers still use them (Goldman, 1994); however, the limitations regarding these data need to be recognized. In this research the health data for Asthma and cancer incidents are acquired at zip code level.

Another example is pollution sources data, which are frequently “inadequate or questionable, such as self-reported data from the EPA’s Toxic Release Inventory”

(Holifield, 2014, p. 7). Maantay (2002) also underlines that legal protections of privacy make it hard to access the heath data at small scales. Consequently, the accuracy of the results is uncertain because the data used in the analysis vary in quality (National Cooperative Highway Research Program (NCHRP), 2004). In this research the distribution maps of toxic release inventory is presented but no further statistical analysis is done as both case studies are recognized as EJ populations.

There are also limitations in application of GIS for EJ research which leads to uncertainties about the assessment results. For example, many scholars explain that there is uncertainty in the assessment of hazard and exposure to risk (e.g. Ramsey, 2009). Conventional approaches in EJ studies that use proximity as an indicator of exposure (distance buffer approaches) have been criticized (e.g. Mennis, 2002), because accurate information on disposure requires using environmental and health models (e.g. numerical model of toxic dispersion). Also, there are some uncertainties in regard to population representation methods. For example in this research in GIS, health data is assigned to each unit centroid point which Chakraborty and Armstrong (1997) call the "centroid containment method". The issue with this methodology is that errors occur if the centroid falls within the buffer but the population is concentrated outside the buffer (Mennis, 2002). Here I only use this method to visualize (using Inverse Distance Weighted interpolation (IDW)) the cancer incidents in Dallas and Asthma rate in Boston.

Additionally, this study makes the assumption that the presence of environmentally polluting sources (e.g. industries) increases the exposure risk to the population in that zip code without employing actual exposure measurements. In this research I adopt the precautionary principle that states: "when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even

if some cause and effect relationships are not fully established scientifically'' (Wingspread, 1998, p. 1).

There are also limitations in using PGIS in regard to access to information, the representation of societal and environmental issues, and deficiencies in incorporating local knowledge into the PGIS dataset. Harris and Weiner (1998) state that unequal access to data and resources has the ability to both marginalize and empower communities simultaneously. That is why some scholars refer to it as "double-edged sword" (Elwood, 2006). Moreover, many scholars argue the uncertainties of the validity of the PGIS results. In section 2-4-3, I introduced PGIS and its limitations in more details.

4) Case Study Introduction and Comparative Analysis

In this chapter, I introduce two case studies, South Dallas, Texas, and Jamaica Plain neighborhood in Boston, Massachusetts. In the first section, I review the overall profiles of the case studies, focusing mainly on EJ populations, cancer, and asthma incidents.

Additionally, drawing on the discussion in section 2-2, I review the overall EJ policy contexts in Dallas and Boston by looking at the EJ-related legislations passed or introduced in each state and the media coverage of environmental (in) justices in South Dallas and Jamaica Plain neighborhood. I conclude this chapter by analyzing the selected planning documents, and surveys in both case studies along with in-depth interviews with urban ecologists and leading researchers in EJ and environmental health research projects across the country, as well as interviews with public health advocates, environmental advocates, city officials, and community organizers in South Dallas.

4-1) South Dallas

The figure below shows the South Dallas area within the city of Dallas. Many features make South Dallas an interesting case for studying environmental justice. First, Dallas County is the ninth largest and one of the fastest-growing areas in the country (Methodist Dallas Medical Center, 2013). The South Dallas neighborhoods, however, represent relatively large disparities in terms of education, health, and access to resources. Two main factors make South Dallas a critical case for environmental justice research. First, statistical evidence of vulnerability and clusters of health issues exists in the area. Figure 13 shows the boundaries of South Dallas within the city of Dallas.

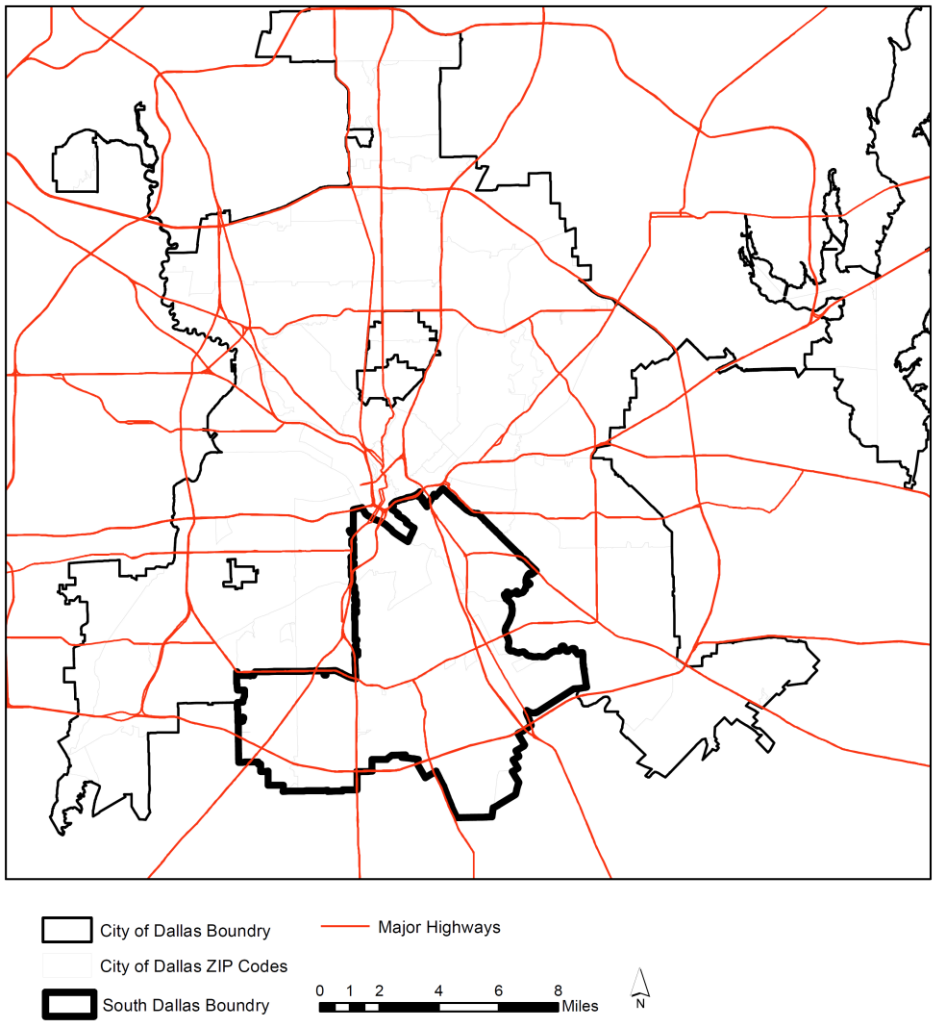


Figure 13 South Dallas Study Area

The following table shows the summary of the main characteristics of South Dallas.

Table 4 Main Characteristics of South Dallas

(1) South Dallas, with 152,639 residents, comprises 6.4% of Dallas County's population
(2) South Dallas has the largest percentage of residents 65 years of age and older: 12%
(3) African American is the majority racial group, 70%; Latino is 26%; Caucasian 3%
(4) South Dallas has the lowest economic indicators of all Dallas County communities, with per capita income of $13,400 and unemployment of 13.1%, 25% below FPL
(5) nearly 36% of South Dallas adults have not graduated from high school
(6) In 2009 the homicide rate in South Dallas was 31.9/100,000, which is nearly four times the Dallas County average (Methodist Dallas Medical Center, 2013)
(7) South Dallas has the highest rate of uninsured residents and a higher rate of many diseases compared to the Dallas County (Parkland Health & Hospital System, 2011).

Furthermore, regarding public health, South Dallas represents alarming issues; for example, ZIP Codes 75210 and 75215 have the highest percentage of breast cancer incidents and mortality rate in Dallas County (Please see figures, 19, 20, and 21). South Dallas has been a focus of community outreach, funding priorities, and cancer awareness programs since 2006 (Komen, 2014).

Second, the nature of the current environmental justice advocacy in the South Dallas neighborhoods is new and evolving, while environmental advocacy in West Dallas has been going on since the 1970s, currently led by the West Dallas Coalition for Environmental Justice. Although there are examples of residents in South Dallas mobilizing and taking action against environmental disparities in different areas,[1] EJ advocacy in South Dallas has not yet been able to reach out to the larger community and enter into the planning and policy discourse. However, it should be mentioned that, based on the socioeconomic statistics in South Dallas, it is not surprising that environmental (in) justice and even public health issues do not have priority in either planning documents, media, or even among the residents. A more detailed description and analysis of people's perception of health threats is provided in the section 4-4.

The only planning document at the local or regional scale to recognize EJ populations in Dallas is the North Central Texas Council of Government's (NCTCOG) study on "Nondiscrimination in Transportation Planning," which introduces an EJ index calculated based on three variables: population density of the block group, percent below poverty, and percent minority (NCTCOG, 2013). This EJ index is a methodology used to illustrate the concentration of EJ populations using demographic data mainly as a mean to compare different areas at a regional scale (NCTCOG, 2013). This index is available at block group based on the data from 2009-2013 American Community Survey five year

[1] For example a group of African-American and Hispanic owners and occupants of homes in the Cadillac Heights neighborhood filed a law suit against the city of Dallas for racial discrimination in the provision of municipal services (Justia US Law, 2009); the Clean South Dallas: Making South Dallas More Beautiful Fair Park initiative started in 2012 with the goal of restoring two main historic buildings and now has expanded its mission to improving environmental health; in 2011 a group of students at Paul Quinn College (PQC) successfully organized the "we are not trash movement" campaign in the Highland Hill neighborhood in South Dallas that opposed the city's plan for expanding the adjacent landfill.

estimates (NCTCOG, 2013). However, environmental disparities and health data are not employed in identifying EJ populations. This study suggests the use of this EJ index for initial screening and as a tool for further research. The figure below shows the EJ screening map created by NCTCOG. The EJ scores are displayed in intervals of 10, from 1 to 100.

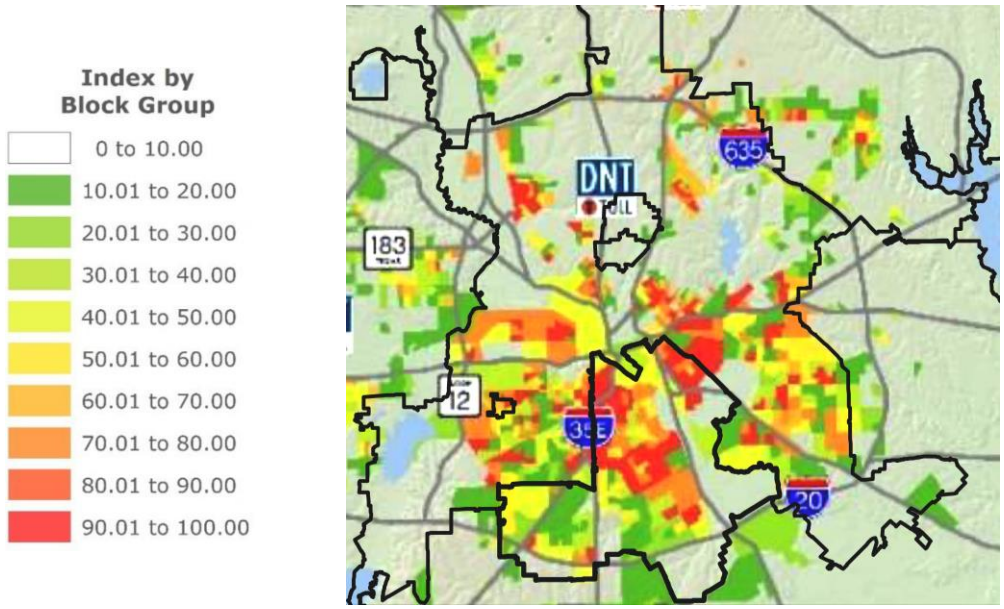


Figure 14 Environmental Justice Index, City of Dallas

Source: NCTCOG, 2013

Although an EJ index based only on socioeconomic factors is inconclusive at best, as discussed in section 2-3, historically race has been the most important aspect of the environmental justice movement. And in the case of South Dallas, its population has always been predominantly African-American and Hispanic.

Looking at population and racial profiles in regions such as Dallas is particularly important because past policies especially regarding residential segregation have had inevitable effects on current environmental and health inequalities, an issue that has been discussed by many scholars (Gee & Payne-Sturges, 2004; Morello-Froscha &

Lopez, 2006). Therefore concepts such as structural racialization and institutional racism are inseparable parts of environmental justice discourse.

Moreover, as Frederick Douglass (1877) (see McKivigan & Kaufman, 2012) puts it, each city has its distinct characteristics that leave their print on the outside and the inside of a city. There are however, broad national and regional policies that change the shape of cities to an extent that even after decades the remnant image will still mirror the conflict-marred context (see Phillips, 2006). Racial zoning/steering, and redlining are among such policies that even today define the urban fabric, mainly through the neighborhood profile and accessibility (please see Charles Abrams's 1955 book *Forbidden Neighbors* and Lawrence Vale in *From the Puritans to the Projects,* (2000)).

Figures 15 shows the Home Owner's Loan Corporation map of Dallas in 1937. The historically redlined areas now located in south and southwest Dallas represent between 40 to 60 percent poverty and they have predominantly African-American and Hispanic populations. Other reports show that the residents in South Dallas (mostly African-Americans) face between 7-11 years of potential life lost on average (Parkland Health & Hospital System, 2011). Overall the child opportunity index is the lowest in South Dallas (Kirwan Institute, 2015). Figures 16 and 17 show the distribution of minority populations in Dallas based on 2010 census tract data.

To map the health status in South Dallas compared to other areas in the city, I acquired the data from Behavioral Risk Factor Surveillance Surveys (BBRFSS) and the Texas Cancer Registry. However, the acquired BRFSS data could not be used to map asthma in Dallas because a large part of the data at the ZIP Code level was suppressed for confidentiality. So here I only provide the mapping for the percentage of the uninsured

population (figure 18), cancer incidents (all sites) (figure 19), female breast cancer incidents (figure 20), and lung and bronchus cancer incidents (figure 21).

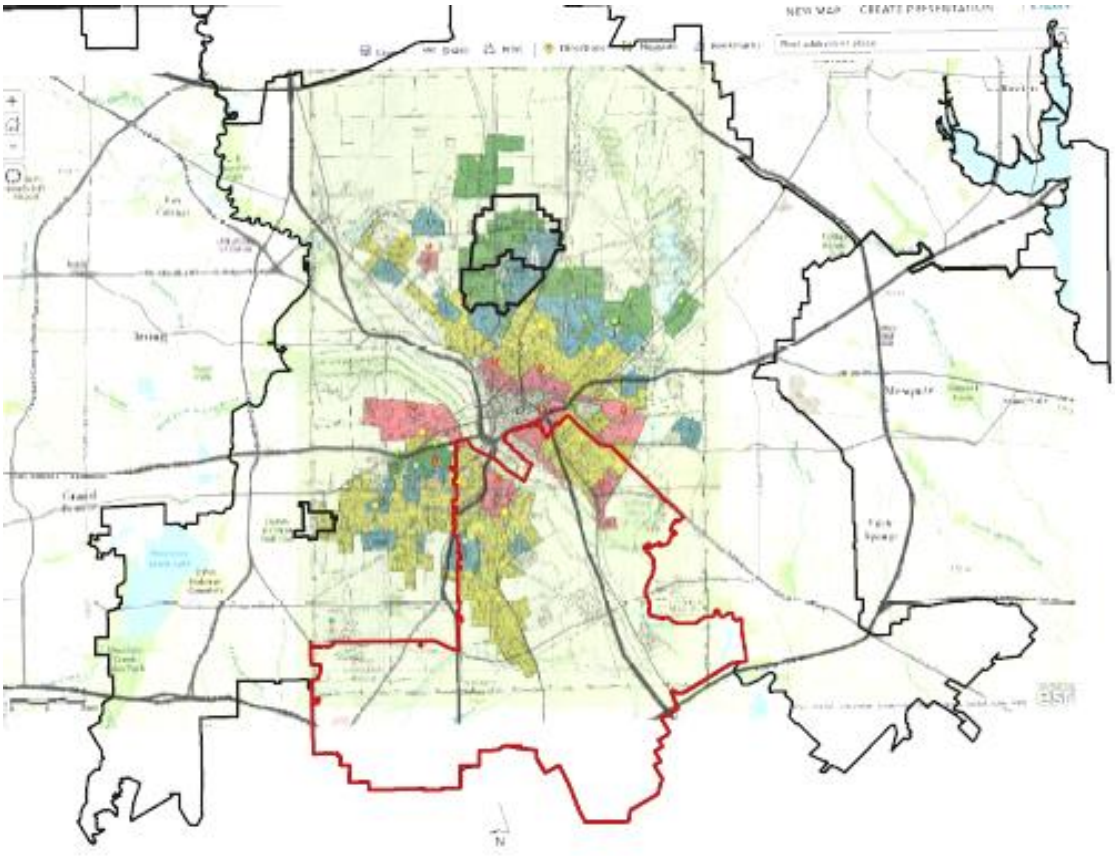


Figure 15 South Dallas location in the Home Owners' Loan Corporation (HOLC) appraisal report map in 1937

Source: Based on http://kirwan.maps.arcgis.com

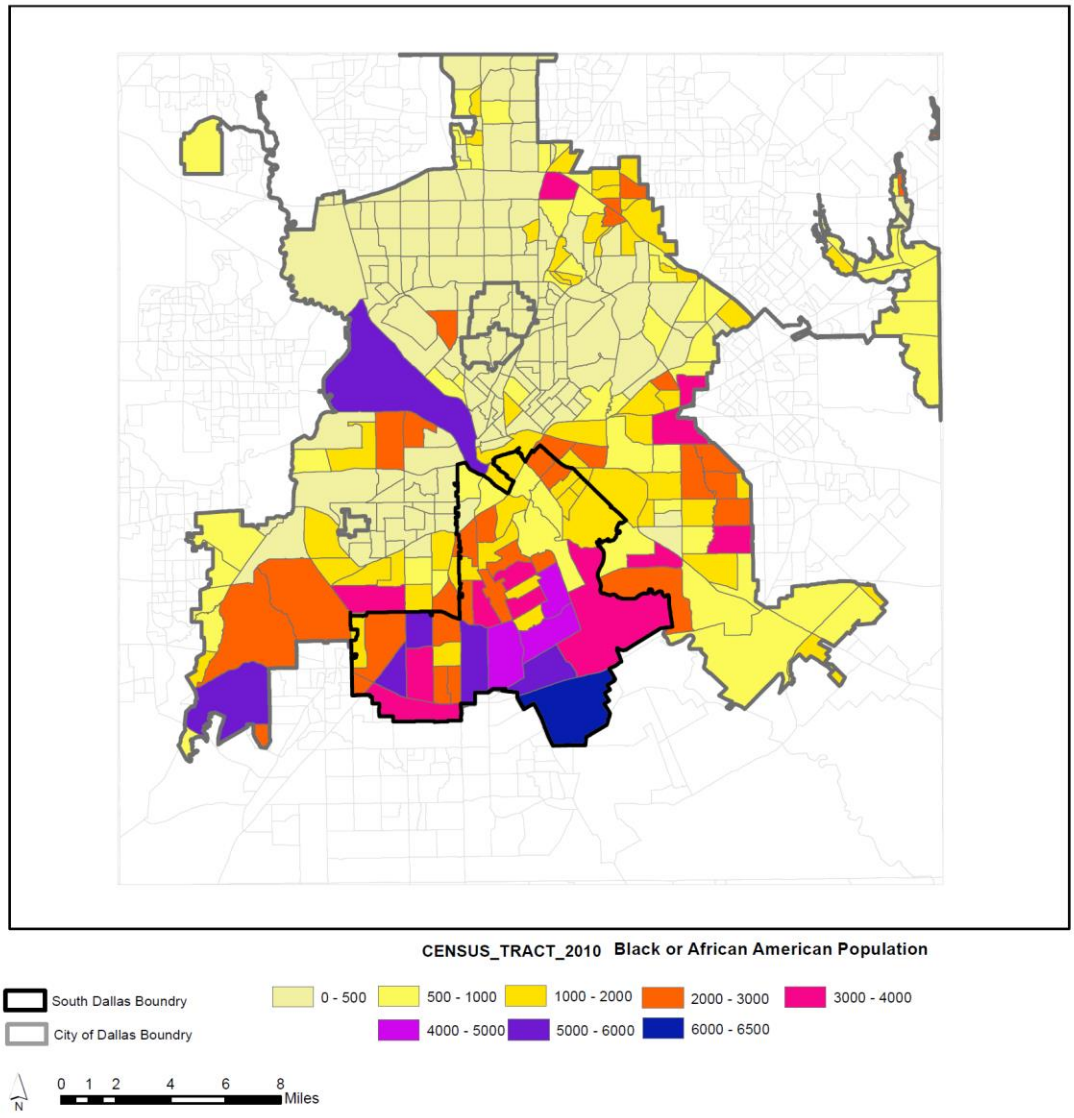


Figure 16 Census Tract 2010, African-American Population

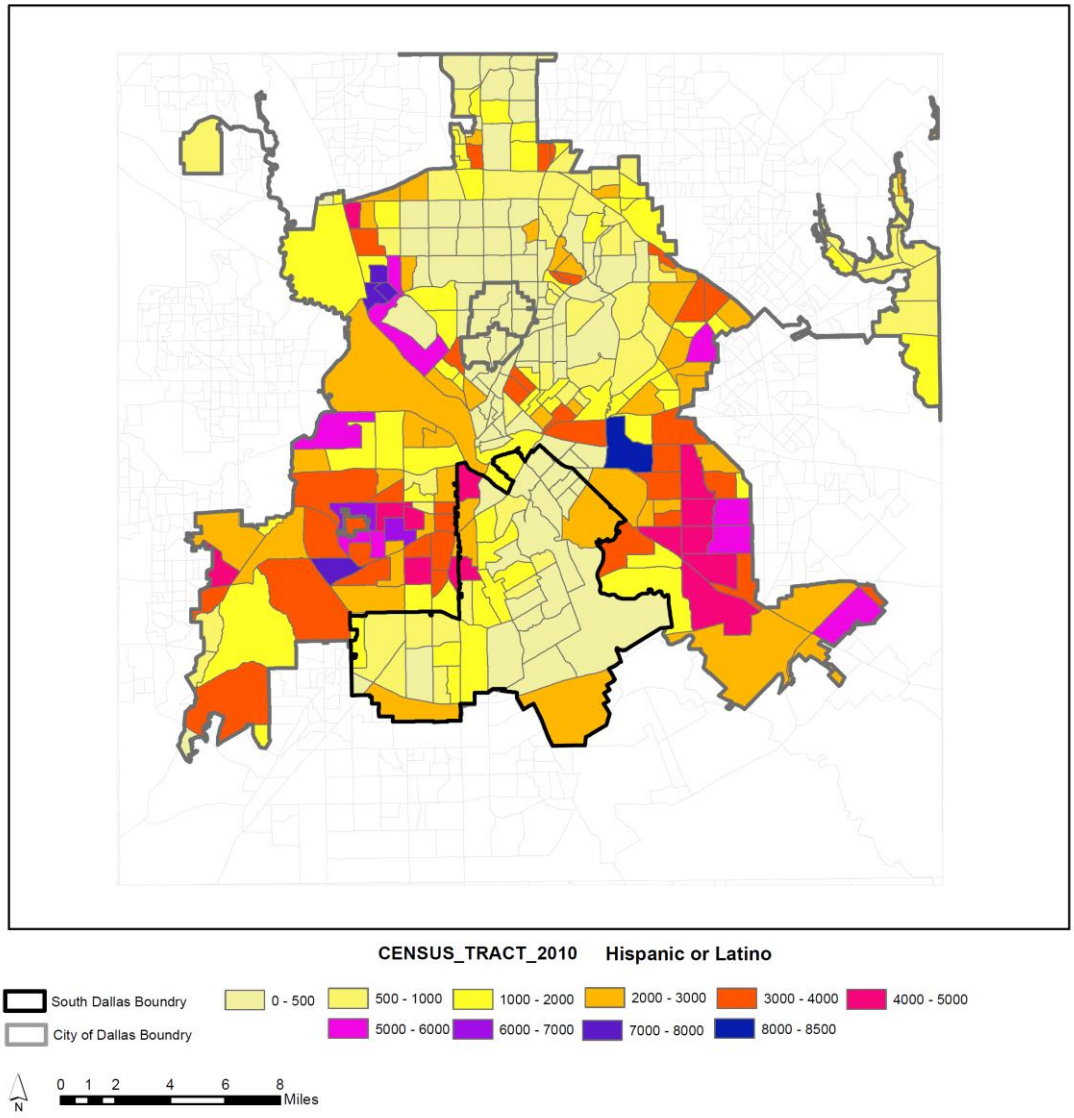


Figure 17 Census Tract 2010, Hispanic or Latino Population

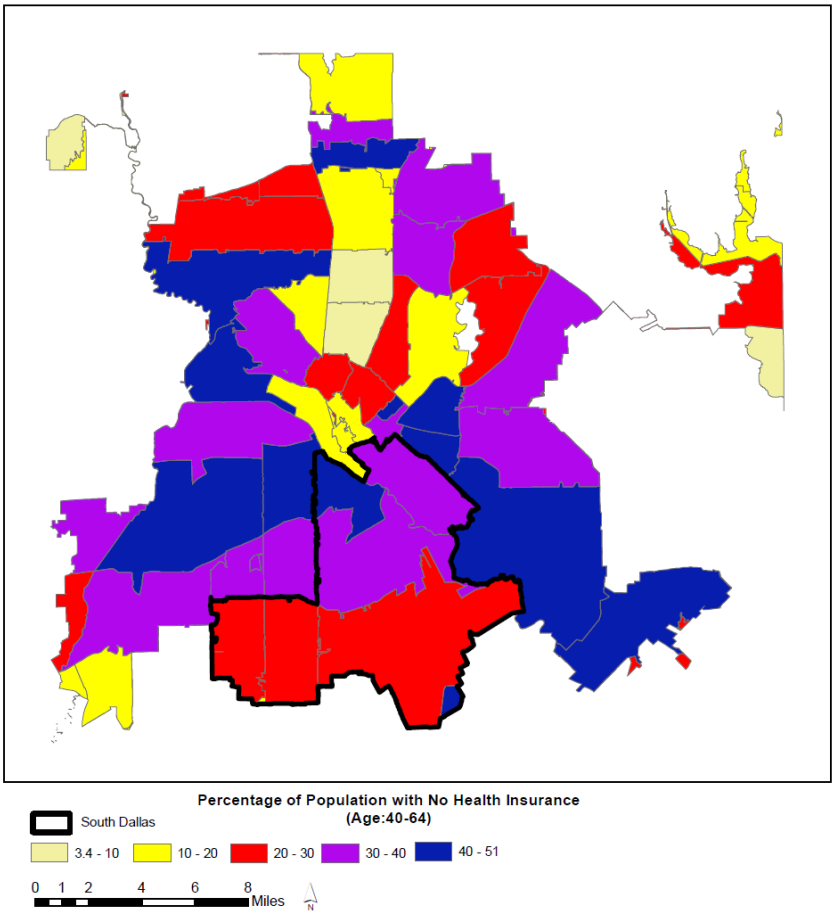
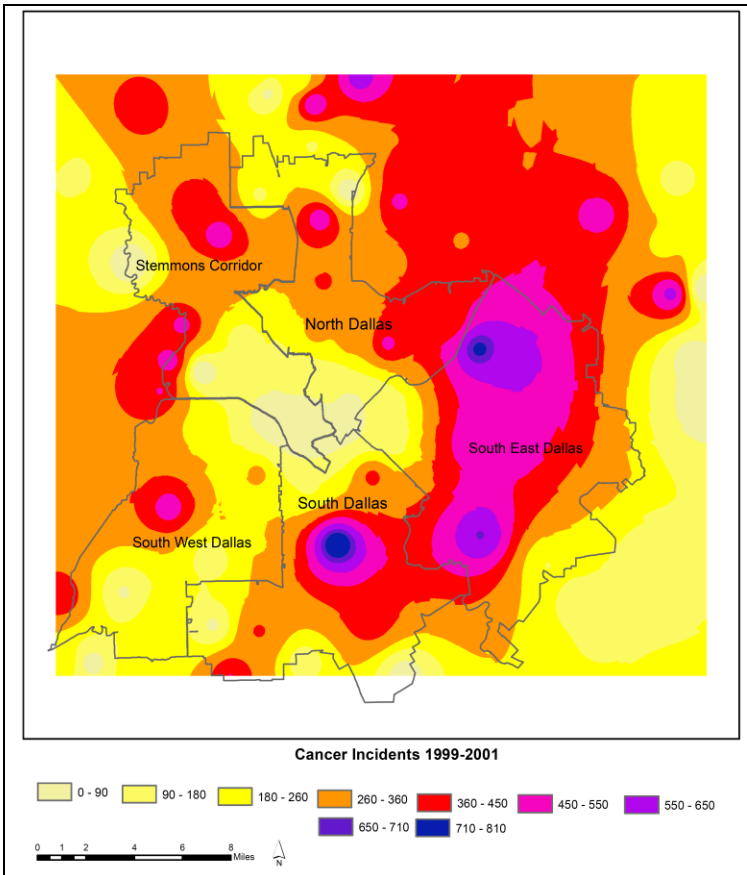
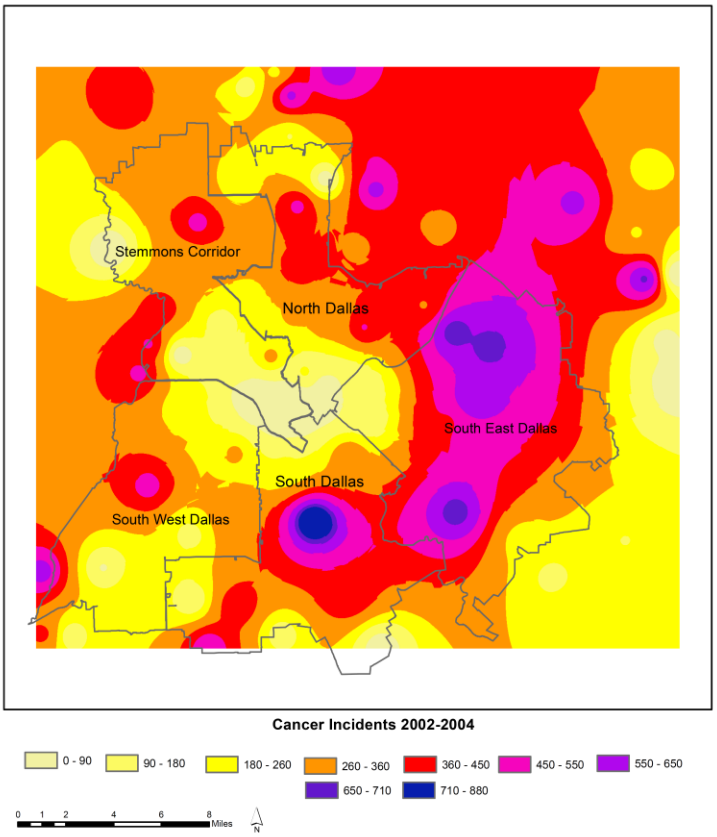


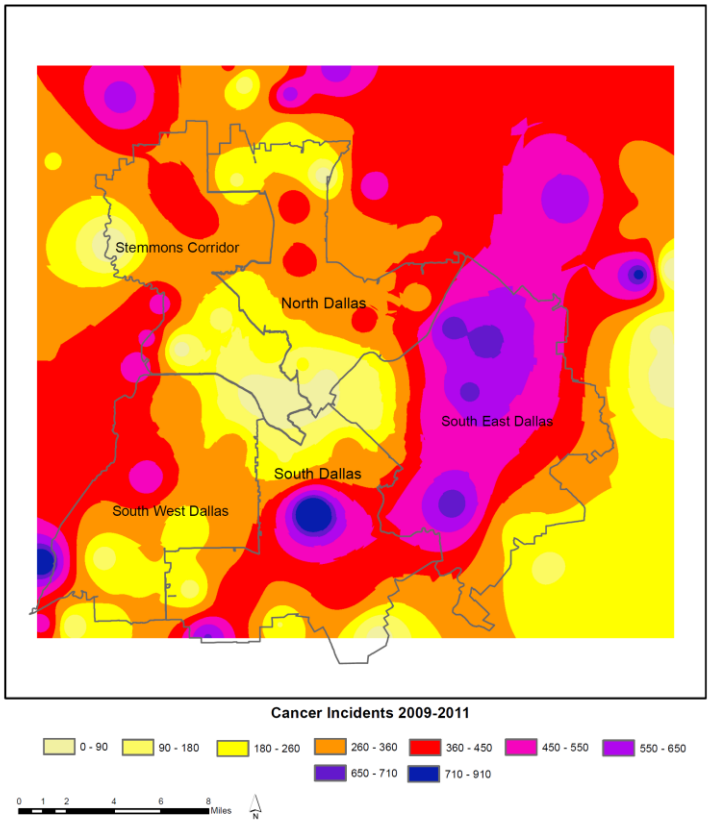
Figure 18 Percentage of Population with No Health Insurance

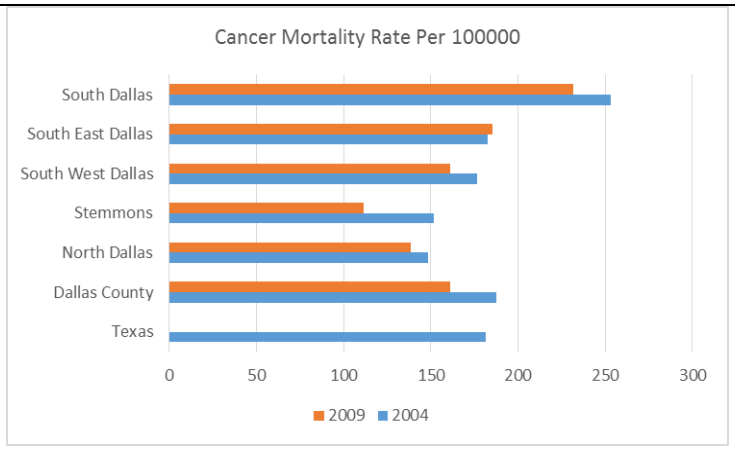
Source: Komen, 2014

It should be mentioned that in 2011, 16.6 percent of the population (between the ages of 40-64) had no health insurance while the percentage in Texas and Dallas County were, respectively, 24.7 and 29.1 percent. Also the Community Need Index (CNI) is the highest in South Dallas and Southwest Dallas and is 4.7 out of 5. The Dallas County average is 3.9 (Methodist Dallas Medical Center, 2013). The following maps show cancer incidents in the city of Dallas and figure 22 shows the toxic release points in the city of Dallas.





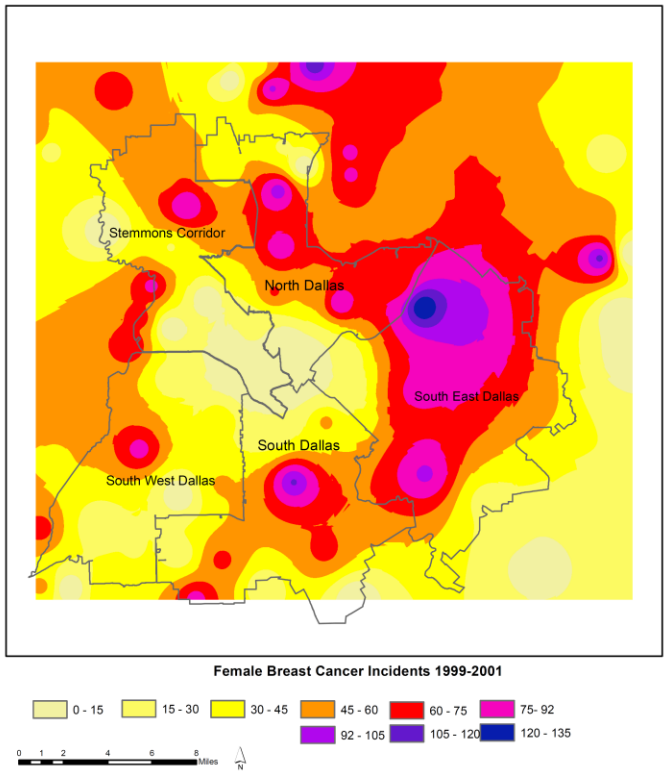


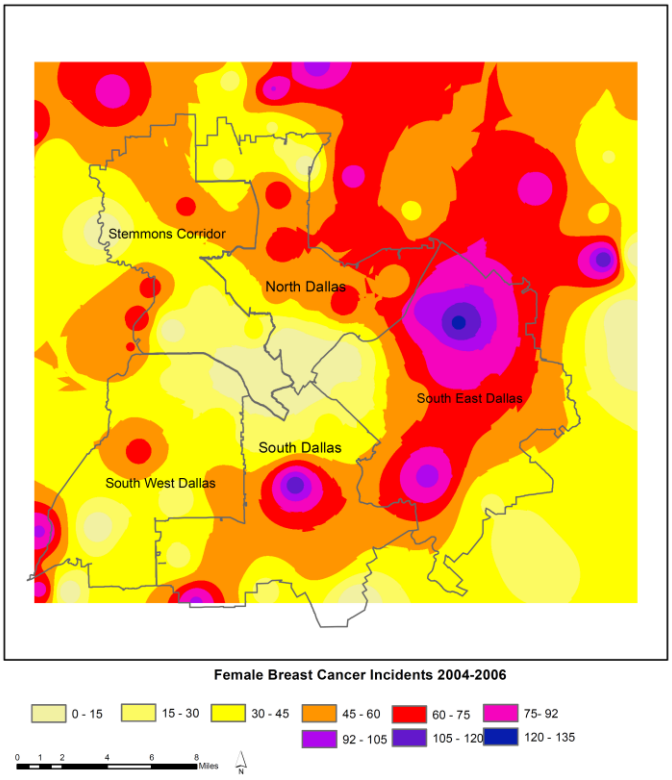


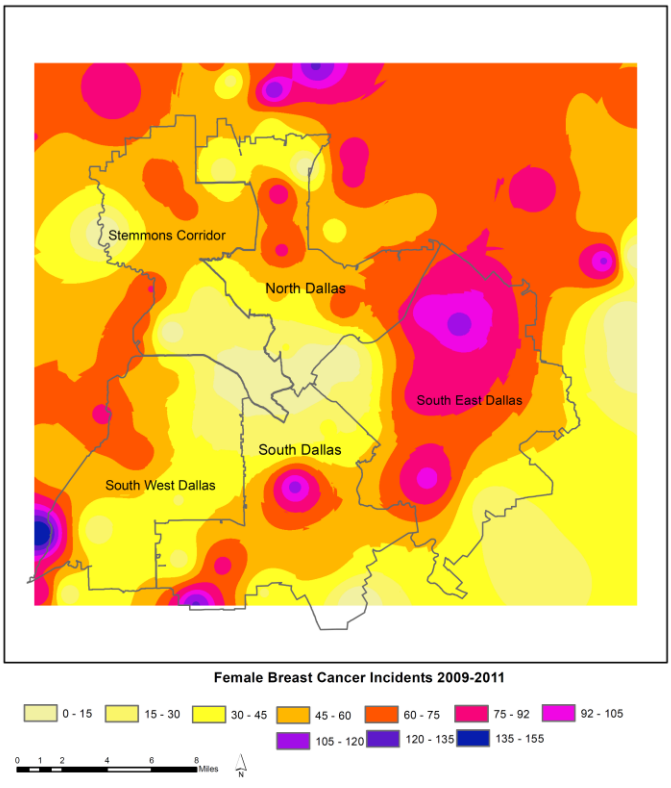
Source: Parkland Community Health Institute, 2013

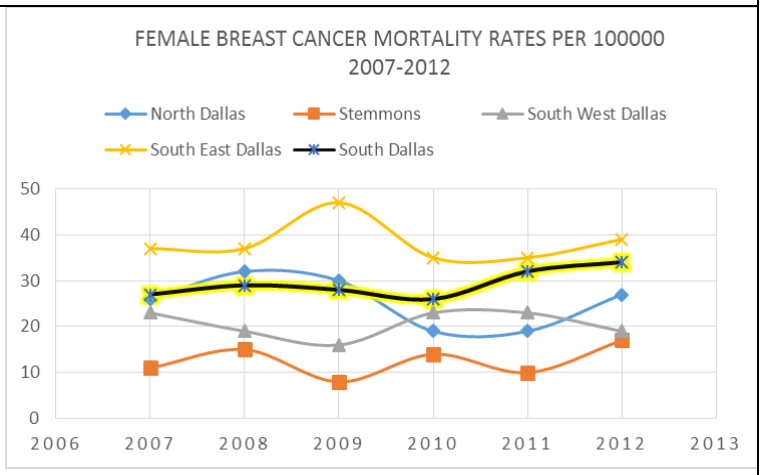
Source: Based on Cancer Registry Data

Figure 19 Cancer Incidents and Mortality Rates in Dallas





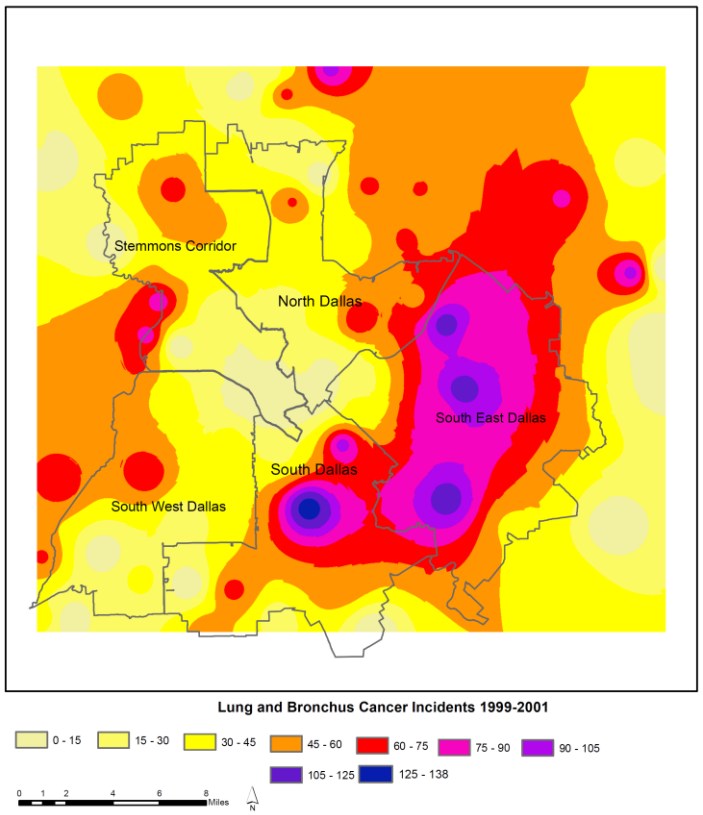


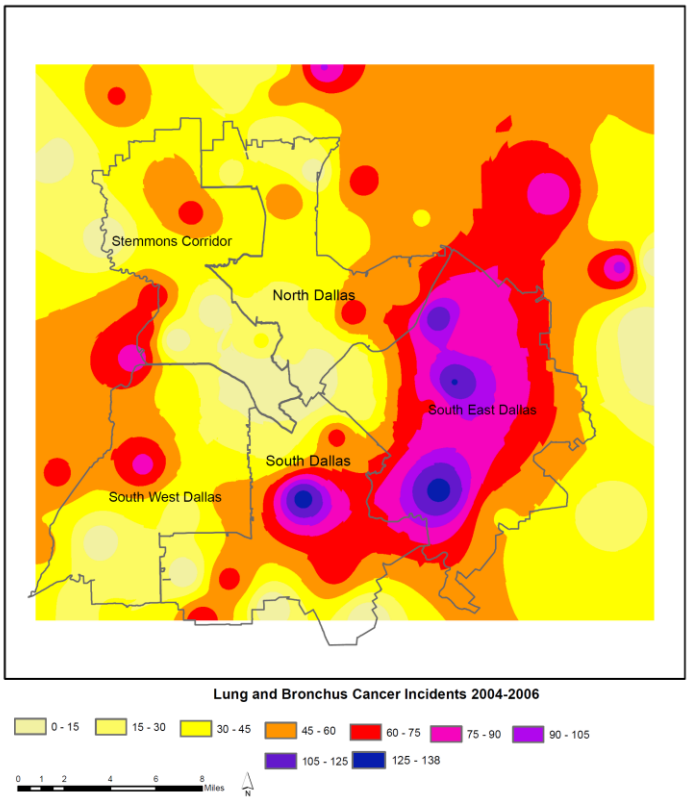


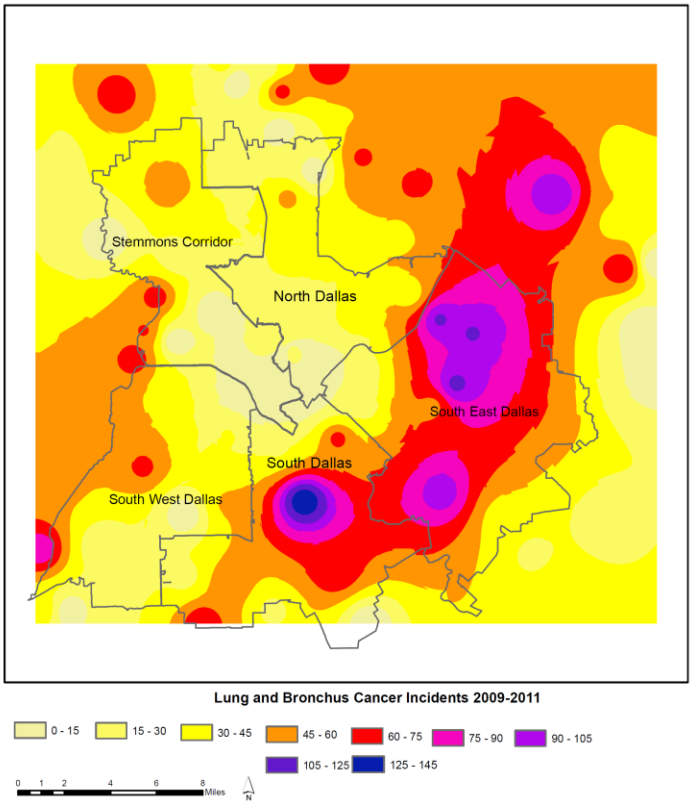
Source: Komen, 2014

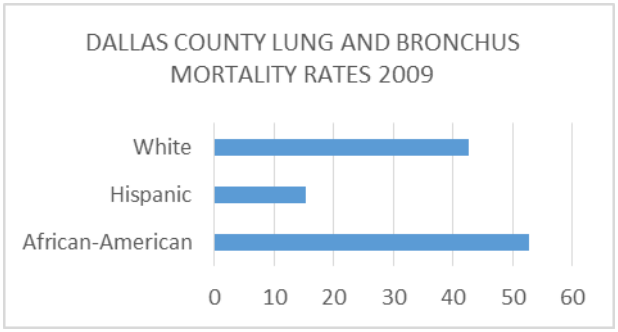
Source: Based on Cancer Registry Data

Figure 20 Female Breast Cancer Incidents and Mortality Rates in Dallas









Source: Methodist Dallas Medical Center, 2013

Note: The African-American lung cancer age-adjusted mortality rate (AAMR) is higher than the rate of any other cancer type in any population.

Source: Based on Cancer Registry Data

Figure 21 Lung and Bronchus Cancer Incidents in Dallas

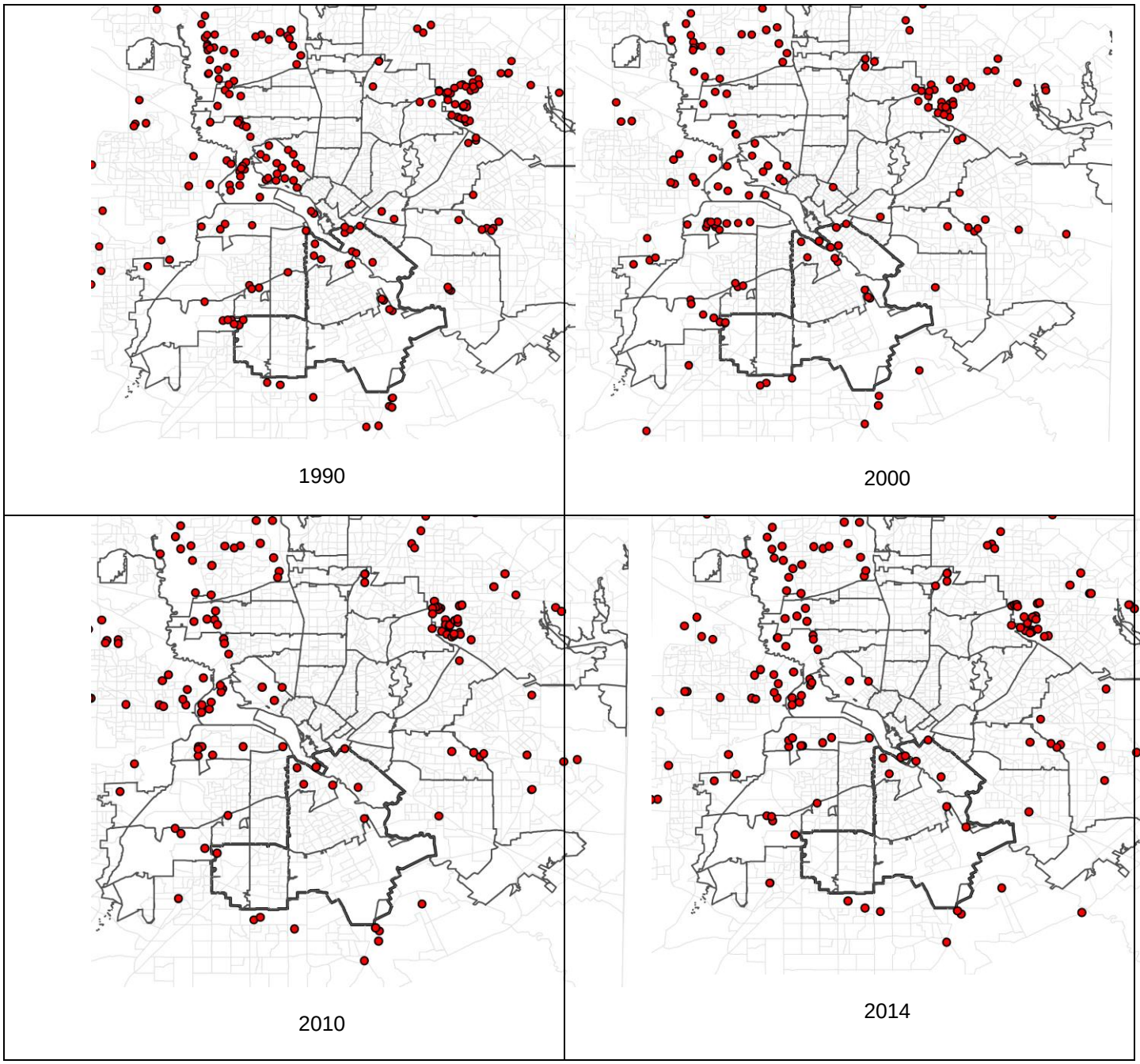


Figure 22 Toxic Release Points in Dallas, 1990-2014

Source: Toxics Release Inventory (TRI)

4-2) Jamaica Plain Neighborhood in Boston

Jamaica Plain neighborhood (JP) transformed from a farming community into a suburb during the nineteenth century (Boston Landmark Commissions, 2001), and today it is one of the most diverse and dynamic neighborhoods in Boston. JP has a long history of community activism beginning in the 1970s. The recent grass roots movements are centered on health issues and equity. Among the most influential organizations dedicated to EJ are the Neighborhood Pesticide Action Committee, Jamaica Plain Neighborhood Council, and Friends of Jamaica Pond.

According to a Neighborhood Pesticide Action Committee study in 2009, JP is one of the "24 most environmentally overburdened communities" among the state of Massachusetts's 362 communities (Neighborhood Pesticide Action Committee (NPAC), 2009, p. 8). Another study on the unequal distribution of environmental hazards suggests that JP has "more active hazardous waste sites" than the other 348 communities in Massachusetts (NPAC, 2009, p. 12). Based on the Analysis of the Massachusetts Institute of Technology and Boston Public Health Commission, there is a one-square-mile section within the JP neighborhood that is burdened with over three-quarters of all the neighborhoods' environmentally hazardous sites (including 76 unremedied hazardous waste sites) and has been identified as "a hot spot of environmental risk" (NPAC, 2009, p. 12).

Moreover, the population profile of the JP neighborhood, which represents the sixth largest percentage of people of color and ethnic minorities in the state, makes this case an interesting environmental (in) justice case study in this research. JP ranks as the community with the sixth largest percentage of people of color in the state. Fifty percent of the population are ethnic minorities, and 21 percent of the population live below the poverty level. The asthma hospitalization rate among children ages five and under living

in Jamaica Plain is 20 percent higher than the overall Boston rate (NPAC, 2009; Boston Behavioral Risk Factor Surveillance Surveys. 2010 and 2013). Figure 23 shows the neighborhood in the city of Boston, and figure 24 shows the HOCL map in 1937, where the historically red-lined area in Boston is adjacent to the current JP area.

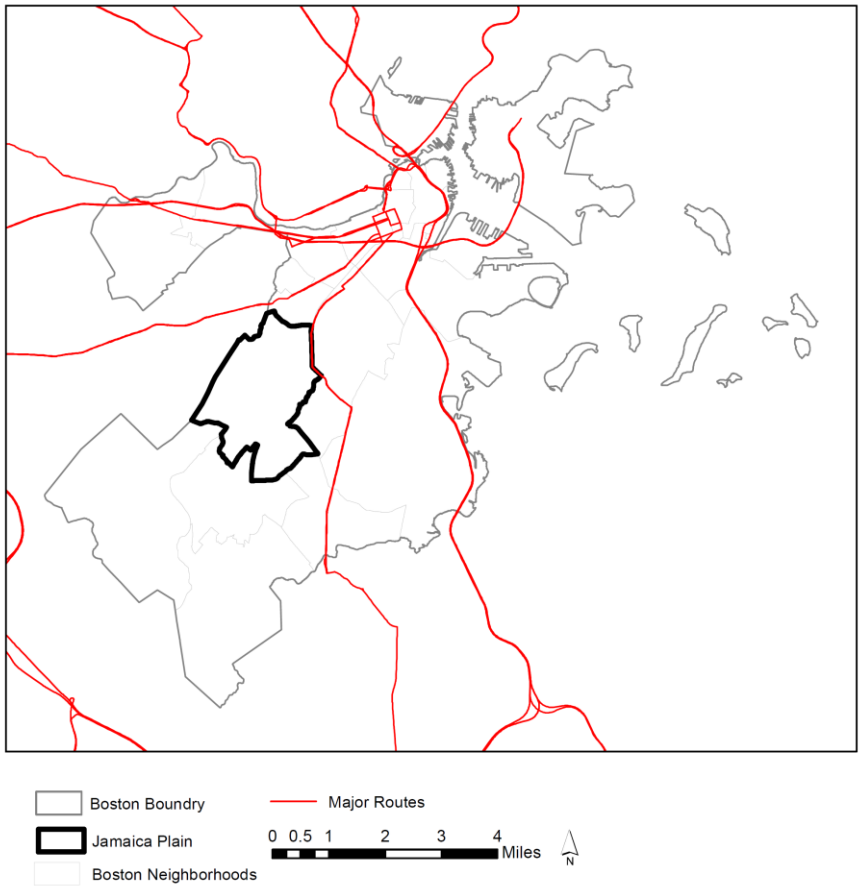


Figure 23 Jamaica Plain Neighborhood

In Massachusetts, EJ populations are identified by the state's Executive Office of Energy and Environmental Affairs (EEA) Environmental Justice (EJ) Policy and it is an integral part of all EEA's programs (Executive Office for Administration and Finance, 2016). The criteria used to create the EJ population maps are: high-minority, non-English speaking, and/or low-income populations, and EJ populations are block groups where the

median annual household income is at or below 65% of the state median, 25% of residents are minorities, 25% are foreign-born residents, or 25% are non-English speakers. Based on these statistics, 70.8% of the Boston block group are EJ populations (please see figures 25 & 26).

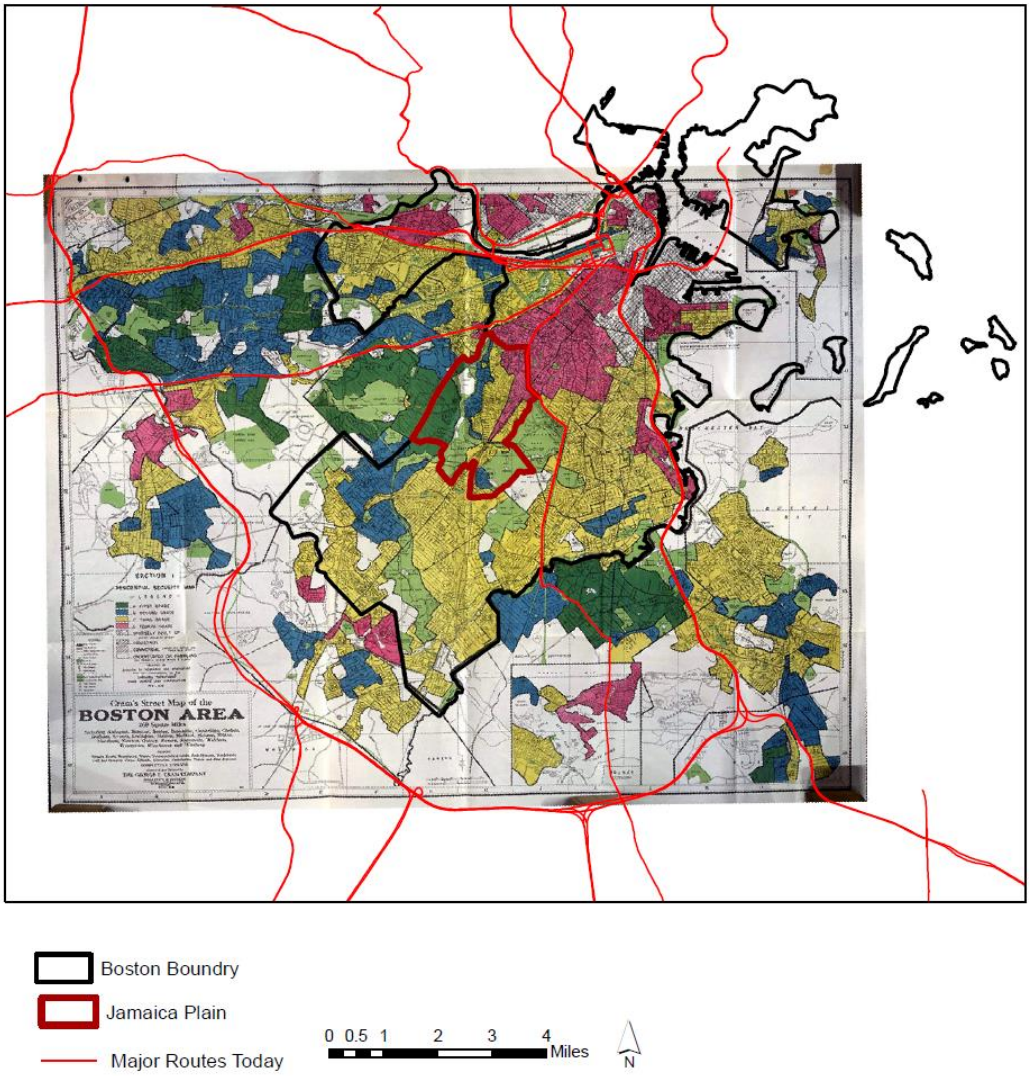


Figure 24 Jamaica Plain's location in the Home Owners' Loan Corporation (HOLC) appraisal report map in Boston, 1937

Source: Based on http://kirwan.maps.arcgis.com

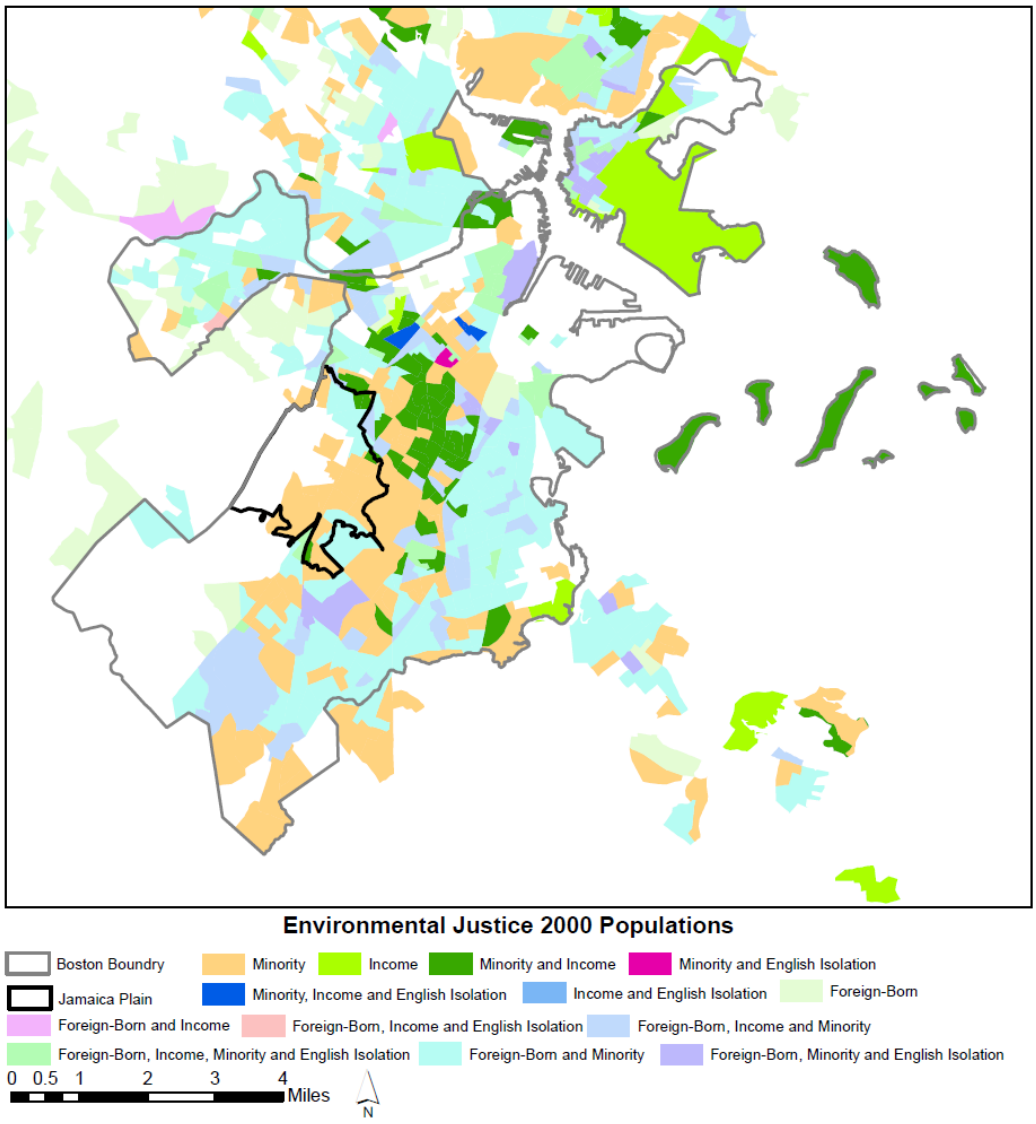


Figure 25 Environmental Justice 2000 Population, Boston

Source: Based on MassGIS Data

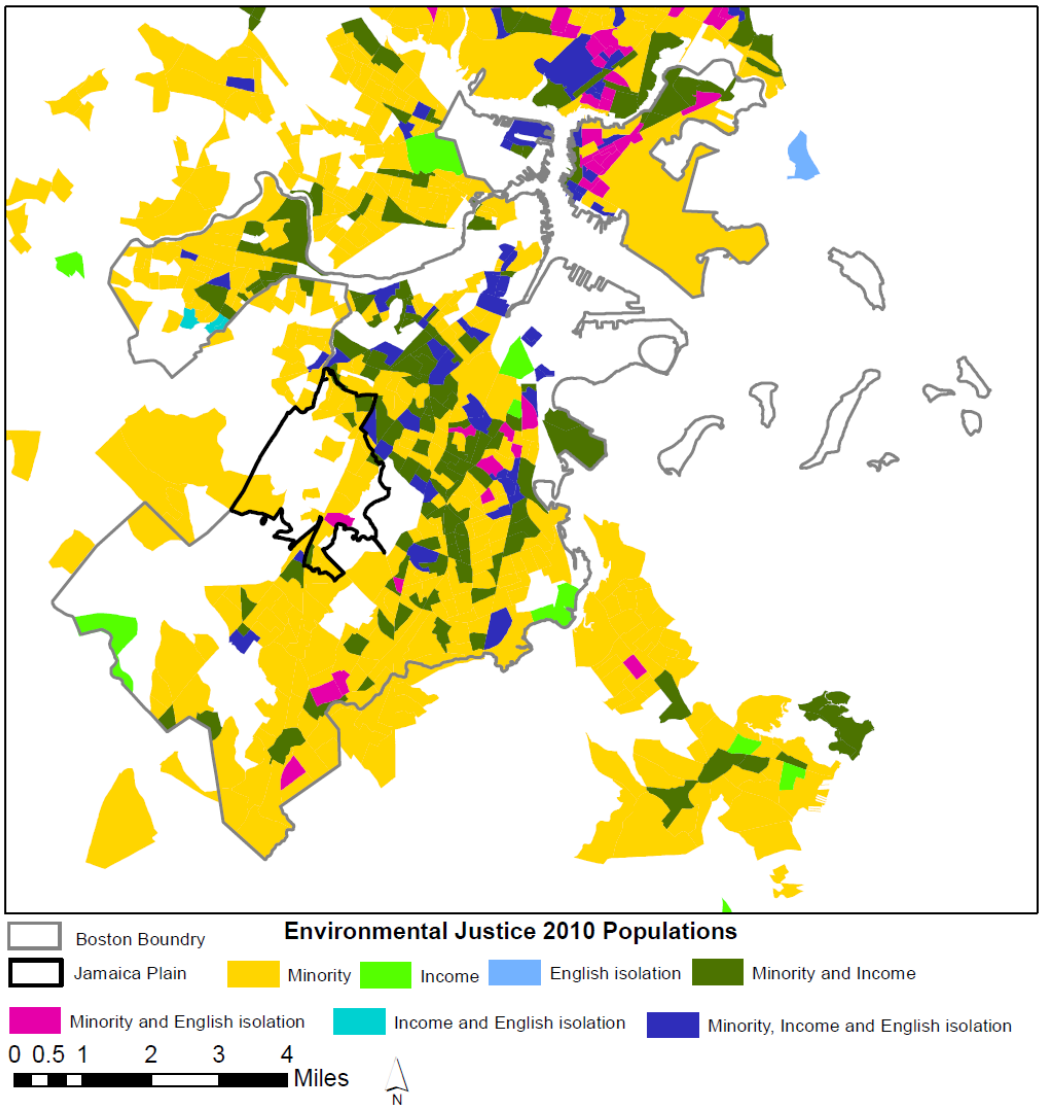


Figure 26 Environmental Justice 2010 Population, Boston

Source: Based on MassGIS Data

Figure 27 shows asthma rates in different parts of the city. Although JP is an identified EJ population, and the rate of asthma is higher in this neighborhood, according to BBRFSS (combined data of 2010 and 2013), almost 93 percent of the female population in the neighborhood receives Pap test cancer screening.

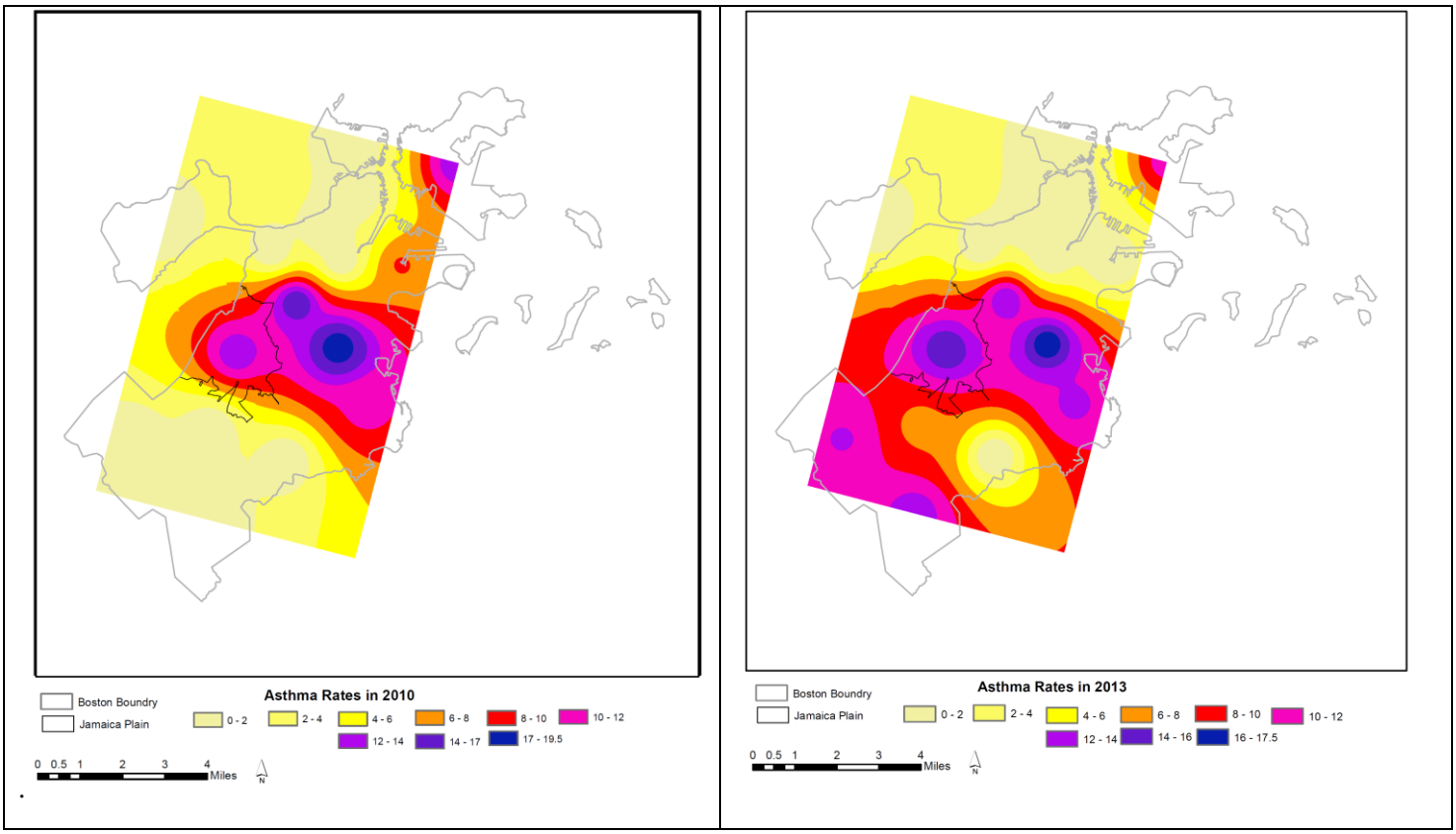


Figure 27 Asthma Rates in Boston

Source: Based on Boston Behavioral Risk Factor Surveillance Surveys (BBRFSS), 2010 & 2013

4-3) Environmental Justice Policy Context in Dallas, Texas, and Boston, Massachusetts

The overall policy atmospheres of Texas and Massachusetts have created radically different contexts for environmental justice related policies. In Texas, the first milestone in environmental justice policy was the establishment of Environmental Equity Program in 1993 by the Texas Commission on Environmental Quality. Improving citizen participation, addressing allegations of injustice, and promoting environmental quality in communities were the foundations of the program (Bonorris, 2010). Additionally, in Texas

under the Clean Water Revolving Fund and the Drinking Water Revolving Fund, projects are required to comply with executive order 12898 (Bonorris, 2010).

Massachusetts, on the other hand, is among the few states that have adopted an environmental justice policy which is an integral part of all energy and environmental related programs. The concept of “EJ populations” was introduced as an outcome of the state environmental justice policy and it is defined as “those segments of the population that EOEEA (Executive Office of Energy and Environmental Affairs) has determined to be most at risk of being unaware of or unable to participate in environmental decision making or to gain access to state environmental resources” (Environmental Justice Policy of the Executive Office of Environmental Affairs, 2002. p. 5). This policy requires specific services to be provided for these populations (e.g. EJ training, enhanced public participation and engagement, creation of open spaces, and expedited clean up). Several other programs such as “Smart Growth / Smart Energy”, “Urban Forestry Environmental Justice Pilot Grant” and “Beyond 2000: Solid Waste Master Plan” programs have strong environmental justice components.

EJ-related legislations introduced by each state’s representatives can be used as a measure of attention. Figure 28 shows the number of environmental justice-related bills introduced (as a measure of attention) by both Texas Democrats and Republicans in Congress. None of the three enacted bills (all introduced by Republican representatives) from 1980 to 2014 are focused on EJ; however, in one section, they all state that the funds should not contravene Executive Order No. 12898 (please see section 2-2-1 for a background on this executive order). On the other side, Texas Democrats pushed for a Neighborhood Rail Accountability Act (introduced three times between 2003 and 2008) and identifying any disproportionate negative impacts on any socioeconomic population.

Other bills suggested a study on proximity of hazardous waste sites to federally assisted housing (2001) and increased funding for environmental justice activities (2014).

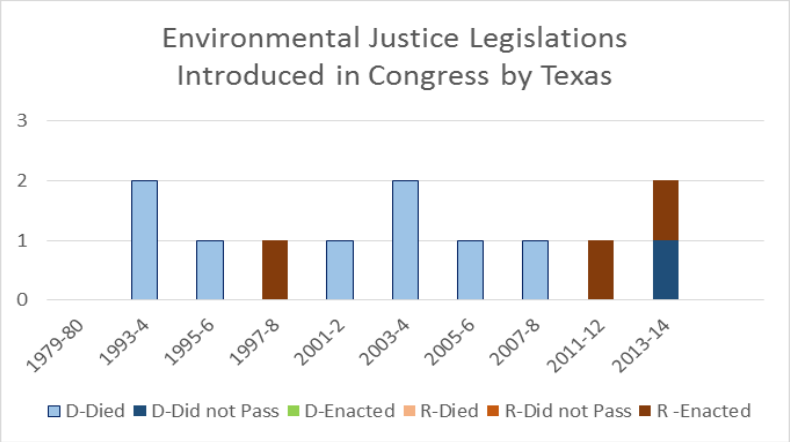


Figure 28 Environmental Justice Bills introduced in Congress by Texas Legislators.

Source: Based on the Data Available at www.congress.gov

Although many bills were introduced by representatives from Massachusetts during the same period, (e.g. on environmental policy, biodiversity, and pollutant liability), since none of them explicitly use the phrase ”environmental justice” or focus on the issue of disproportionate impact on different populations, they are not presented here.

Figure 29 shows the number of environmental justice-related bills introduced in Texas. It should be mentioned that most of these bills are related to the issues of landfills and toxic waste, including restrictions on high-impact siting of solid waste management facilities and consideration of the environmental justice community before facility siting. The most comprehensive EJ bill introduced in 2007, suggested that each state agency should develop an environmental justice strategy for the entire agency. However, from 2011 to 2013 most environmental related bills were focused on transferring some of the functions of Texas Commission on Environmental Quality to the

Public Utility Commission of Texas, particularly those that were considered “economic” decisions.

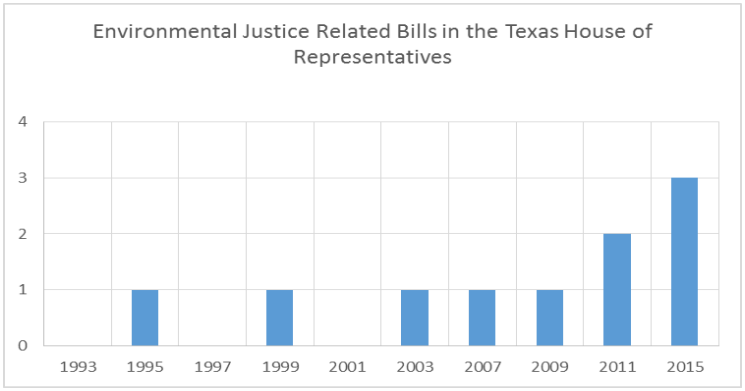


Figure 29 Environmental Justice Related Bills in the Texas House of Representatives. Source: http://www.house.state.tx.us

Figure 30 shows the number of environmental justice related bills introduced in Massachusetts. In Massachusetts, EJ policy is created according to the Environmental Justice Policy of the Executive Office of Environmental Affairs in 2002. The opening of this document quotes parts of the state’s constitution which recognizes environmental justice as a right of the residents. In 2014 a new Executive Order on Environmental Justice was issued. This new executive order establishes a “new framework for implementing EJ within EEA and across multiple state agencies” (Richmond, 2015). This executive order, which is developed based on the 2002 version, has more procedural and substantive requirements for the projects that can potentially affect EJ Populations (Richmond, 2015). Based on this information it can be concluded that environmental injustice although a more prominent issue in Texas has received more legislative attention in Massachusetts.

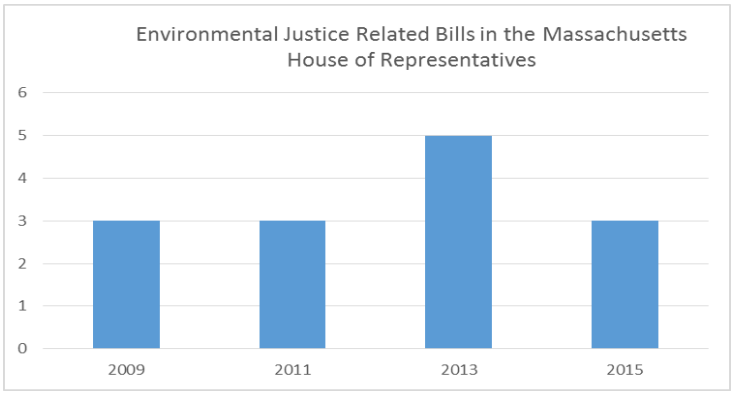


Figure 30 Environmental Justice Related Bills in the Massachusetts House of Representatives

Source: https://malegislature.gov

In the next step, I look at the coverage of environmental justice issues in Dallas and Boston. In the case of Dallas I analyzed the following newspapers: *Dallas Morning News* (1990- 2016), *Dallas Observer* (2005-2015), *Dallas South New* (2010-2015), *North Dallas Gazette* (2000, 2015); and for Boston I reviewed the archive of the following newspapers: *Boston Globe* (1996-2015), *Jamaica Plain Gazette* (2007-2015), *Bay Windows,* and *Boston Metro*. In figures 31 and 32 I only include the results from the *Dallas Morning News* and *Boston Globe* because in other publications environmental justice coverage is almost nonexistent. However, it should be mentioned that the issue of inner-city pesticide use was covered by the *Jamaica Plain Gazette* a few times in 2000 and 2005 and today the Neighborhood Pesticide Action Committee (NPAC) is one of the Gazette's resources.

As for Dallas, as figure 31 shows, during the 1990s lead smelters in West Dallas received a lot of attention that led to a series of clean ups. In recent years the divide between north and south Dallas in terms of opportunities, gentrification, and economic development has been the major focus. Also since 2014 the issue of this area being a

food desert has been discussed in the *Dallas Morning News* a few times. Also, the urban farm located in the Bonton neighborhood has been featured five times since 2015.

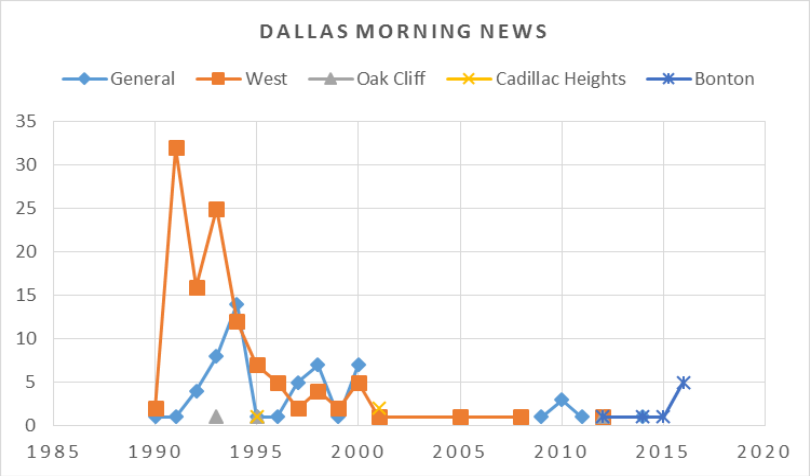


Figure 31 Environmental Justice Coverage in Dallas Morning News

Source: http://www.dallasnews.com/archive/

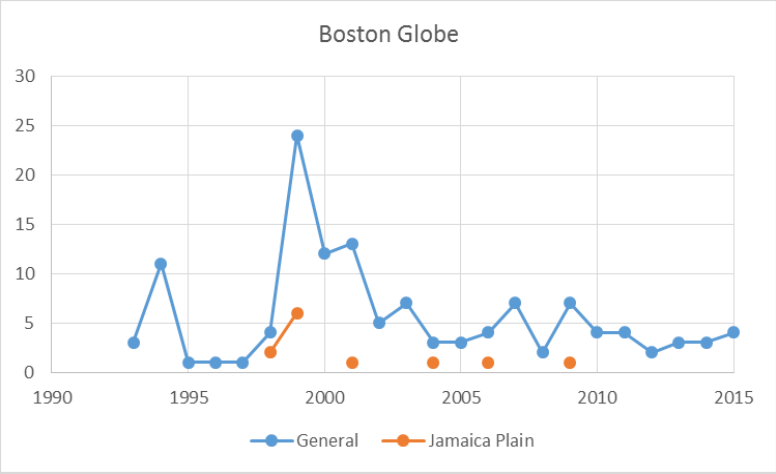


Figure 32 Environmental Justice Coverage in Boston Globe

Source: https://secure.pqarchiver.com/boston/advancedsearch.html

In 2012, the City of Dallas announced a comprehensive strategy for economic development in the southern part of Dallas, which led to the Growsouth Initiative with the goal of creating vibrant and healthy neighborhoods. The important measures used in the

annual progress report (all socioeconomic) are measures of commitment (e.g. population leaving the neighborhood), resilience (e.g. high school graduation rate), and amenities (e.g. crime rate). All of these measures are used to study each area's potentials for future investment and development. EJ populations are not identified or adopted from other plans (see figure 14), and the only environmental justice related themes in the plan are improving the status of food deserts. The concepts of creating Dallas Trinity Park and bringing more nature trails to the southern parts of Dallas are the only environmentally focused plans in South Dallas, and these are funded through private donors (Formby, 2015). Another recently compiled document is "Neighborhood Plus" which along with socioeconomic profiles, looks at the walkability and health status in different parts of the city and focuses on themes such as equity and improved quality of life and the importance of collective impact through collaboration and partnerships (Neighborhood Plus, 2015).

Given that different policy contexts and discourses can foster different perceptions of health and well-being among the residents, in the next section, drawing on two surveys conducted in South Dallas and JP in Boston, I attempt to map different perceptions of health and the perceived relationships between environmental health and human health.

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4-4) Environmental Justice Attitudes and Health Perception

In this section I investigate the perception of environmental risks and health issues in the Jamaica Plain neighborhood in Boston and in South Dallas (ZIP Code 75215). For this purpose a questionnaire was designed (please see Appendix C) and distributed among the participants. The results of this survey were later used to design the questions and a set of activities for the PGIS mapping session (please see Chapter 5). For this data collection I used a non-probability sample because of time limits and cost.

In the case of South Dallas a total of 50 residents completed the survey, which has only one open-ended question about their perception and definition of health. The participants were recruited through door-to-door survey (in Bonton neighborhood) and also by using flyers at a local library. It should be noted that all the participants were over 18 years old and their permanent address was within Dallas' 75215 ZIP Code. Table 4 shows the characteristics of the participants.

I answered the questions and assisted those who needed help completing the survey; for example I read the question for those who requested it. The first set of questions includes items that would show one's attitude toward environmental regulations, government accountability, and the relationship between environmental health and human health. For this section of the survey the participants were asked to read a series of statements and indicate the extent to which they agree or disagree with a statement. Control questions were designed to make sure that the participant's response is consistent. Table 5 shows the percentage of participants agreeting or disagreeing with each statement. The most consensus is found for the statement "I think local environmental advocacy is important to educate people about environmental health issues," where over 60 percent strongly agreed.

Table 5 Demographic Characteristics of Participants in South Dallas (75215)

	Characteristics	**Study Participants**		**South Dallas (75215 Zip code)**	
		Numerical Value	Percentage	Numerical Value	Percentage
	Total	50		14,118	
Age	Median Age	45-54			
Gender	Female	21	42	7206	51
	Male	28	56	6912	49
Ethnicity	African American	41	82	11487	81.36
	Hispanic	3	6	2037	14.42
Education	HS Grad	15	30		
	Not HS Grad	8	16		28.7
	Some College Degree	15	30		
	4 Years of College or More	12	24		
Employment	Unemployed	7	14		21.2
	Employed (Full Time or Part Time)	27	54		
Health	Fair or Poor Health	9	18		
	Good or Very Good Health	33	66		
	Excellent Health	8	16		
	Self or Family Member has Asthma	21	42		
	Self or Family Member has Cancer	7	14	310	
Political Affiliation	Very Conservative or Conservative	8	16		
	Liberal	8	16		
	Refused to Answer	23	46		

Table 6 Percentage of Participants in South Dallas Agreeing or Disagreeing with Survey Statements (N=50)

Statement	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
I believe there are enough laws and policies to control environmental risks in the Dallas area.	22.4	14.3	32.7	30.6
When there is a really serious health problem, the government will do something about it. Until they tell me about a specific problem, I don't have to worry.	12.8	8.5	34	44.7
I believe there are no serious environmental problems in my neighborhood (e.g. Hazardous waste and air pollution)	16.3	16.3	14.3	53.1
There are environmental problems in my neighborhood and can affect human health.	49	16.3	20.4	14.3
I think life style factors like smoking and diet increase the risk of cancer more than environmental factors like pollution.	36.2	34	19.1	10.6
People can protect themselves against environmental health issues by improving their own individual life style.	49	26.5	14.3	10.2
People are in control of their health.	38.8	34.7	16.3	10.2
I rely on the media to learn about environmental issues and health threats.	27.1	25	33.3	14.6
I think local environmental advocacy is important to educate people about environmental health issues.	61.2	24.5	8.2	6.1
I am familiar with environmental justice topic.	31.2	37.5	18.8	12.5

Interestingly while 49 percent of the participants strongly agreed with the statement "There are environmental problems in my neighborhood and can affect human health," 49 percent also strongly agreed that "People can protect themselves against environmental health issues by improving their own individual life style." It should be added that based on my observations during the recruitment process (mostly rejections)

and also based on the questions that I received, I changed my approach in terms of introducing the research topic by avoiding the word “environment” or “environmental health” when possible and replacing it with health hazards very often. After employing this strategy the number of participants increased noticeably. This is while more than 60 percent of the participants strongly disagreed or somewhat disagreed with the statement “I believe there are enough laws and policies to control environmental risks in the Dallas area” and yet environmentally focused research is not appealing to the local residents and a change of discourse in this case affected the course of participation. This can be explained (at least) partially by the fact that DFW is a conservative region and historically has not been in favor of environmental regulations (please see section 4-3).

The second set of questions in the survey was designed to assess the participants’ perceptions of environmental risks. They were asked to indicate the extent of each risk factor for both themselves and their families and also for the larger community (this set of questions is adopted from White & Hall, 2015). Climate change, outdoor air pollution, and pesticides in food were perceived as a high risk or very high risk to participants and their families, respectively at 72.8 %, 63.1 %, and 60.4 % (Please see table 6). Outdoor air pollution, chemicals, and climate change were perceived as the highest risks to the community respectively at 73.9 %, 72.4 %, and 71.8 %. For all the items, the risks to the larger community were perceived to be higher than the risks to the participants and their families. The only exception was climate change, where the perceived risk to the individual and one’s family was ranked slightly higher.

The last set of survey questions provides basic socioeconomic information (please see table 4) along with a few specifically designed health questions. In terms of the source of information for environmental and health issues, 48 percent stated that they

rely on mainstream TV news channels. For this question, about 10 percent of the participants referred to religious and faith-based sources.

Table 7 Percentage of participants in South Dallas indicating that hazard is “high risk/very high risk to myself and my family”, and “high risk/very high risk to my community” (N = 50)

Risk Factors	**Community**	**Family & Self**	**Difference**
Pesticide in Food	66.6	60.4	6.2
Indoor Air Pollution	56.8	37.5	19.3
Depletion of the Ozone Layer	63.7	55.5	8.2
Sewage	67.4	56.5	10.9
Waste Incinerators	43.4	36.4	7
Climate Change	71.8	72.8	-1
Sun Exposure	62.2	57.4	4.8
Chemicals	72.4	53.6	18.8
Outdoor Air Pollution	73.9	63.1	10.8
Drinking Water	53.2	45.7	7.5
Dumping Hazardous Waste	69.5	59.1	10.4
Landfills	66.7	48.9	17.8
Lead	64.4	50	14.1

Finally, I used the participants’ responses to the open-ended question about the definition of health and the state of being healthy to map their perceptions on a diagram, which shows the main stages of evolution in public health perception and discourse (please see figure 34 at the end of this section). But prior to that I explain the results of the survey conducted in the Jamaica Plain neighborhood. In this case a door-to-door survey was also conducted and the total number of participants was 25. Table 7 shows the summary of the participants’ characteristics in JP.

Table 8 Demographic Characteristics of Participants and Jamaica Plain Neighborhood

	Characteristics	**Study Participants**		**Jamaica Plain Community**	
		Numerical Value	Percentage	Numerical Value	Percentage
	Total	25		35133	
Age	Median Age	25-34			
Gender	Female	11	44	19126	54.43
	Male	14	56	16008	45.56
Ethnicity	African American	2	8	4013	11.42
	Hispanic	2	8	7670	21.83
	White, non-Hispanic	20	80	20510	58.37
Education	HS Grad	1	4		
	Not HS Grad	1	4		
	Some College Degree	5	20		
	4 Years of College or More	18	72		
Employment	Unemployed (out of Work)	0	0		
	Employed (Full Time or Part Time)	20	80		
Health	Fair or Poor Health	5	20		
	Good or Very Good Health	16	64		
	Excellent Health	4	16		
	Self or Family Member has Asthma	1	4		16
	Self or Family Member has Cancer	3	12		
Political Affiliation	Conservative	2	8		
	Liberal or Vey Liberal	14	56		
	Refused to Answer	4	16		

Table 8 shows the percentage of participants agreeting or disagreeing with each statement in the first section of the questionnaire. The most consensus is found for the statement ”I think local environmental advocacy is important to educate people about environmental health issues,” where 72 percent strongly agreed. Sixty percent of the respondents strongly disagreed or somewhat disagreed with the statement” I believe there are enough laws and policies to control environmental risks in the Boston area.”

Table 9 Percentage of Participants in Jamaica Plain Agreeing or Disagreeing with Survey Statements (N=25)

Statement	**Strongly Agree**	**Somewhat Agree**	**Somewhat Disagree**	**Strongly Disagree**
I believe there are enough laws and policies to control environmental risks in the Boston area.	8	32	20	40
When there is a really serious health problem, the government will do something about it. Until they tell me about a specific problem, I don't have to worry.	4	12	36	48
I believe there are no serious environmental problems in my neighborhood (e.g. Hazardous waste and air pollution)	8	36	20	36
There are environmental problems in my neighborhood and can affect human health.	20	48	24	8
I think life style factors like smoking and diet increase the risk of cancer more than environmental factors like pollution.	36	36	8	20
People can protect themselves against environmental health issues by improving their own individual life style.	40	20	24	16
People are in control of their health.	28	40	16	16
I rely on the media to learn about environmental issues and health threats.	4	32	24	40
I think local environmental advocacy is important to educate people about environmental health issues.	76	16	4	4
I am familiar with environmental justice topic.	28	36	16	20

Compared to the results in South Dallas, a higher percentage of respondents (64%) strongly disagreed or somewhat disagreed with the statement “I rely on the media to learn about environmental issues and health threats.” However, as the population characteristics in Table 8 show, 80 percent of the participants were white (non-Hispanic), which is not representative of the population profile in the Jamaica Plain neighborhood. And this put a further limit on possibility of generalization of the results in terms of the residents’ health perceptions.

Furthermore, the attitude toward government’s accountability for public health is generally negative, where 84 percent of the respondents strongly disagreed or somewhat disagreed with the statement “When there is a really serious health problem, the government will do something about it. Until they tell me about a specific problem, I don’t have to worry.” The South Dallas survey shows the same result, where 78.7 percent of participants strongly or somewhat disagreed with the former statement.

As for the second set of questions, climate change, chemicals, and outdoor air pollution were perceived as high or very high risks to participants and their families respectively at 76%, 64%, and 60% (Please see table 9). Climate change, sun exposure, and outdoor air pollution were perceived as the highest risks to the community respectively at 80%, 60%, 60%. For all of the items, the risks to the larger community were perceived higher than risks to the participants and their families. The only exception is dumping hazardous waste, where the perceived risk to the individual and one’s family was ranked 8 points higher.

In terms of the source of information for environmental and health issues, while 44 percent stated that they rely on mainstream TV news channels, the rest of participants tended to be very specific referring to CDC, EPA, and academic journals, this might be

explained by the liberal political atmosphere and higher level of education attainment compared to the case of South Dallas, where the main characteristics are the high percentage of black, older, low level of education, poverty, unemployment, and medically underserved. Seventy-two percent of Jamaica Plain respondents have four years of college or more while the number for South Dallas respondents was 24 percent. It should be mentioned that the low level of high school graduation in South Dallas is one of the community's biggest concerns while in Jamaica Plain neighborhood lower rent has attracted students and artists.

Table 10 Percentage of participants in Jamaica Plain neighborhood indicating that hazard is "high risk/very high risk to myself and my family", and to my community" (N = 25)

Risk Factors	**Community**	**Family & Self**	**Difference**
Pesticide in Food	48	28	20
Indoor Air Pollution	36	28	8
Depletion of the Ozone Layer	60	56	4
Sewage	24	20	4
Waste Incinerators	40	36	4
Climate Change	80	76	4
Sun Exposure	60	52	8
Chemicals	72	64	8
Outdoor Air Pollution	60	60	0
Drinking Water	36	24	12
Dumping Hazardous Waste	36	44	-8
Landfills	28	24	4
Lead	56	48	8

In sum, the result of the surveys show that while participants in the Boston and Dallas case-study regions do not feel adequately protected from environmental health hazards, and there is a strong consensus on the importance of EJ advocacy at local level, there is also a strong sense of control over one's health particularly among Dallas participants.

Figure 30 is an attempt to map the respondents' perceptions of health (what does it mean to be healthy). The numbers in each circle represent the number of respondents in each case. In sections 2-4-4 and 2-5-4, I explain that the idea of health being the absence of disease is completely outdated as the WHO definition in 1946 explicitly states (WHO, 2016). And still a considerable number of participants have a very basic understanding of what it means to be healthy. Four respondents in Dallas explained health as not only the opposite of disease but the opposite of dying which they explained by words such as "not dying," and "the ability to live on." The rest of the responses, which are placed at the very beginning of the diagram, mainly focus on physical health and use phrases such as "the ability to function without pain."

It should be mentioned that after the conference on Beyond Health in 1984, there was a shift in public health paradigms in terms of considering quality of life (please see section 2-4-4). The important health documents in this era in the United States are the Planned Approach to Community Health (1983), and the Assessment Protocol for Excellence in Public Health (1991), documents that put a great focus on illness prevention and disease control. Responses that are put here do recognize mental health and do not explain health as the opposite of disease; however, they do not expand the definition to include other aspects of quality of life that are not directly related to disease control. The European healthy cities project that later expanded across the globe can be

seen as a turning point that set the goals for a new era of urban planning and public health advocacy. Responses that are put here, recognize that quality of life is an important indicator of one's health.

However, very few responses in this category (marked as status quo) recognize the importance or the role of environmental health in human health. As one South Dallas participant explains, "health is a term used to measure how well people take care of their bodies, and the uncontrolled natural factors that could impact the body." Another participants in JP states: "Health is related to knowledge, medical elitism and corporate greed prevent the average person access to information about their health and how to protect themselves. Knowledge=Health."

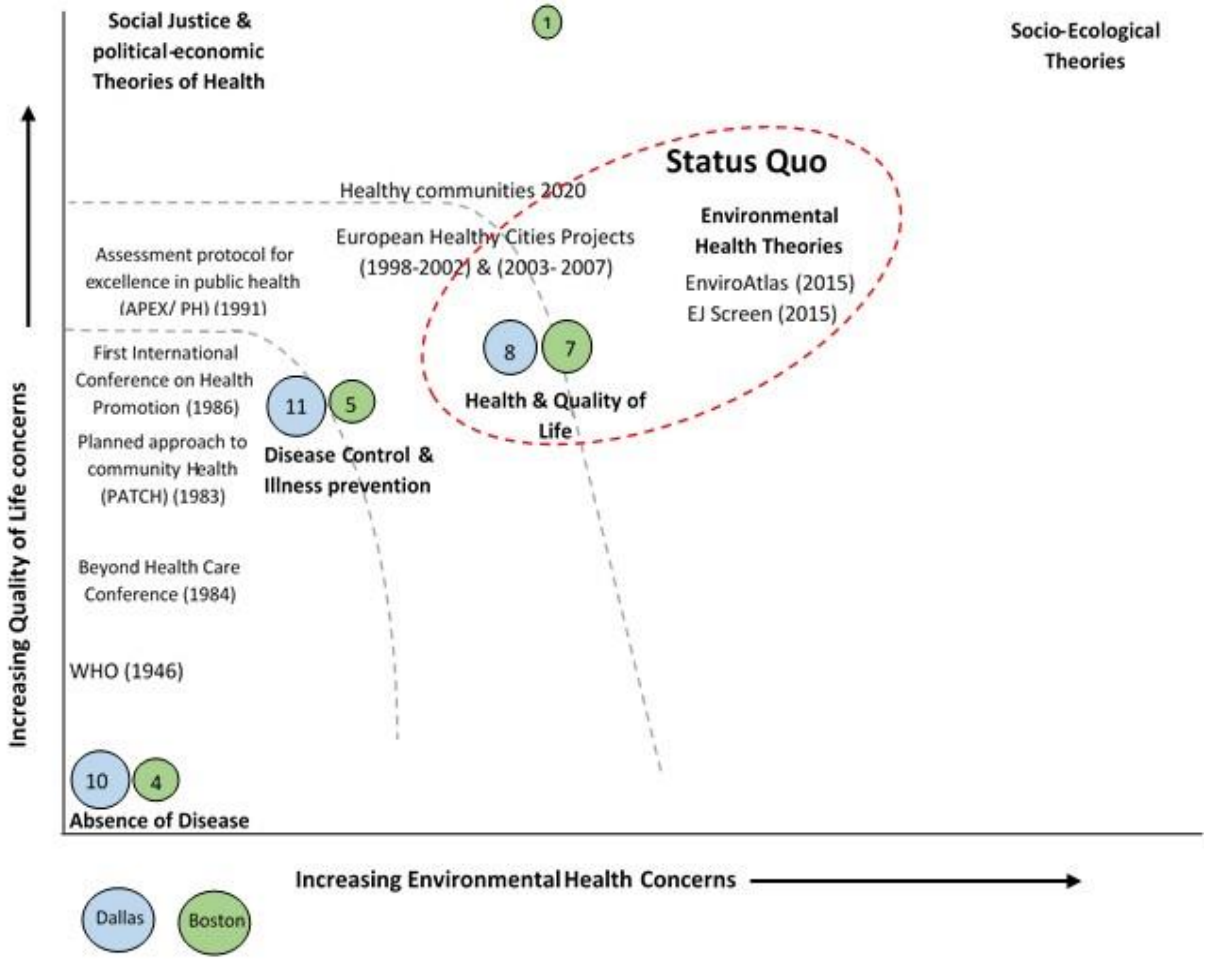


Figure 34 Mapping Participants' Perception of Health

4-5) Dimensions of Environmental Justice Discourses

As I explained in section 2-5-3, political ecology provides a theoretical framework for analyzing the empirical evidence and discourses on both biophysical and socioeconomic factors. Here, drawing on the discussions in the previous sections on policy context, media coverage, and environmental health perception in two case studies and analyzing in-depth interviews with four environmental and public health advocates,

three city officials, and two community organizers in Dallas, I revisit the first category of research questions.

RQ1: What are the varying aspects of EJ discourse?

Although the EJ movement appears to employ a distinct rhetoric and discourse, as the evidence from the two case studies shows, EJ discourses include a variety of concerns over distribution of environmental hazards, power relations, and procedural equity. However they are all interrelated and to some extent complement each other. Understanding these diverse rhetorics, which are based on different experiences and perspectives, is particularly important for policy development in EJ. In my study of EJ issues I have identified three distinct discourses including: (a) institutional racism, (b) socio-economic equity, and (c) science-based discourse. The first category that is the most prominent EJ perspective in South Dallas is described by Downey (1998) as the "institutional racism model" and draws on past policies in housing and land-use developments in urban landscapes to explain the current state of maldistributions and powerlessness in EJ communities. This discourse, more than other EJ discourses, attributes environmental (in) justice to economic and political powerlessness.

As one interviewee, an environmental advocate, says:

"It [the community] was created according to the restrictions explicitly for the purpose of housing, because African Americans could not live all over the city or wherever they wanted in a city at specific point in time. So because of those types of land use planning hindrances and then just the geographical composition in the city itself is very exclusionary and it speaks to a lot of challenges that really amplifies the challenges that are already there. So I think that history and history of intolerance to a large degree

social, economic, and political have played a huge role in where those communities are today" (Personal Interview, Environmental Advocate in Dallas).

There is on the other hand, a more science-oriented discourse that in large part opposes the traditional EJ discourse. As it was explained in the literature review chapter, EJ has been called on to produce scientific proof, or, in other words to transform itself into a more scientific discourse, in order to enter the policy-making arena.

As an environmental advocate puts it:

"If you just have testimonial or incidents and stuff like that that is one thing, but when you are down there talking to state legislators you better have numbers you better have research and all and that may not be enough. So certainly getting hard data, numbers and that kind of thing is critical" (Personal Interview, Environmental Advocate in Dallas).

This burden of proof, however, is one of the reasons that ecology as a discipline in large part has not entered the EJ discourse and explains in part the EJ tendency to remain atheoretical.

Another interviewee, an urban ecologist, puts it like this:

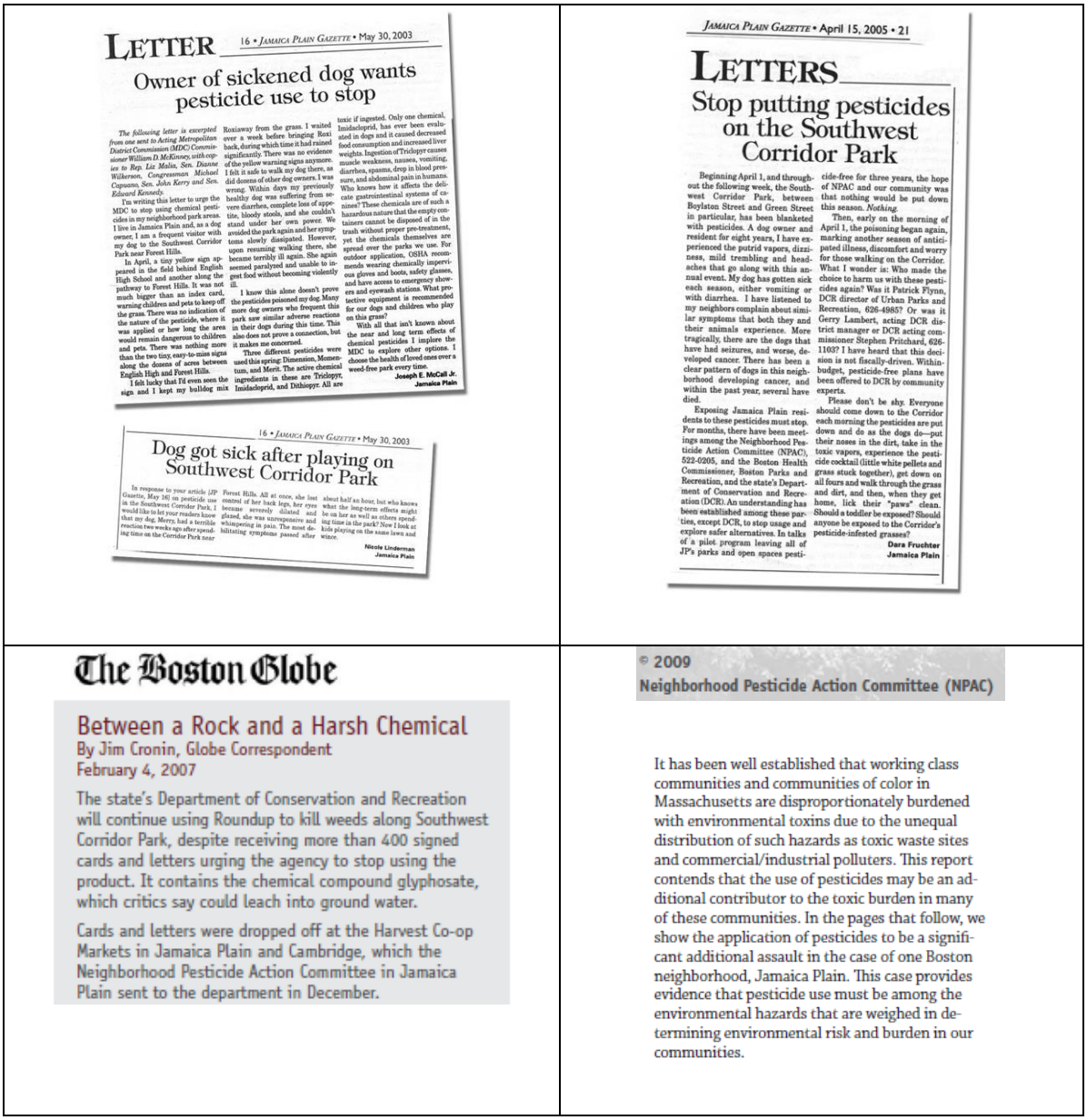
"You know people are going to make decisions whether they have information or tools, and sometimes those decisions need to be made. So I would imagine that people who are activists and in that category probably say, let's not wait we don't need to wait for science to perfect itself or to evolve, we think we know enough now to make decisions. I can see them saying that…I do not think they need it to make decision, but they need it so better decisions can be made. So at another level they can even do a better job" (Personal Interview, Urban Ecologist).

While the institutional racism discourse is more prominent among environmental advocates in Dallas, based on the analysis of the planning and policy-related documents (e.g. The New England Environmental Justice Network (EJRN); Environmental Justice Executive Order No. 552, 2014; Environmental Justice Policy, 2002), in Boston the most dominant EJ discourse is built around the theme of socio-economic equity. This discourse acknowledges the need to address incidents of environmental (in) justice which result from economic, racial, and cultural discriminations. Although, in general, the institutional racism model of discourse puts a greater emphasis on procedural justice, the policy discourse in Boston (and in Massachusetts in general) has recognized the importance of different aspects of justice aside from distributive justice. In Dallas, however, due to South Dallas's isolation from economic development, the EJ discourse has not moved beyond very extreme cases of environmental pollution (e.g. Trinity River).

RQ2: What kind of discourse development exposes or hides environmental injustice?

Based on the analysis of planning documents and the coverage of EJ issues in this research, it can be argued that in policy contexts where EJ is not an integral part of planning at the local and regional level, only extreme events will alarm the residents and compel the authorities to respond. In other words, the general limit of traditional EJ discourse, which relies on testimonies and communities experiences, is even more limiting when the EJ discourse has not yet entered the mainstream discourse. Thus the framing of the issues of environmental health and their effect on human health become even more complex. An example is the EJ advocacy in Jamaica Plain that at one point received a lot of attention and was studied as a case of environmental (in) justice concerning inner-city pesticide use in local parks after a resident's pet got sick. Later,

more incidents were reported about local dogs. From there, connections were made to human health, especially concerning kids (please see figure 35).



LETTER 16 • Jamaica Plain Gazette • May 30, 2003

Owner of sickened dog wants pesticide use to stop

The following letter is excerpted from one sent to Acting Metropolitan District Commission (MDC) Commissioner William D. McKinney, with copies to Rep. Liz Malia, Sen. Dianne Wilkerson, Congressman Michael Capuano, Sen. John Kerry and Sen. Edward Kennedy.

I'm writing this letter to urge the MDC to stop using chemical pesticides in my neighborhood park areas. I live in Jamaica Plain and, as a dog owner, I am a frequent visitor with my dog to the Southwest Corridor Park near Forest Hills.

In April, a tiny yellow sign appeared in the field behind English High School and another along the pathway to Forest Hills. It was not much bigger than an index card, warning children and pets to keep off the grass. There was no indication of the nature of the pesticide, where it was applied or how long the area would remain dangerous to children and pets. There was nothing more than the two tiny, easy-to-miss signs along the dozens of acres between English High and Forest Hills.

I felt lucky that I'd even seen the sign and I kept my bulldog mix Roxiaway from the grass. I waited over a week before bringing Roxi back, during which time it had ruined significantly. There was no evidence of the yellow warning signs anymore. I felt it safe to walk my dog there, as did dozens of other dog owners. I was wrong. Within days my previously healthy dog was suffering from severe diarrhea, complete loss of appetite, bloody stools, and she couldn't stand under her own power. We avoided the park again and her symptoms slowly dissipated. However, upon resuming walking there, she became terribly ill again. She again seemed paralyzed and unable to ingest food without becoming violently ill.

I know this alone doesn't prove the pesticides poisoned my dog. Many more dog owners who frequent this park saw similar adverse reactions in their dogs during this time. This also does not prove a connection, but it makes me concerned.

Three different pesticides were used this spring: Dimension, Momentum, and Merit. The active chemical ingredients in these are Triclopyr, Imidacloprid, and Dithiopyr. All are toxic if ingested. Only one chemical, Imidacloprid, has ever been evaluated in dogs and it caused decreased food consumption and increased liver weights. Ingestion of Triclopyr causes muscle weakness, nausea, vomiting, diarrhea, spasms, drop in blood pressure, and abdominal pain in humans. Who knows how it affects the delicate gastrointestinal systems of canines? These chemicals are of such a hazardous nature that the empty containers cannot be disposed of in the trash without proper pre-treatment, yet the chemicals themselves are spread over the parks we use. For outdoor application, OSHA recommends wearing chemically impervious gloves and boots, safety glasses, and have access to emergency showers and eyewash stations. What protective equipment is recommended for our dogs and children who play on this grass?

With all that isn't known about the near and long term effects of chemical pesticides I implore the MDC to explore other options. I choose the health of loved ones over a weed-free park every time.

Joseph E. McCall Jr.
Jamaica Plain

16 • Jamaica Plain Gazette • May 30, 2003

Dog got sick after playing on Southwest Corridor Park

In response to your article (JP Gazette, May 16) on pesticide use in the Southwest Corridor Park, I would like to let your readers know that my dog, Mercy, had a terrible reaction two weeks ago after spending time on the Corridor Park near Forest Hills. All at once, she lost control of her back legs, her eyes became severely dilated and glazed, she was unresponsive and whimpering in pain. The most debilitating symptoms passed after about half an hour, but who knows what the long-term effects might be on her as well as others spending time in the park? Now I look at kids playing on the same lawn and wince.

Nicole Linderman
Jamaica Plain

Jamaica Plain Gazette • April 15, 2005 • 21

LETTERS

Stop putting pesticides on the Southwest Corridor Park

Beginning April 1, and throughout the following week, the Southwest Corridor Park, between Boylston Street and Green Street in particular, has been blanketed with pesticides. A dog owner and resident for eight years, I have experienced the putrid vapors, dizziness, mild trembling and headaches that go along with this annual event. My dog has gotten sick each season, either vomiting or with diarrhea. I have listened to my neighbors complain about similar symptoms that both they and their animals experience. More tragically, there are the dogs that have had seizures, and worse, developed cancer. There has been a clear pattern of dogs in this neighborhood developing cancer, and within the past year, several have died.

Exposing Jamaica Plain residents to these pesticides must stop. For months, there have been meetings among the Neighborhood Pesticide Action Committee (NPAC), 522-0205, and the Boston Health Commissioner, Boston Parks and Recreation, and the state's Department of Conservation and Recreation (DCR). An understanding has been established among these parties, except DCR, to stop usage and explore safer alternatives. In talks of a pilot program leaving all of JP's parks and open spaces pesticide-free for three years, the hope of NPAC and our community was that nothing would be put down this season. *Nothing.*

Then, early on the morning of April 1, the poisoning began again, marking another season of anticipated illness, discomfort and worry for those walking on the Corridor. What I wonder is: Who made the choice to harm us with these pesticides again? Was it Patrick Flynn, DCR director of Urban Parks and Recreation, 626-4985? Or was it Gerry Lambert, acting DCR district manager or DCR acting commissioner Stephen Pritchard, 626-1103? I have heard that this decision is not fiscally-driven. Within-budget, pesticide-free plans have been offered to DCR by community experts.

Please don't be shy. Everyone should come down to the Corridor each morning the pesticides are put down and do as the dogs do—put their noses in the dirt, take in the toxic vapors, experience the pesticide cocktail (little white pellets and grass stuck together), get down on all fours and walk through the grass and dirt, and then, when they get home, lick their "paws" clean. Should a toddler be exposed? Should anyone be exposed to the Corridor's pesticide-infested grasses?

Dara Fruchter
Jamaica Plain

The Boston Globe

Between a Rock and a Harsh Chemical

By Jim Cronin, Globe Correspondent
February 4, 2007

The state's Department of Conservation and Recreation will continue using Roundup to kill weeds along Southwest Corridor Park, despite receiving more than 400 signed cards and letters urging the agency to stop using the product. It contains the chemical compound glyphosate, which critics say could leach into ground water.

Cards and letters were dropped off at the Harvest Co-op Markets in Jamaica Plain and Cambridge, which the Neighborhood Pesticide Action Committee in Jamaica Plain sent to the department in December.

Neighborhood Pesticide Action Committee (NPAC)

It has been well established that working class communities and communities of color in Massachusetts are disproportionately burdened with environmental toxins due to the unequal distribution of such hazards as toxic waste sites and commercial/industrial polluters. This report contends that the use of pesticides may be an additional contributor to the toxic burden in many of these communities. In the pages that follow, we show the application of pesticides to be a significant additional assault in the case of one Boston neighborhood, Jamaica Plain. This case provides evidence that pesticide use must be among the environmental hazards that are weighed in determining environmental risk and burden in our communities.

Figure 35 EJ Discourse Development, Jamaica Plain

Source: Neighborhood Pesticide Action Committee (NPAC), 2009

In the case of Dallas, lead pollution in West Dallas received a lot of attention in the 1990s but the only EJ issue that has recently made its way into the planning topics and media coverage is food deserts. However, the communities in South Dallas represent considerable health disparities.

Also EJ discourse development is the direct result of residents' perception of environmental health and their willingness to believe that a problem exists and to make a collective decision to act on it.

The environmental advocate interviewee says:

"There are a lot of factors, I mean people do not want to hear, they are in denial. A lot of people will make fun of it if you say so. They kind of joke because they do not want to think that something that they are eating or drinking or breathing or whatever is going to hurt them. There is a lot of denial. There are things that corporations are certainly making money off of this" (Interview, Environmental Advocate in Dallas).

RQ3: How have local residents been portrayed and/or marginalized in the EJ discourse of different groups?

The most interesting themes in the portrayal of local residents in EJ cases in South Dallas are "awareness," "knowledge," and "control." The city sees EJ as a planning issue that should be dealt with, however, the extent to which the local residents are aware of the conditions is frequently questioned.

An interviewee from the City of Dallas puts it like this:

"But do people even know that injustice is taking place for them to even start? To worry about oh my God I have to let someone know. The issue goes a lot deeper than that" (Personal Interview, City of Dallas Official).

From the residents' perspective and their daily experiences the situation is clear. For example, one resident states:

"Being from this area I know of different corporations that were here that we know left pollution in the land and the air, we know of at least couple of companies that were polluting Trinity River and went to legal issues with the city of Dallas…They had to deal with the city and a lot these areas were taken to provide for the new developments… a few blocks from here they were dumping all of the blood from the kill of the meat packing companies into the Trinity…So we are left with all those things. And I always say that we pay taxes just like everybody else. I think we pay more taxes because everything in this side of town whether it is gas or anything is more expensive. I think overall we pay more for the less that we have."

Another resident similarly states:

"I have heard of plans…but some of the people who really want to do things are not connected. In a city like this you have to be connected because I do not believe in some of our leadership. I think they are holding revenue back, they are being guarded and channeled to different directions, by our so called leaders in this community."

Another important factor in both EJ discourse development and the portrayal of the residents is what, borrowing a term from neighborhood plus plan, can be referred to as the "commitment index" (Neighborhood Plus, 2015). Words can create realities and communities that are owned by their residents can create strong words.

As one resident puts it:

"I think because this area has been a food desert and a desert in so many other ways when it comes down to housing. I found people here when they have the means to

better their life, they have to move out of this neighborhood because here there are no decent housing options; so I think quality of life gets distorted when the strengths of a neighborhood is taken out."

5) Landscape Analysis and PGIS in South Dallas

In section 2-4-3, I explained that PGIS is essentially a response to the top-down approach which is common in GIS projects. The values of PGIS in different arenas of geography and urban planning have long been acknowledged (e.g. Harley, 1988; Elwood, 2011). The main concerns that led to the discussion of participatory GIS, since the late 1980s, are centered on themes of power, knowledge, and representation (Harley, 1988; Chambers, 2006). This is why, particularly in the context of EJ research, PGIS is an effective medium to move beyond the superficial representations of communities, specifically in terms of their interaction within and toward urban landscapes. Environmental justice in its essence is about people's experiences and their strategies for coping with environmental and health disparities. And EJ advocacy is all about empowering communities and, as more progressive EJ policies move beyond distributive justice by putting an emphasis on procedural justice and recognition (please see section 2-3 for discussion on justice in EJ and section 4-3 for a review of recent EJ policies in Massachusetts), the essential need for local knowledge, participant-originated data, and promoting participatory approaches gain more attention in both academia and advocacy arenas.

However, empowerment through participation is not a new discussion; more than any other environmental movement it is an integrated theme in EJ research and advocacy. It also aligns with the epistemology of EJ which questions the absolute expert-driven environmental knowledge and the viewing of communities as the objects of research; instead it calls for a focus on participation to incorporate different knowledges and to view local communities as co-researchers rather than as objects of research. However, as mentioned in section 2-4-3, this raises a variety of critiques over PGIS' ability to integrate local knowledge and expert knowledge.

However, this research does not aim to respond to all limitations of PGIS with qualitative research. In this chapter, using PGIS, I attempt to further explore the narratives and experiences of the residents. In the previous chapter I discussed the importance of accounting for process as well as pattern in any EJ study; in this regard, PGIS provides a good platform for analyzing the historical and contemporary perspectives on environmental (in) justice and disparate vulnerabilities in urban landscapes.

This chapter is organized into two sections. In the first section, drawing on the literature review and the interviews with urban ecologists, I look at selected landscape metrics in different regions of Dallas. It should be noted that these regions are adopted from Methodist Dallas Medical Center so the scale of analysis would match the health statistics in the case study chapter (please see figure 36). In the second section I change the scale and focus on the Bonton neighborhood in South Dallas for conducting the PGIS session (please see figure 40).

5-1) Landscape Analysis

Land cover is an important determinant of EJ; however the local scale analysis of ecological patterns is not as common as the regional scales in urban planning and ecological studies. Moreover, the core ecological concepts of pattern and process tend to get lost in translation between the two disciplines. The starting point in creating such a linkage could be the application of quantitative metrics of landscape. Application of landscape metrics has proven useful in land use management and sustainability plans.

As I discussed in the literature review chapter, while many scholars have acknowledged the influence of landscape ecology on disciplinary fields such as human ecology, urban ecology, and planning (Ingegnoli, 2002; Gergel & Turner, 2002;

Dramstad, Olson, & Forman, 1996), there are many aspects of the complexities of urban landscapes that have not yet been adequately studied. For example, the specialized applications of the landscape approach to studying environmental justice is a new area of research introduced by the Environmental Protection Agency.

In terms of landscape metrics, factors such as patch size and shape (please see table 11 for definitions), corridor characteristics, and connectivity together influence the pattern and process of a landscape, and the correlation between pattern and process results in interdependency between landscape structure and function (Forman, 1990). Such quantitative spatial information on landscape mosaic arrangements is essential for presenting the historical/processual changes in environmental justice and the state of environmental justice.

Application of landscape ecology focuses on the comparison of mosaics, patches, or corridors in urban landscapes (Jongman, 2008). In this application, the first step is to translate the land-use maps or aerial images into landscape ecology language. In other words, historical and current landscape structures should be created in Arc GIS based on the data. The next step is the superposition of the results in order to extract a map of landscape change. These indicators are also known as landscape ecology metrics (e.g. Forman & Godron, 1986).

For decades landscape approaches have been used to categorize and translate the ecological data into useful information, visualize the spatial pattern and processes of landscapes, and ultimately quantify the eco-characteristics of each landscape in order to understand the interactions between ecological characteristics and human activities. Some of the attributes of landscapes are especially popular in land-use planning models that base their ecological modeling on landscape ecology. However, the main concepts

of landscape ecology are used in this research and the evaluation metrics are not limited to the conventional metrics of this paradigm. This approach, in the end, helps in the construction of South Dallas's main landscape patterns. To explain the outcomes, I draw on the literature to find commonly acceptable interpretations of the status quo of different landscapes and I use PGIS to further understand the results. For this analysis, I use the same regions (please see figure 36) that were used in the case study section to present health data.

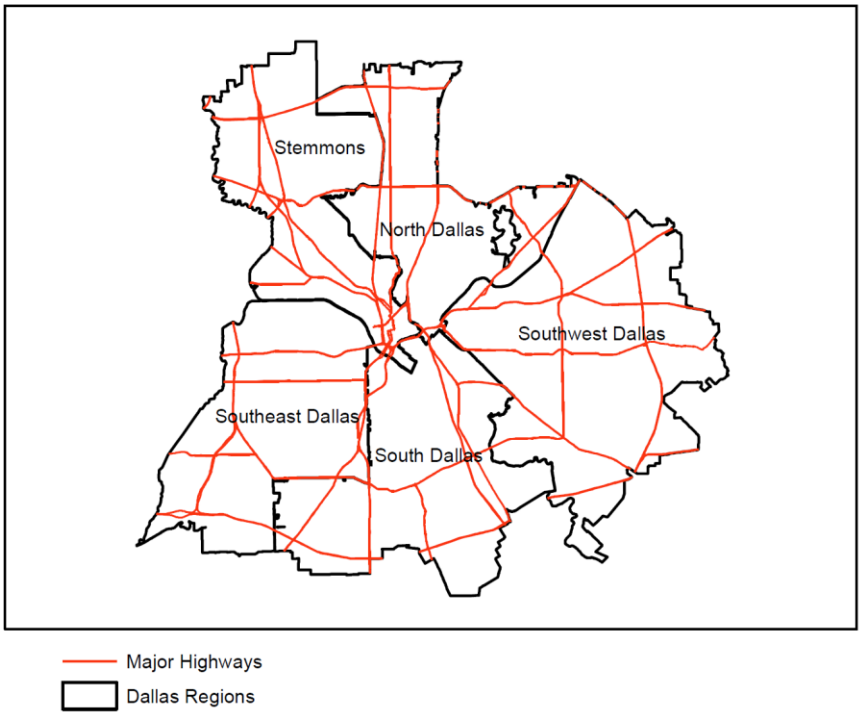


Figure 36 Dallas Regions for Landscape and Health Analysis

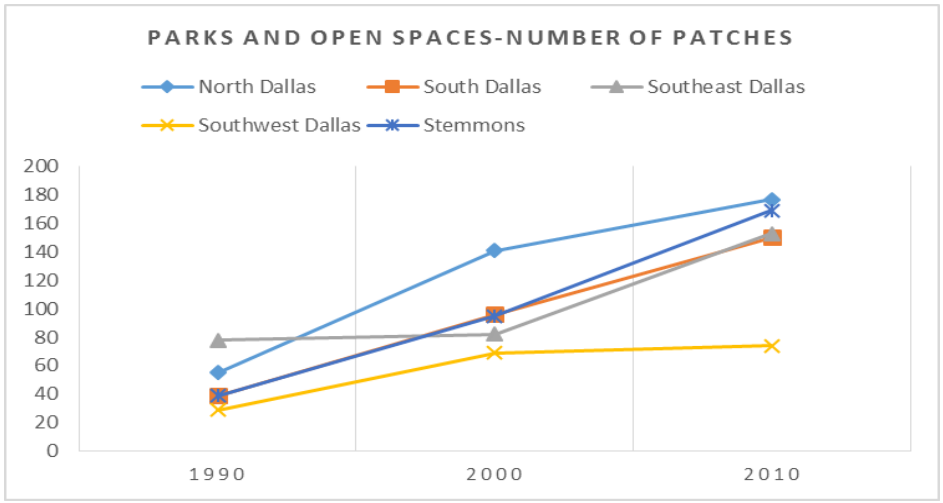
Source: Based on Methodist Dallas Medical Center, 2013

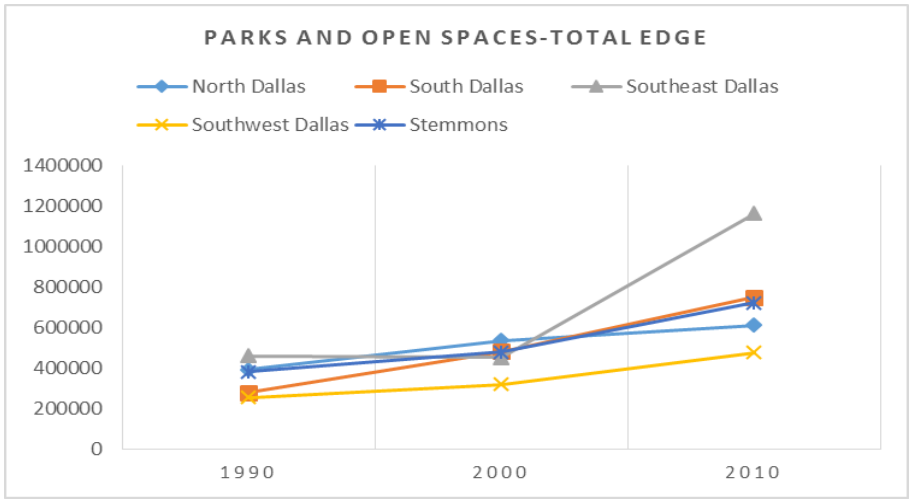
The table below summarizes the indices used in the analysis. For EJ analysis these metrics are compared for open and green patches, industrial areas and landfills. Also I used the land-use categories in the National Land Cover Data as a basis for analysis (please see appendix D for the landscape maps). Moving on to landscape analysis, the following figures show the process of landscape change in the city of Dallas from 1990 to 2010.

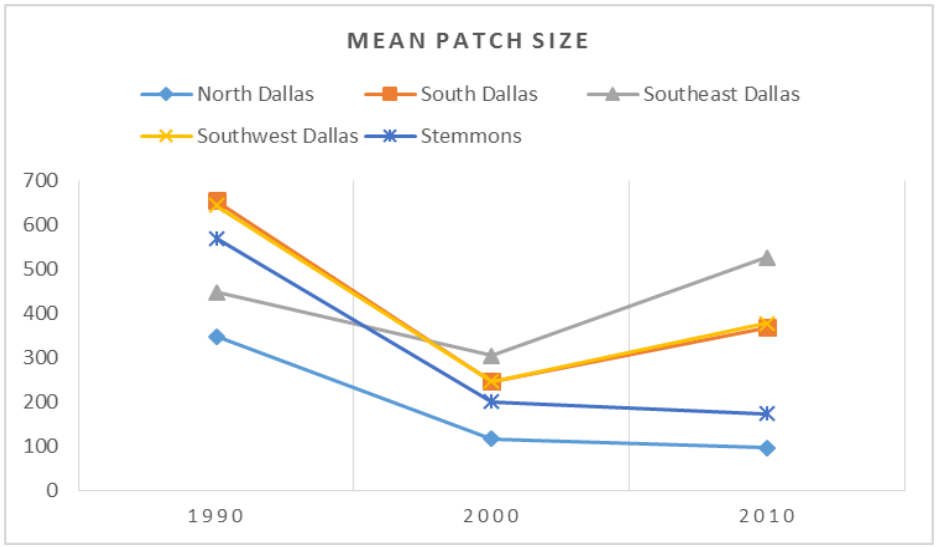
Table 11 Landscape Metrics

Landscape Metrics	**Definition**
Number of Patches (NP)	Total number of patches in the landscape
Mean Patch Size (MPS)	Average patch size
Total Edge (TE)	Perimeter of patches
Mean Perimeter-Area Ratio (MPAR)	perimeter-to-area ratio for the landscape as a whole

As figures 37, 38, and 39 show, the development pattern in all regions show the same trend but at a different pace. In terms of ecosystem services, figure 37 shows the quantification of the spatial-temporal patterns of the green and open patches, and as the results show South Dallas does not represent the most fragmented patches and has more open patches than Southwest Dallas. Please note that here the total number of edges and mean of perimeter to area are used as measures of fragmentation. Also as figure 38 shows it has less industrial land covers than Southwest Dallas and Stemmons Corridor. However the landfill areas in South Dallas have significantly increased since the 1990s. In the next section, after presenting these results to a group of residents, I focus on residents' perception of the ecosystem services in their neighborhood.







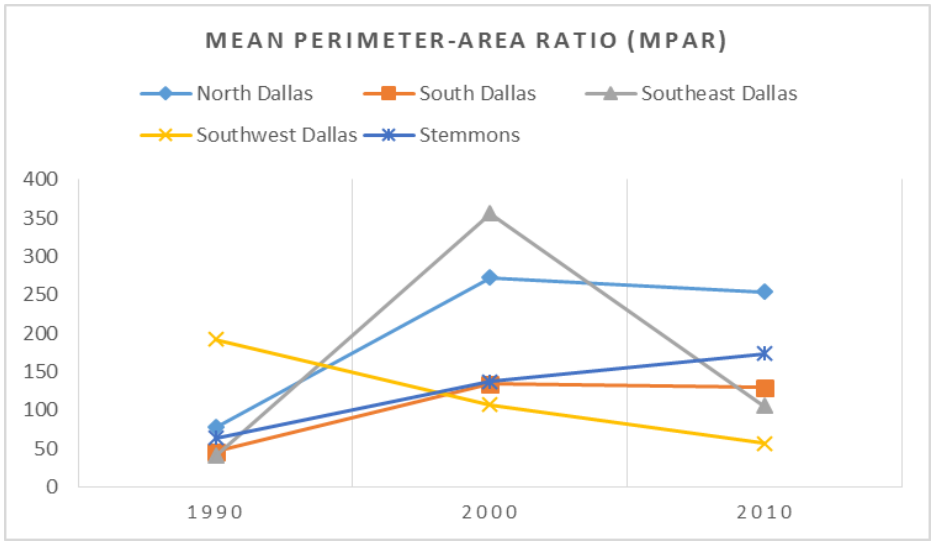


Figure 37 Quantification of the Spatial-Temporal Patterns of the Green and Open Patches

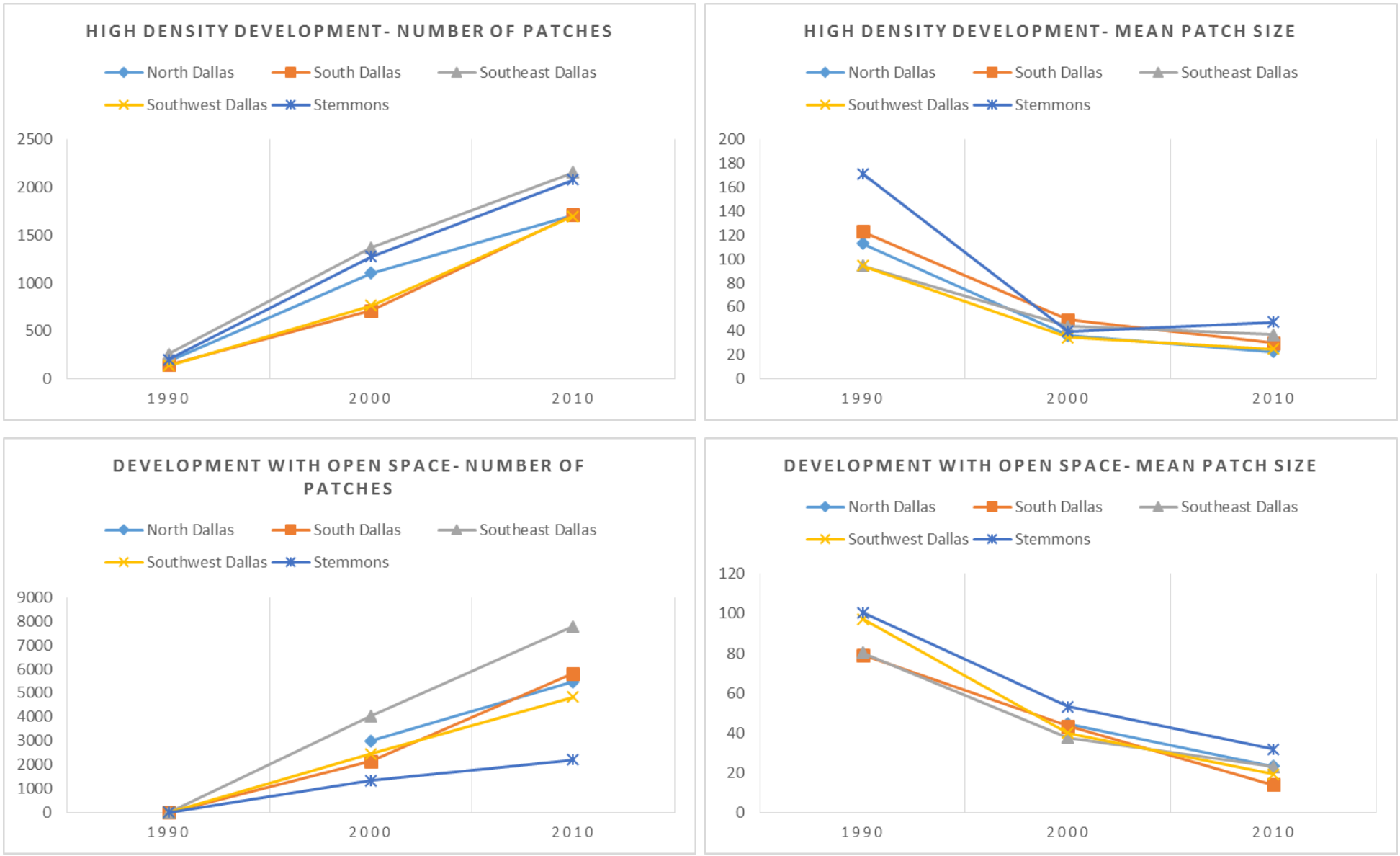
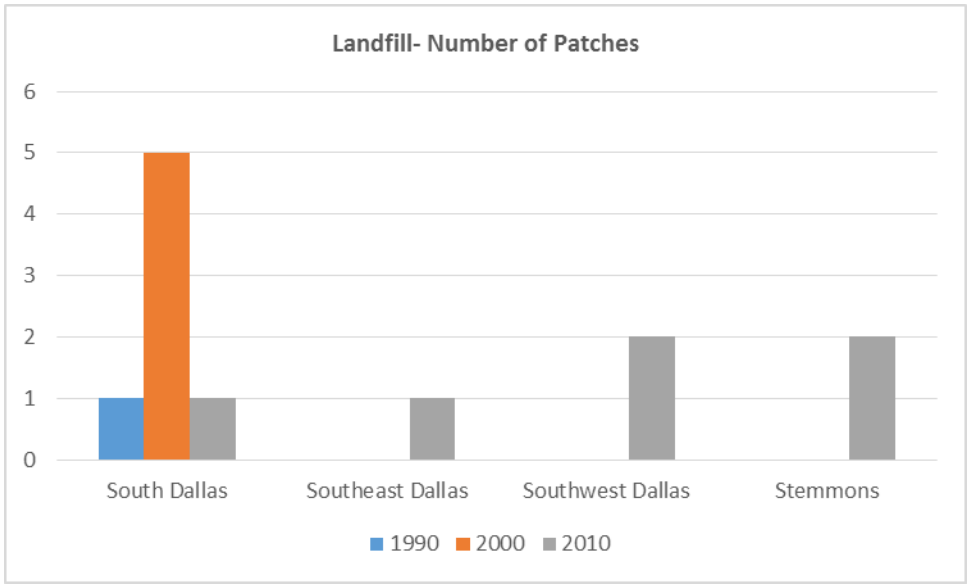
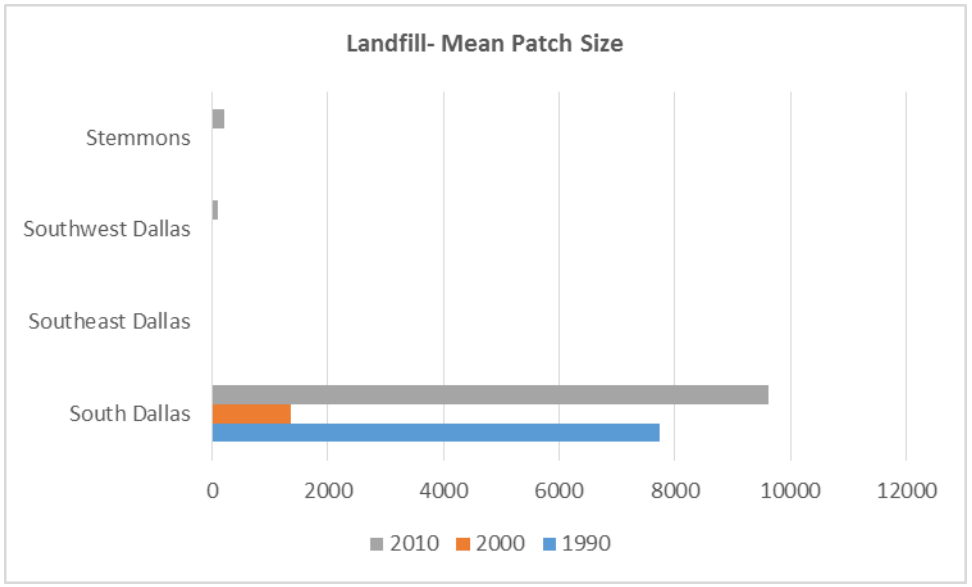


Figure 38 Quantification of the Spatial-Temporal Patterns of High Density Development and Development with Open Spaces





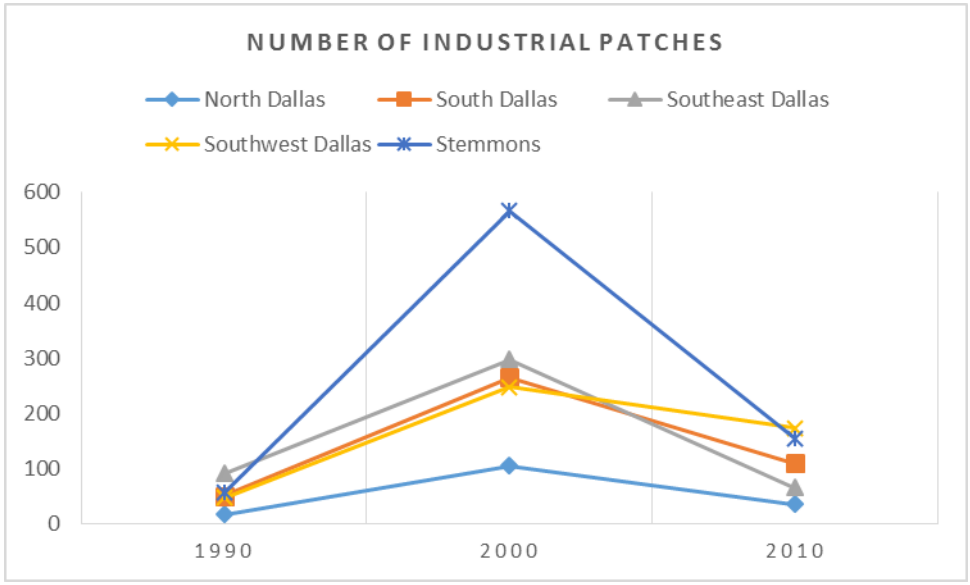


Figure 39 Number of Industrial and Landfill Patches

5-2) Perspective on Ecosystem Services

It is important to remember that people's daily lives are shaped by power relations over decades. For example planning exercises can determine the extent of vulnerability or isolation in parts of cities. That is why in the previous section I first showed the evolution of the landscape throughout the past 30 years. In this section I focus on ecosystem services as the most important theme related to environmental justice. This conceptual theme was selected after the final coding of the interviews and analyzing the surveys in South Dallas.

For this exercise five residents in the Bonton neighborhood were recruited. This neighborhood was initially selected because it is a well-known case of a food desert in South Dallas and also it is located within 75215 ZIP Code that represents larger black female population percentages, older female population percentages, and lower education, income, and employment levels (Komen, 2014). Also this area is medically underserved and has the highest mortality from female breast cancer in the city of Dallas. (Please see section 4-1 for statistics).

The maps showing the evolution of the landscape were presented to the residents and then each participant was given an arial Google map of the neighborhood and its surroundings. The arial map was used as a base map and two sets of exercises focused on people's daily lives, their interaction with the surrounding landscape, and their perspectives and perception of environmental justice issues and health threats. Figure 40 shows the location of the Bonton neighborhood in South Dallas.

Participants followed a series of discussions on EJ and health and used colored markers to visualize their opinion on two base maps. Please see table 12 for a summary of discussion questions.

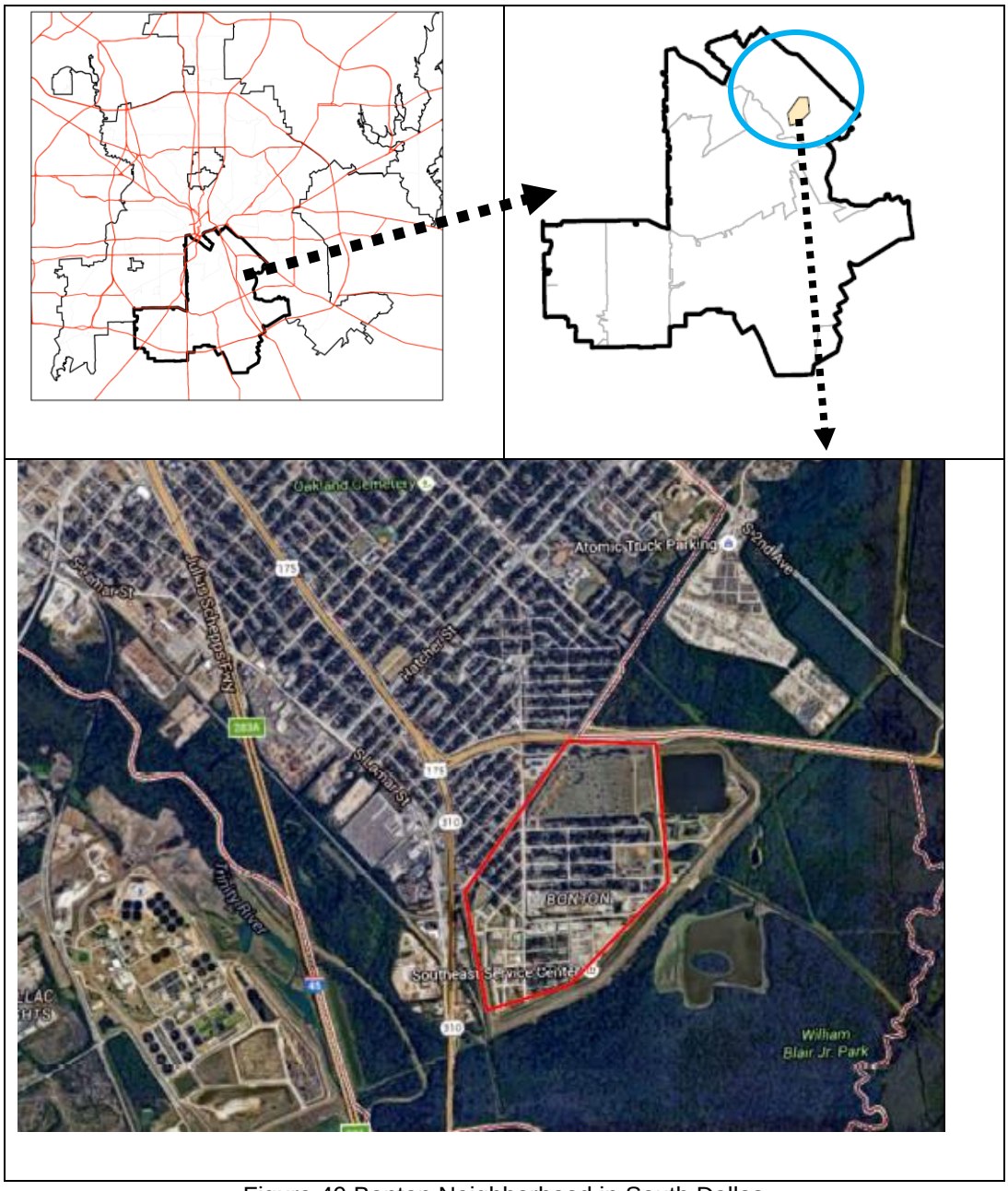


Figure 40 Bonton Neighborhood in South Dallas

Participants' perception of their neighborhood varies from the boundaries of Bonton to the whole of South Dallas. Therefore they were asked to consider either the area shown on the base map for the discussion or a smaller area of their choice.

Table 12 PGIS Disscussion Questions

First category of Mapping
Please use the yellow marker to show the area that you consider your neighborhood.
Please use the green marker to show your favorite parts in your neighborhood
Please use the pink marker to show your least favorite pats in the neighborhood
Please use the blue marker to show the walking routs that you use frequently
Second Category of Mapping
Please use the green marker to show recreational and/or green spaces that you use
Please use the pink marker to show any nuisance.
Please use the blue marker to show any perceived health hazard.
Please use the yellow marker to point the areas with health hazards that should be given priority

Figure 41 shows the results of the participants' discussions on areas of ecosystem service and nuisance. Trinity River and William Blair Jr. Park, which is adjacent to the Bonton neighborhood, are the natural patches that are marked as nuisances, while the other nuisances are streets that are considered unsafe or unpleasant. While few paths are marked for walking, the neighborhood itself is among the somewhat walkable areas in Dallas. Interestingly the ecosystem service marked by participants is Fair Park.

As for the reasons for considering the natural patches as unpleasant, participants explained: "(a) the place is OK, people are nuisance; I guess I have to put a dot for every one of them. (b) There is going to be a lot of dots."

On the relationship between the environmental pollutions marked and human health a local resident explains:

"Comparing the two, [environmental health and human health], I would say that a lot of times they do equate. I mean look at where we live, this is a food desert; there is nowhere to get fresh food here in this neighborhood, there really isn't."

Figure 41 Perceived Nuisance and Ecosystem Services

As for the priority, though participants pointed out that all of South Dallas needs to be a priority, they marked the central part of Bonton and Fair Park as the most urgent areas for EJ. Participants collectively pointed out that Bonton should be given priority because a lot of kids live in the area.

Discussing the city's current plans to improve the conditions in South Dallas, participants were hesitant about possible future improvements. One participant described it like this:

"To see how much of that will come south of I-30 would be very interesting to me. There has always been a lot of conversations, but I have found, my discoveries through time, we do a lot of clean ups and we do a lot of planting, a lot of trees but no development unless someone else comes in after it is clean and began the development. In which we are not part of. I think that is part of why we are not doing as well as we should be doing because we are not part of the commercial structure."

Although there is no considerable political tension between the residents and the city or the regional representatives, it is obvious that the participants do not feel that their voices are heard. And aside from political isolation, EJ advocacy in this area should put a priority on helping educate people in a more responsible way and on a more consistent basis rather than just waiting for the big environmental hazard to finally gain attention amongst all the economic hardship that South Dallas faces.

Going back to the second category of research questions, as the results of the PGIS show, social and economic façade of a neighborhood tends to overshadow its ecological potentials. In this case study participants even consider some of the natural patches as nuisances, which was explained by the frequency of gun play and harassment in these areas. On the other hand a more in-depth ecological analysis of the vegetation and the conditions of the trees is required to determine the actual benefits of these areas for the neighborhood. But generally speaking, the ecosystem services marked by planners and ecologists are not always perceived similarly by the residents due to complications that they experience but that are not traditionally mapped.

In this sense, a participatory approach can change the nature of the information and the way that it is represented on maps used by planners. Intersectionality is the key to sharing a common language and also to paving the way for adjusting the relationships

and building coalitions within communities. The most important implication of such intersectionality can be described as an action-oriented ecology that educates the residents about the ecological capacities in their neighborhood approach and empowers them to take policy actions. This is a very crucial need in Bonton and all areas of South Dallas today, because, as the results of landscape metrics in the previous section showed, the urban landscape in South Dallas is less disturbed compared to Stemmons and Southwest Dallas. On the other hand the residents and the city need to figure out how to utilize the environmental potentials in the neighborhood in a way that they would serve as ecosystem services for the residents.

6) Conclusions

The relationship between urban ecology and environmental justice research has historically been affected by overly categorized academic disciplines. On one hand environmental justice advocates need to value urban ecological principles as a tool for better understanding the urban landscape and, on the other side, urban ecologists need to make an effort to move beyond the traditional ecology of plants and animals and work with communities to better understand urban landscapes and the relationship between human wellbeing and ecological states of a community. In the context of EJ this relationship between urban ecology and human health is manifested in the patterns and processes of change in the utilization of ecosystem services and/or responses to landscape disturbances, such as unwanted land uses.

In this research I suggest a participatory framework for studying EJ which is contrary to traditional EJ studies that are formed around pre-identified issues such as siting of landfills and statistical analysis of proximity to minority populations and which rely on a participatory approach that borrows from both local narratives and perceptions and landscape-ecological principles, paving the way for a more action-oriented ecology.

The concept of action-oriented ecology is particularly important in the context of environmental justice research, because, as the result of the study in South Dallas shows, identified ecosystem services were not considered valuable, and it speaks to the need for discussing with the community the value of those landscapes and understanding why they consider them a nuisance. While in different cases different discourses and perceptions might be dominant, in the case of South Dallas the economic and social realities overshadow the ecological potentials of the neighborhood and call for a need to employ participatory mapping techniques in ecosystem services mapping and also the need to further analyze the relationship of communities to the environment whether they

are different or the same as what is shown on maps and if they are different why are they different? What are the effects on the community?

In other words, while the value of expert knowledge in mapping ecosystem services has been studied in the literature (e.g. Grêt Regamey, Brunner, Altwegg, Christen, & Bebi, 2013), it does not necessarily reflect the lived experiences of the communities. It also raises questions about the need to study the ecology of urban landscapes at a regional level. Because, as the results of the landscape analysis in this research showed, South Dallas has more ecological potentials but they are not utilized as ecosystem services for the local community and, in terms of environmental justice, they do not provide the necessities to cope with environmental disparities at a regional level. Because the environmental health status in South Dallas is directly related to the landscape structure of other parts of the region, such as West Dallas and Stemmons, South Dallas in essentially a down winder when it comes to air pollution.

Employing participatory GIS in mapping ecosystem services is also important because, as it was previously discussed in this research, urban landscapes are social constructs. Therefore on one hand environmental landscapes in urban areas cannot be studied independent of the social and economic landscapes, participant driven data and local knowledge is necessary to understand the residents' perception of environmental quality and human health aspects. On the other hand, a collaborative relationship between experts and residents as co-researchers is necessary to address the complex dynamic of discourse development about environmental disparities overshadowed by extreme poverty and social problems such as safety.

This democratization of expert knowledge has important implications for EJ policy as well, where of course the dilemma of political legitimacy, scientific accuracy,

and essentially the values of different knowledges put limits on applications of PGIS for EJ advocacy and research, which, until today, are the main critiques of the environmental justice movement. On the other hand it can be argued that participatory GIS adds to the quality of ecological knowledge by cross-checking the expert knowledge with actual lived experiences and local knowledges. PGIS can also be employed as a medium to ease the tension between lay and expert knowledge, which are on two sides of the spectrum of environmental justice perception. Providing a collaborative platform through PGIS is an alternative to both traditional EJ advocacy that lacks political effectiveness due to burden of proof and the scientific approach that is still trying to perfect itself and suffers from a lack of access to quantitative data. Moreover, PGIS provides a suitable context to collect different narratives on environmental and health perceptions and, along with political ecology, can explain the pattern and processes of change in urban landscapes.

6-1) Research Summary

The environmental justice movement has long been criticized for being an exclusively anthropocentric discourse and consequently lacking the foundations necessary to analyze environmental issues. While a great deal of emphasis is placed upon anthropocentric values within the EJ literature, the complexity of ecosystems and the extent to which they affect the well-being of communities has not been adequately studied. Additionally, the future of the EJ movement partly depends on its ability to communicate with mainstream environmental science discourses. However, purely structured scientific environmental studies, with their absolute reliance on computerized modeling or analysis, do not agree with the core concepts of environmental justice, which are centered on community empowerment. To overcome this challenge the methodology

of environmental justice research should represent both ecological foundations and narratives and discourses.

First, expanding the EJ discourse to include ecological considerations will give researchers the opportunity to apply an ecological theory which will result in reliable and more in-depth understanding of EJ issues. Additionally, an ecological theory can potentially enhance the opportunities to bridge to policy-making arenas. In this research I argue that the indicators and underlying assumptions of the landscape ecology approach could help in the initial study of ecological health and ecosystem sustainability. However, application of other approaches, such as ecosystem health theory, along with landscape analysis, will help explore both ecosystem and human health indicators further.

Second, while the landscape ecology approach helps one understand the evolution of urban environments in the study area and see the patterns of uneven urban landscapes, it is necessary to include the cultural and political factors in that landscape, analyze the changes in the socio-demographic over time, and be aware of political power in certain landscapes that affect distribution of resources over time.

Moreover discourse analysis is necessary to contextualize the ecological knowledge and to situate varying discourses. In this study I suggest that a combination of theoretical urban political ecology (UPE) and participatory GIS can provide a suitable context for both studying and producing EJ discourses. In this research one of the first inquiries is to study the “chain of explanations” in current environmental discourses and the representation of those discourses. This tradition is mostly rooted in Foucauldian discourse analysis that provides insight into uncovering the power relations embedded in knowledge and in the institutional frameworks that can potentially constrain, repress, and subjugate knowledge (Leff, 2013). This approach, by revealing both dominant and

undiscovered discourses, dissects the two fundamental questions in environmental justice studies: whose knowledge? Whose nature?

Third, comparison case study is an appropriate approach to apply and test the designed methodology. Therefore, choosing critical cases is central for the purpose of this study. The case studies in this research are critical examples that can provide a broader knowledge of the reality of EJ due to their different contexts of EJ policy and advocacy. The collective case studies in this research are South Dallas and Boston's Jamaica Plain neighborhoods. Both of these cases are well-known EJ cases that to some extent share similar characteristics. For example, both represent a high percentage of ethnic minority groups, a high level of polluted/contaminated areas, and historically strong community involvement and activism. Furthermore, the different contexts of these cases create an interesting ground for grasping the different natures of community activism and discourse development. In this research I look at different perceptions of environmental health and how they affect the discourse development around EJ. I also explain how participatory GIS provides a context for understanding urban landscapes as lived experiences and how further participation and dialogue is required for resolving the differences and moving toward effective policies.

6-2) Future Research

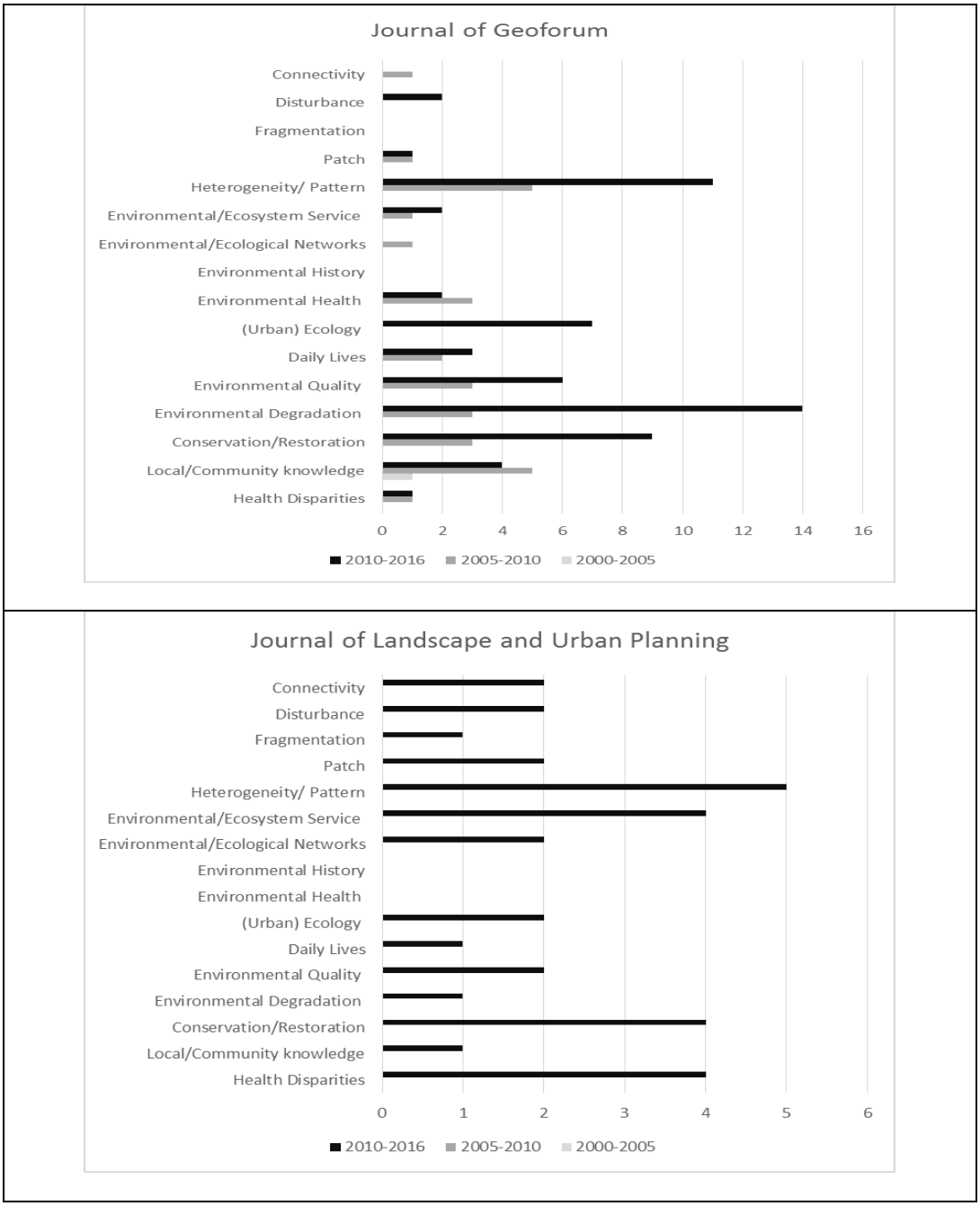
This research discusses the first steps toward incorporating action-oriented ecology in EJ research. I argue that landscape ecology can be used as a powerful tool in mapping environmental (in) justice and political ecology can serve as the theoretical framework for further analyzing the existing relationships between communities and urban landscapes. As I explain throughout this work, the combination of landscape ecology and post-structural political ecology is organic and suitable for environmental

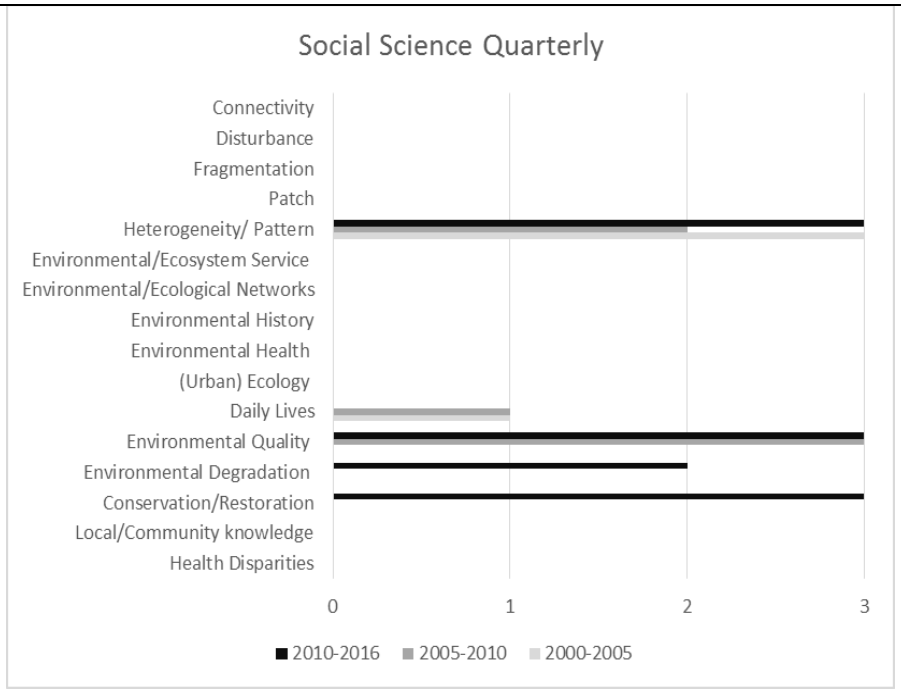
justice research for the role of discourse in political ecology and the emphasis on pattern and processes in the landscape ecology discipline make them uniquely appropriate tools for EJ.

However this research does not deal with variety of patches in urban landscapes and it only focuses on identified and/or perceived ecosystem services. A more in-depth analysis of vegetation maps and the conditions of trees in the neighborhoods and the state of public health would add to the legitimacy of landscape ecology in EJ research.

Moreover, the different results gathered from landscape analysis and participatory GIS session in this research speaks to the need for undertaking more local-level socio-ecological research to identify the roots of the difference and moving toward a more holistic framework for integrating ecology and EJ research.

Appendix A: Environmental Justice in Peer Reviewed Literature




Social Science Quarterly
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Environmental Health
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Daily Lives
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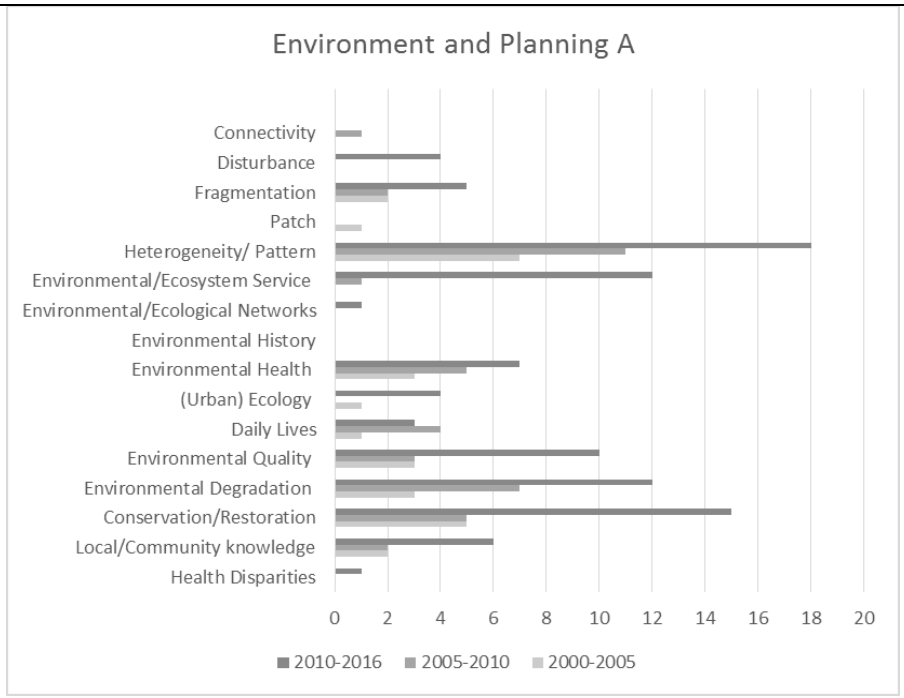
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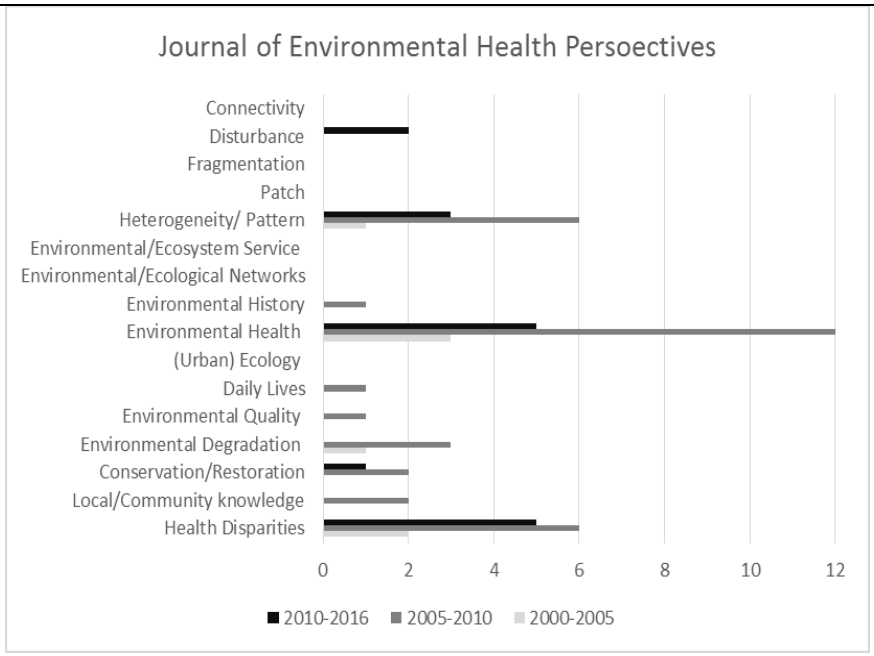
Journal of Environmental Health Persoectives
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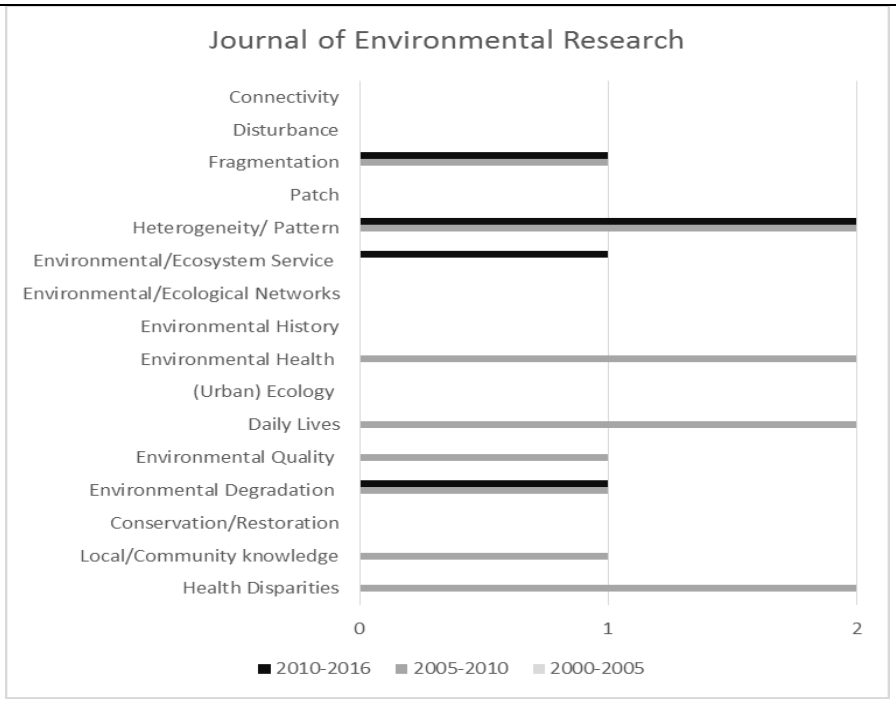
Journal of Environmental Research
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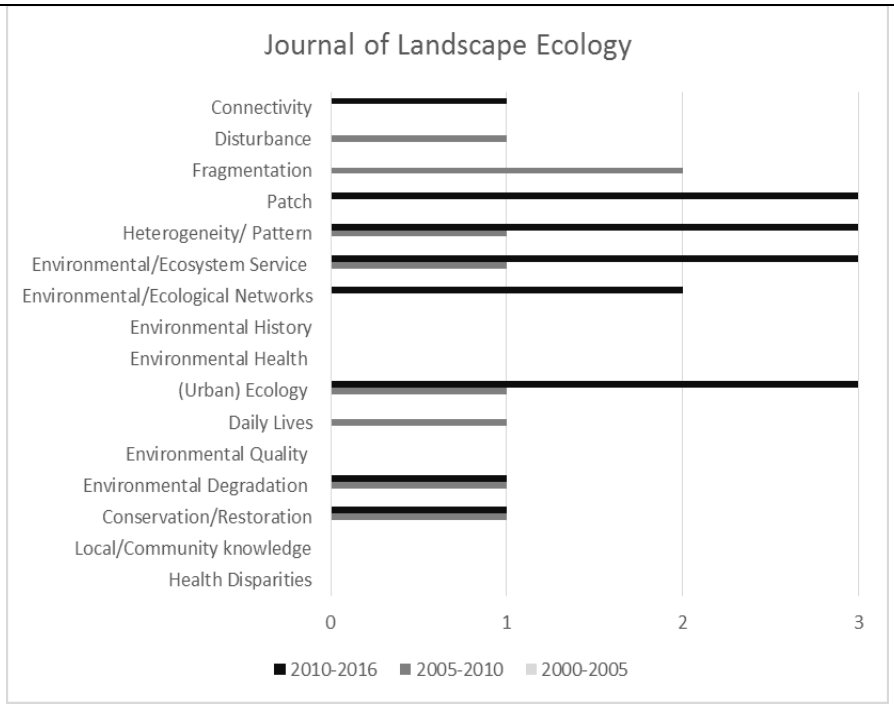
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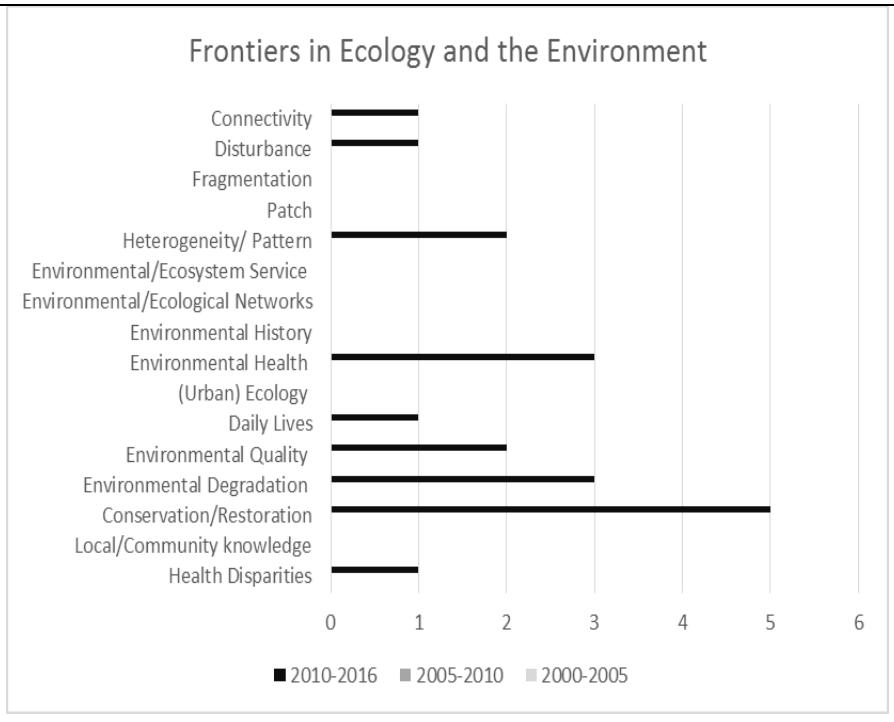
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Environmental/Ecological Networks
Environmental History
Environmental Health
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Daily Lives
Environmental Quality
Environmental Degradation
Conservation/Restoration
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Appendix B: Interview Protocols

Interview protocol- Residents

1) How long have you been living in this neighborhood?

2) What do you think about the environmental conditions and overall quality life in this neighborhood?

3) Do you know people who are recently diagnosed with a disease like Asthma, cancer, or heart problem?

4) Have you ever came across health or environmental advocates, their work in general or in this neighborhood?

5) What do you think is hindering our understanding of disease prevention in the U.S?

6) What is a good quality of life for you?

7) What do you think should be done at the government or local level to increase health awareness?

Interview protocol- Health Advocates and Environmental Activists

1) Can you tell me how you became involved in the work you are doing for environmental justice, health awareness and support?

2) Do you attribute the increasing rate of cancer cases in South Dallas to any hereditary, lifestyle or environmental reasons?

3) How do you feel about the blame often placed on patients?

4) What do you think is hindering our understanding of cancer prevention in the U.S.?

5) What is quality of life in your opinion?

6) What do you think about the media's coverage of the current environmental threats for human health?

7) What do you think should be done at the government or local level to increase health awareness?

8) What are the deficiencies of environmental justice research?

9) What have you learned or gained from your advocacy work during the years?

Interview protocol- Officials

1) Can you tell me how you started your work at this organization and how does it relate to environmental justice or health equality?

2) Do you attribute the increasing rate of cancer cases in different areas of the country (e.g. South Dallas) to any hereditary, lifestyle or environmental reasons?

3) What do you think about the blame often placed on patients?

4) What do you think is hindering our understanding of cancer prevention in the U.S.?

5) What are the deficiencies of environmental justice research?

6) What is quality of life in your opinion?

7) What do you think about the media's coverage of the current environmental threats for human health? And how does your organization contribute to that?

8) What do you think should be done at the government or local level to increase environmental justice, and cancer prevention and awareness?

9) What have you learned or gained from your work during the years?

Interview protocol- Urban Ecologists

1) Although landscape ecology as a discipline is growing rapidly, its application in interdisciplinary fields such as urban planning and design is proceeding more slowly. What do you think contribute to that?

2) There is a recent trend in landscape ecology called urban landscape ecology. How to you see the future trends regarding this paradigm?

3) In your research how to you analyze urban ecological systems?

4) Some argue that landscape ecology can be a powerful in mapping environmental justice. Do you agree?

5) Environmental protection agency has recently launched an environmental justice screening tool. Have you heard about it? What are your thoughts?

6) Why do you think instead all similarities and overlaps landscape ecology and urban environmental studies have remained divorced?

7) How do you see the future of landscape ecology research?

Appendix C: Environmental Justice Questionnaire

Environmental Justice Questionnaire **IRB Approval Date:** JUN 0 3 2016

I am a PhD student in Urban Planning and Public Policy at the University of Texas at Arlington conducting research for my dissertation. This questionnaire has been designed to explore the knowledge, ethics and morals that surround our understanding of environmental issues. You must be 18 years of age or older to participate, your participation is voluntary, you may discontinue participation at any time, there are no direct benefits to you, and there are no perceived risks or discomforts for participating. The survey is expected to take less than 5 minutes to complete and approximately 200 people may complete the survey. Your name or identifying information is not required, so your responses are completely confidential. Please contact Sima Namin (smnamin@uta.edu) with questions about this study or the Office of Research Administration (817.272.2105; regulatoryservices@uta.edu) with questions about your rights as a research subject.

Please indicate how much you agree or disagree with each statement.

[1] Strongly Agree **[2] Somewhat Agree** **[3] Somewhat Disagree** **[4] Strongly Disagree**

I believe there are enough laws and policies to control environmental risks in the Dallas area.	[ ]
When there is a really serious health problem, the government will do something about it. Until they tell me about a specific problem, I don't have to worry.	[ ]
I believe there are no serious environmental problems in my neighborhood (e.g. Hazardous waste and air pollution)	[ ]
There are environmental problems in my neighborhood and can affect human health.	[ ]
I think life style factors like smoking and diet increase the risk of cancer more than environmental factors like pollution.	[ ]
People can protect themselves against environmental health issues by improving their own individual life style.	[ ]
People are in control of their health.	[ ]
I rely on the media to learn about environmental issues and health threats.	[ ]
I think local environmental advocacy is important to educate people about environmental health issues.	[ ]
I am familiar with environmental justice topic.	[ ]

Please indicate what level of risk the following items are to you and your family, and your community. [Perceived severity]

1 Almost no risk **2 Low risk** **3 Somewhat of a risk** **4 High risk** **5 Very high risk**

	Yourself and Family	Your community
Pesticides in food	[ ]	[ ]
Indoor air pollution	[ ]	[ ]
Depletion of the ozone layer	[ ]	[ ]
Sewage	[ ]	[ ]
Waste incinerators	[ ]	[ ]
Climate change	[ ]	[ ]
Sun exposure	[ ]	[ ]
Chemicals	[ ]	[ ]
Outdoor air pollution	[ ]	[ ]
Drinking water	[ ]	[ ]
Dumping hazardous waste	[ ]	[ ]
Landfills	[ ]	[ ]
Lead	[ ]	[ ]

The last set of questions asks general information about you and your background.

Gender: Male [ ] Female [ ] Unspecified [ ] Intersex [ ] Prefer not to say [ ]

Age: 18-24 years old [ ] 25-34 years old [ ] 35-44 years old [ ] 45-54 years old [ ]
55-64 years old [ ] 65-74 years old [ ] 75 years or older [ ]

What ethnic background best describes you?

African American or Black [ ] Asian/Pacific Islander [ ] Hispanic/Latino [ ] White, non-Hispanic [ ]
Native American/Alaskan Native [ ] Other (SPECIFY: _____) Don't know/ Refuse to answer [ ]

What is the highest grade or year of school you completed?

Never attended school [ ] Enter grade (up to 11th grade) [ ] High school graduate or GED [ ]
College 1 year to 3 years (Some college or tech school) [ ] College 4 years or more (College graduate) [ ]
Refuse to answer [ ]

Which of the following best describes your work situation?

Employed full-time [ ] Employed part-time [ ] Homemaker [ ] Student [ ] Retired [ ]
Out of work for more than 1 year [ ] Out of work for less than 1 year [ ] Unable to work or disabled [ ]
Other (SPECIFY: _____) [ ] Refuse to answer [ ]

In general, would you say your health is

Excellent [1] Very good [2] Good [3] Fair [4] Poor [5]

Do you or an immediate family member has Asthma Yes [ ] No [ ]

Do you or an immediate family member has cancer Yes [ ] No [ ]

Which political party are you affiliated with

Very conservative [ ] Conservative [ ] Middle of the road [ ] Liberal [ ] Very liberal [ ]
Apolitical [ ] I do not wish to answer this question [ ]

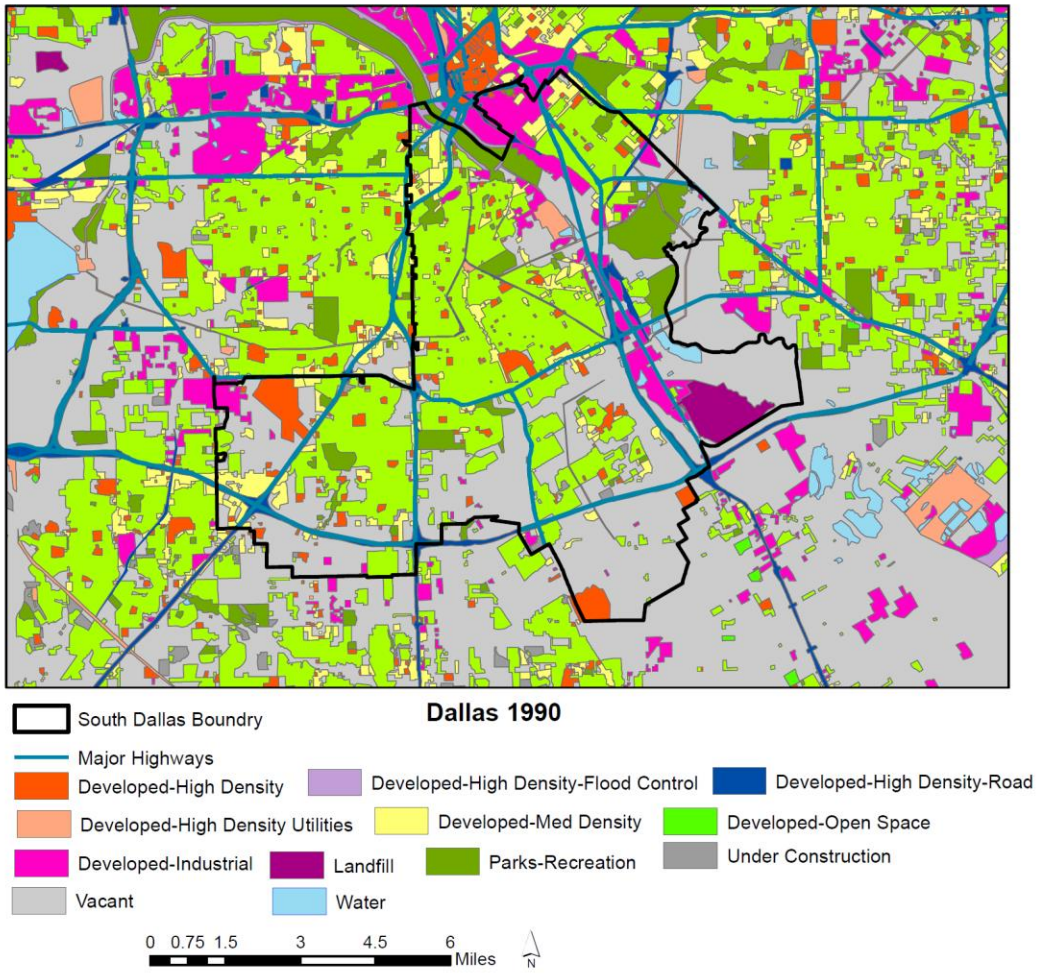
Please indicate the main source from which you receive your information about environment and health issues.

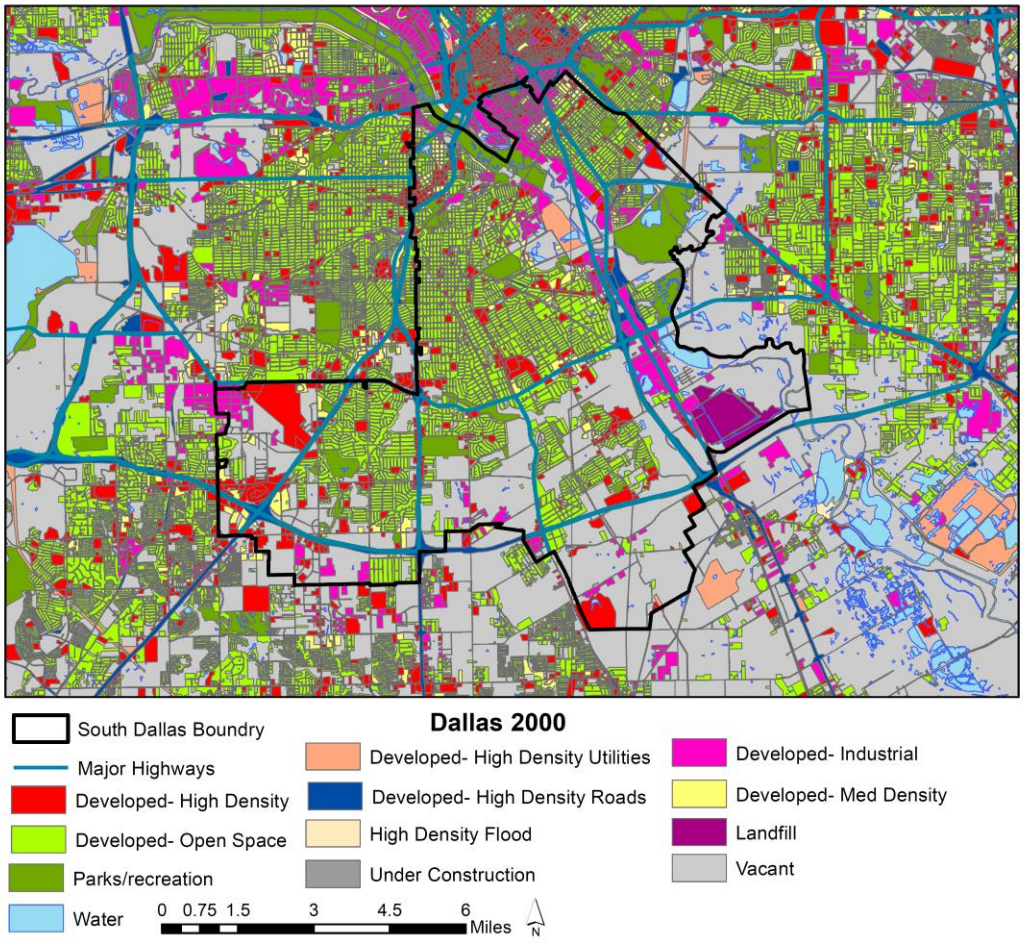
(SPECIFY: _____)

How do you define the term "health"?

Your Zip code: (_____)

Appendix D: Landscape Structures




Dallas 2000
South Dallas Boundry
Major Highways
Developed- High Density
Developed- Open Space
Parks/recreation
Water
Developed- High Density Utilities
Developed- High Density Roads
High Density Flood
Under Construction
Developed- Industrial
Developed- Med Density
Landfill
Vacant
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Miles
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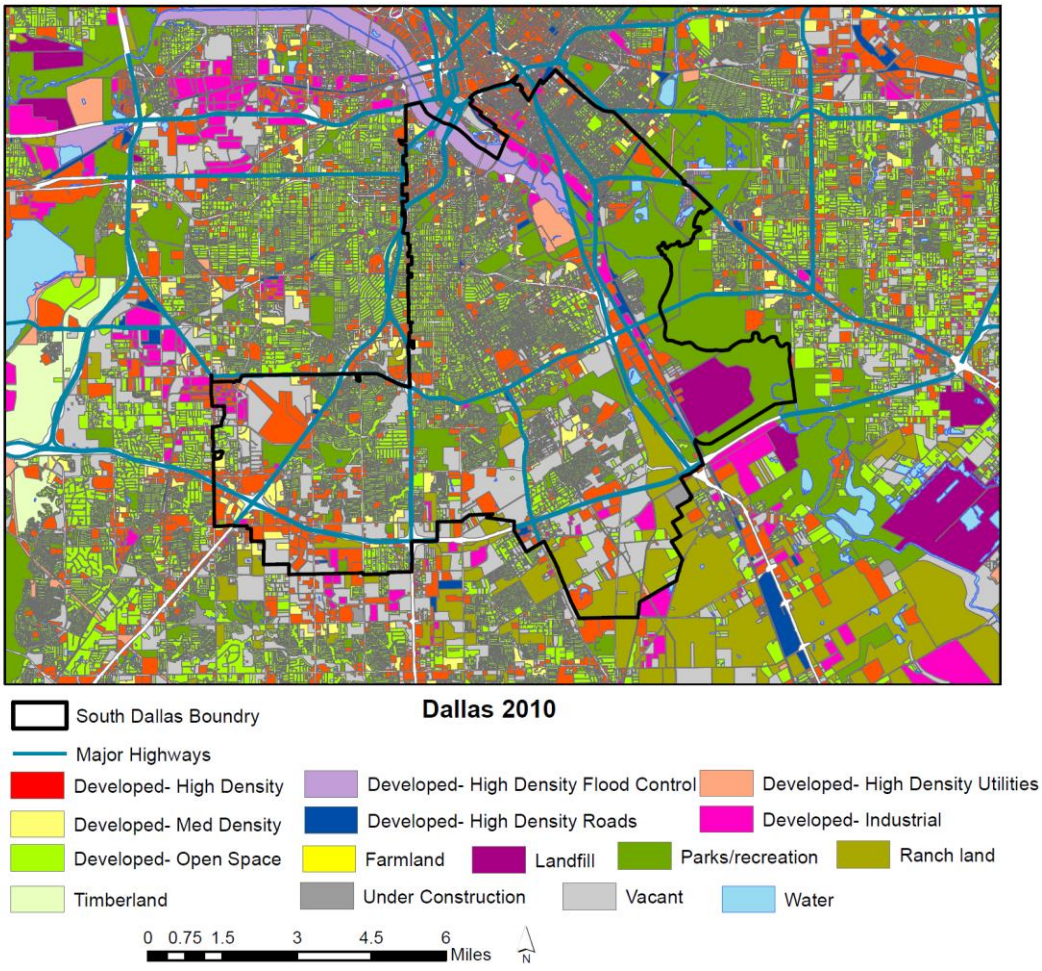
Dallas 2010
South Dallas Boundry
Major Highways
Developed- High Density
Developed- High Density Flood Control
Developed- High Density Utilities
Developed- Med Density
Developed- High Density Roads
Developed- Industrial
Developed- Open Space
Farmland
Landfill
Parks/recreation
Ranch land
Timberland
Under Construction
Vacant
Water
0 0.75 1.5 3 4.5 6
Miles
N

References

Abrams, C. (1955). *Forbidden Neighbors: A Study of Prejudice in Housing*. Port Washington, NY: Kennikat Press.

Agyeman, J., Bullard, R., & Evans, B. (2002). Exploring the Nexus: Bringing Together Sustainability, Environmental Justice and Equity. *Journal of Space & Polity*, 6(1), 77-90.

Ahern, J. (2005). Theories, methods and strategies for sustainable landscape planning. In B. Tress, G. Tres, G. Fry, & P. Opdam (Eds.), *From landscape research to landscape planning: Aspects of integration, education and application* (pp. 119-133). Netherlands: Springer.

Alagan, R. (2007). *Participatory GIS Approaches to Environmental Impact Assessment: A Case study of the Appalachian Corridor H Transportation Project*. (Doctoral dissertation). Retrieved from ProQuest Digital Dissertations. (UMI 3298537).

Amerasinghe , M., Farrell, L., Jin, S., Shin, N., & Stelljes, K. (2008). *Enabling Environmental Justice: Assessment of Participatory Tools*. Retrieved September 10, 2014, from Massachusetts Institute of Technology, Department of Urban Studies and Planning Web site: http://web.mit.edu/jcarmin/www/carmin/EnablingEJ.pdf

Anderson, M. (2012). *New Ecological Paradigm (NEP) Scale*. Retrieved November 14, 2013, from, http://umaine.edu/soe/files/2009/06/NewEcologicalParadigmNEPScale1.pdf

Anderton, D., Anderson, A., Rossi, P., Oakes, J., Fraser, M., Weber, E., & Calabrese, E. (1994). Hazardous Waste Facilities: 'Environmental Equity' Issues in Metropolitan Areas. *Evaluation Review*, 18, 123-140.

Atkinson, A. (1991). *Principles of political ecology*. London: Belhaven Press.

Bastian, O., Steinhardt, U., & Naveh, Z. (2003). *Development and Perspectives of Landscape Ecology*. Norwell, MA: Springer.

Barry, B. (1997).Sustainable and Intergenerational Justice. *Theoria*, 45(89), 43-65.

Been, V., Gupta, F. (1997). Coming to the nuisance or going to the barriers: A Longitudinal Analysis of Environmental Justice Claims. *Ecology Law Quarterly*, 24(1), 1-55.

Been, V. (1994). Locally Undesirable Land Uses in Minority Neighborhoods: Disproportionate Siting or Market Dynamics? *Yale Law journal*, 103 (6), 1383-1422.

Bernstein, H., & Woodhouse, P. (2001). Telling environmental change like it is? Reflections on a study in Sub-Saharan Africa. *Journal of Agrarian Change,* 1(2), 283-324.

Blaikie, P. (2001). Social Nature and Environmental Policy in the South: Views from Verandah and Veld. In N. Castree & B. Braun (Eds.), *Social Nature: Theory, Practice and Politics.* (pp. 133-151). Malden, MA: Blackwell Publishers Ltd.

Blaikie, P. (1999). A Review of Political Ecology Issues, Epistemology and Analytical Narratives. *Zeitschrift fur Wirtschaftsgeographie*, 43(3-4), 131-147.

Blaikie, P., & Brookfield, H. (1987). Defining and Debating the Problem. In P. Blaikie, & H. Brookfield (Eds.), *Land Degradation and Society* (pp. 1-4). New York, NY: Routledge.

Bonorris, S. (Ed.). (2010). *Environmental Justice for All: A Fifty State Survey of Legislation, Policies and Cases.* Retrieved January 15, 2016, from http://gov.uchastings.edu/public-law/docs/ejreport-fourthedition.pdf

Boston Globe Archive. Retrieved December 15, 2015, from https://secure.pqarchiver.com/boston/advancedsearch.html

Boston Landmark Commissions. (2001). *Jamaica Plain: Exploring Boston's Neighborhoods*. Retrieved December 15, 2015, from https://www.cityofboston.gov/images_documents/Jamaica_Plain_brochure_tcm3-19120.pdf

Brown, P. (1995). Race, Class, and Environmental Health: A Review and Systematization of the Literature. *Journal of Environmental Research*, 69 (1), 15-30.

Brulle, R., & Pellow, D. (2006). Environmental Justice: Human Health and Environmental Inequalities. *Annual Review of Public Health*, 27, 103-124.

Bryant, R. (1998). Power, Knowledge, and Political Ecology in the Third World: A Review. *Progress in Physical Geography*, 22 (1), 79-94.

Bryant, R. (1997). Beyond the impasse: the power of political ecology in Third World environmental research. *Area*, 29 (1), 5-19.

Bryant, R., & Bailey, S. (1997). *Third World Political Ecology*. London: Routledge.

Bryant, B. (1995). *Environmental Justice: Issues, Policies, and Solutions*. Washington, D.C.: Island Press.

Bullard, R., & Wright, B. (2009). *Race, Place, and Environmental Justice after Hurricane Katrina*. Boulder, CO: Westview Press.

Bullard, R. (2007). *Growing Smarter: Achieving Livable Communities, Environmental Justice, and Regional Equity*. Cambridge, MA: The MIT Press.

Bullard, R., Mohai, P., Saha, R., & Wright, B. (2007). *Toxic Wastes and Race at Twenty 1987—2007: A Report Prepared for the United Church of Christ Justice & Witness Ministries*. Retrieved March 24, 2015, from http://www.tolerance.org/sites/default/files/documents/toxic20.pdf

Bullard, R. (2005). *Katrina and the Second Disaster: A twenty-point plan to destroy black New Orleans.* Retrieved March 24, 2014, from

http://drrobertbullard.com/2015/07/28/katrina-and-the-second-disaster-a-20-point-plan-to-destroy-black-new-orleans-revisited-after-10-years/

Bullard, R., & Johnson, G. (2000). Environmental Justice: grassroots Activism and Its Impact on Public Policy Decision Making. *Journal of Social Issues*, 56(3), 555-578.

Bullard, R. (1996). Environmental Justice: It's More Than Waste Facility Siting. *Social Science Quarterly*, 77(3), 493-499.

Bullard, R. (1994). Overcoming racism in environmental decision-making. *Environment*, 36(4), 39-44

Bullard, R. (1994 b). *Dumping In Dixie: Race, Class, And Environmental Quality*. Boulder, CO: Westview Press.

Bullard, R. D. (1993). *Toxic struggles: The theory and practice of environmental justice*. Philadelphia, PA: New Society Publishers.

Bullard, R. (1993). *Confronting Environmental Racism: Voices from the Grassroots*. Cambridge, MA: South End Press.

Buttel, F. (1985). Environmental quality and the state: Some political-sociological observations on environmental regulation. *Research in Political Sociology*, 1, 167-188.

Byrne, J., Martinez, C., & Glover, L. (2002). A Brief on Environmental Justice. In J. Byrne, C. Martinez & L. Glover (Eds.), *Environmental Justice: Discourses in International Political Economy* (pp. 3-19). New Brunswick, NJ: Transaction Publishers.

Cable, S., & Benson, M. (1993). Acting Locally: Environmental Injustice and the Emergence of Grass-Roots Environmental Organizations. *Social Problems*, 40(4), 464-477.

Cable, S., & Cable, C. (1995). *Environmental Problems, Grassroots Solutions: The Politics of Grassroots Environmental Conflict*. New York, NY: St. Martin's Press.

Campbell, D. T. (1975). Degrees of freedom and the case study. *Comparative Political Studies*, 8(1), 178-191.

Capek, S. (1993). The Environmental Justice Frame: A Conceptual Discussion and an Application. *Social Problems*, 40(1), 5-24.

Caporaso, J., & Levine, D. (1992). *Theories of Political Economy*. New York, NY: Cambridge University Press.

Catton, W., & Dunlap, R. (1978). Environmental Sociology: A New Paradigm. *The American Sociologist*, 13, 41-49.

Chakraborty, J., & Maantay J. (2011). Proximity Analysis for Exposure Assessment in Environmental Health Justice Research. In J. Maantay & S. McLafferty (Eds.), *Geospatial Analysis of Environmental Health* (pp. 111-138). New York, NY: Springer.

Chakraborty, J., & Armstrong, M. (1997). Exploring the use of buffer analysis for the identification of impacted areas in environmental equity assessment. *Cartography and Geographic Information Systems*, 24(3), 145-157.

Chakraborty, J., & Armstrong, M. (1995). Using geographic plume analysis to assess community vulnerability to hazardous accidents. *Computer Environment Urban System*, 19(5), 1-17.

Chambers. (2006). Participatory mapping and geographic information systems: whose map? who is empowered and who disempowered? who gains and who loses?

The Electronic Journal on Information System in Developing Countries, 25(2), 1-11.

Clark, W., Kates, R., Richards, Mathews, J., Meyer, W., Turner, B., Pickett, S., Boone, C., & Mary L. Cadenasso. (2007). Relationships of Environmental Justice to Ecological Theory*. Bulletin of the Ecological Society of America*, 88 (2), 166-170.

Clayton, S. (2000). Models of Justice in Environmental Debate. *Journal of Social Issues*, 56(3), 459-474.

Connecticut Department of Energy and Environmental Protection. (2012). *The Environmental Justice Public Participation Guidelines*. Retrieved September 20, 2013, from http://www.ct.gov/deep/lib/deep/environmental_justice/EJ_Guid.pdf

Corburn, J. (2005). *Street Science: Community Knowledge and Environmental Health Justice*. Cambridge, MA: The MIT Press.

Coutts, C. (2010). Public Health Ecology. *Journal of Environmental Health,* 72(6), 53-55.

Craig, W., Harris, T., & Weiner, D. (2002). *Community Participation and Geographic Information Systems*. London: Taylor and Francis.

Cutter, S., & Solecki, W. (1996). Setting environmental justice in space and place: Acute and chronic airborne toxic releases in the southeastern United States. *Journal of Urban Geography*, 17(5), 380-399.

Cutter, S. (1996). Vulnerability to environmental hazards. *Progress in Human Geography*, 20(4), 529-539.

Cutter, S. (1995). Race, class and environmental justice. *Journal of Progress in Human Geography*, 19(1), 111-122.

Dallas Morning News Archive. Retrieved September 20, 2015, from http://www.dallasnews.com/archive/

Davies, J., & Kelly, M. (Eds.). (1993). *Healthy Cities: Research and Practice.* New York, NY: Routledge.

Davis, E. (1995). It Ain't Easy Being Green: Eco Meets Pomo In Sessions, G. (1995). Postmodernism and Environmental Justice: The Demise Of The Ecology Movement? *The Trumpeter*, 12(3). Retrieved March 10, 2016, from http://trumpeter.athabascau.ca/index.php/trumpet/article/view/305/456

Davis, D. (2002). *When Smoke ran like water: tales of environmental deception and the battle against pollution*. New York, NY: Basic Books.

DeLuca, K. (1999). *The Possibilities of Nature in a Postmodern Age: The Rhetorical Tactics of Environmental Justice Groups*. Retrieved September 11, 2014, from http://comphacker.org/comp/engl338/files/2012/08/j.1468-2885.1999.tb00357.x.pdf

De-Shalit, A. (1995). *Why Posterity Matters*. London: Routledge.

Dobson, A. (1999). *Fairness and Futurity: Essays on Environmental Sustainability and Social Justice*. Oxford, UK: Oxford University Press.

Dobson, A. (1998). *Justice and the Environment: Conceptions of Environmental Sustainability and Social Justice*. Oxford: Oxford University Press.

Domhoff, W. (2005). *Basics of Studying Power.* Retrieved May 11, 2015, from http://www2.ucsc.edu/whorulesamerica/methods/studying_power.html

Downey, L. (1998). Environmental injustice: Is race or income a better predictor? *Social Science Quarterly*, 79(4), 766, 778.

Dramstad, W., Olson, J., Forman, R. (1996). *Landscape Ecology Principals in Landscape Architecture and Land-Use Planning*. Washington, D.C.: Harvard University Graduate School of Design.

Dryzek, J. (1997). *The politics of the earth: environmental discourses*. New York, NY: Oxford University Press.

Dunlap, R., & Mertig, A. (1992). The Evolution of the U.S. Environmental Movement from 1970 to 1990: An Overview. In R. E. Dunlap & A. G. Mertig (Eds.), *American Environmentalism: The U.S. Environmental Movement, 1970-1990*. (pp. 1-10) Philadelphia, PA: Taylor and Francis.

Dunlap, R., & Van Leire, K. (1978). The new environmental paradigm. *Journal of Environmental Education*, 9(4), 10-19.

Dyson, M. (2006). *Come Hell or High Water: Hurricane Katrina and the Color of Disaster* . New York, NY: Basic Books.

Eakin, H., & Luers, A. (2006). Assessing the Vulnerability of Social-Environmental Systems. *Annual Review of Environment and Resources,* 31, 365-394.

Efron, E. (1984). *The Apocalyptics: Cancer and the big lie, How Environmental Politics Controls What We Know about Cancer*. New York, NY: Simon and Schuster.

Ellis, R., & Thompson, F. (1997). Culture and Environment in the Pacific Northwest. *American Political Science Review,* 91(4), 885-897.

Elwood, S. (2011). Participatory Approaches in GIS and society Research: Foundations, Practices, and Future Directions. In T. Nyerges, H. Couclelis, & R. McMaster (Eds.), The SAGE Handbook of GIS and Society (pp.381-400). Thousand Oaks, CA : SAGE Publication Inc.

Elwood, S. (2006). Critical Issues in Participatory GIS: Deconstructions, Reconstructions, and New Research Directions. *Transactions in GIS*, 10(5), 693-708.

Elwood, S. (2002). GIS and collaborative urban governance: Understanding their implications for community action and power. *Urban Geography*, 22(8), 737-759.

Elwood, S. & Leitner, H. (1998). GIS and community-based planning: exploring the diversity of neighborhood perspectives and needs. *Cartography and Geographic Information Systems*, 25(2), 77-88.

Environmental Justice Policy of the Executive Office of Environmental Affairs. (2002). Retrieved December 4, 2016, from http://www.mass.gov/eea/docs/eea/ej/ej-policy-english.pdf

Environmental Protection Agency. (2014*). Summary of the Recourse Conservation and Recovery Act*. Retrieved on September 11, 2014, from http://www2.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act

Environmental Protection Agency. (2014a). *Hazardous Waste Generators*. Retrieved on September 11, 2014, from http://www.epa.gov/waste/hazard/generation/index.htm

Environmental Protection Agency. (2014b). *Brownfields and Land Revitalization*. Retrieved on September 11, 2014, from http://www.epa.gov/brownfields/

Environmental Protection Agency (EPA). (2013 a). *Federal Interagency Working Group on Environmental Justice*. Retrieved December 4, 2013, from http://www.epa.gov/compliance/ej/interagency/index.html

Environmental Protection Agency (EPA). (2013 b). *Plan EJ 2014 Progress Report*. Retrieved December 4, 2013, from http://www.epa.gov/compliance/ej/resources/policy/plan-ej-2014/plan-ej-progress-report-2013.pdf

Environmental Protection Agency (EPA). (2013 c). *Current Environmental Justice Efforts*. Retrieved December 4, 2013, from http://www.epa.gov/compliance/ej/interagency/

Environmental Protection Agency (EPA). (2013 d). *Plan EJ 2014*. Retrieved December 4, 2013, from http://www.epa.gov/compliance/ej/interagency/

Environmental Protection agency. (2013f). *Air Pollution: Current and Future Pollutions*. Retrieved September 4, 2014, from http://www.epa.gov/air/caa/challenges.html

Environmental Protection Agency. (2013g). *Sustainable Material Management: The Road Ahead*. Retrieved September 4, 2014, from http://www.epa.gov/osw/conserve/smm/vision.htm

Environmental Protection Agency. (2012). *Air Research*. Retrieved on September 10, 2014, from http://www.epa.gov/research/airscience/air-historyofairpollution.html

Environmental Protection Agency. (2012 a). *National Ambient Air Quality Standards (NAAQS)*. Retrieved September 11, 2014, from http://www.epa.gov/compliance/environmentaljustice/

Environmental Protection Agency. (2011). *RCRA Information Management*. Retrieved September 11, 2014, from http://www.epa.gov/region6/6pd/rcra_c/pd-i/mgmt_inf.htm

Environmental Protection Agency. (2007). *Factors for identifying and assessing disproportionate environmental health impacts*. Retrieved January 15, 2016, from http://archive.epa.gov/ncer/ej/web/pdf/whitepaper.pdf.

Environmental Protection Agency. (2006). *National Environmental Justice Advisory Council Fact Sheet*. Retrieved December 4, 2013, from http://www.epa.gov/Compliance/ej/nejac/index.html

Environmental Protection Agency. (2003). *Interagency Working Group on Environmental Justice Revitalization Projects*. Retrieved December 4,2013, from http://www.epa.gov/compliance/resources/publications/ej/interagency/iwg_demo_proj ects_intro. pdf

Environmental Protection Agency (EPA). (2000). *Integrated Federal Interagency Environmental Justice Action Agenda*. Retrieved November 22, 2013, from http://www.epa.gov/compliance/ej/resources/publications/interagency/actionagenda.pdf

Environmental Protection agency (EPA). (1996*). the Model Plan for Public Participation*. Retrieved November 22, 2013, from http://www.epa.gov/compliance/ej/resources/publications/nejac/model-public-part-plan.pdf

Environmental Protection Agency. (1995). *The EPA's Environmental Justice Strategy*. Washington, D.C.: Environmental Protection Agency. Retrieved December 4 , 2013, from www.epa.gov/compliance/resources/policies/ej/ej_strategy_1995.pdf.

Environmental Protection Agency. (1994). *Executive Order: Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*. Retrieved December 4, 2013, from http://epa.gov/compliance/ej/resources/policy/exec_order_12898.pdf

Esbjörn-Hargens. S. (2011). An ontology of climate change: Integral Pluralism and the Enactment of Multiple Objects. *Journal of Integral Theory and Practice*, 5(1), 143-174.

Escobar, A. (1999). After nature: Steps to an antiessentialist political ecology. *Current Anthropology*, 40(1), 1-30.

Escobar, A. (1998). Whose Knowledge, Whose nature? Biodiversity, conservation, and the political ecology of social movements. *Journal of Political Ecology*, 5, 53-82.

Escobar, A. (1997). Post-constructivist political ecologies. In M. R. Redclift & G. Woodgate (Eds.), *The International Handbook of Environmental Sociology* (pp. 91-106). Northampton, MA: Edward Elgar Publishing, Inc.

Escobar, A. (1996). Elements for a post-structuralist political ecology. *Futures*, 28(4), 325-343.

Escobar, A. (1995). *Encountering Development: The Making and Unmaking of the Third World*. Princeton, NJ: Princeton University Press.

Executive Office for Administration and Finance. (2016). *MassGIS Data - 2010 U.S. Census - Environmental Justice Populations*. Retrieved March 18, 2014, from http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/cen2010ej.html

Faber, D., & McCarthy, D. (2003). Neo-Liberalism, Globalization, and the struggle for Ecological Democracy: Linking Sustainability and Environmental Justice. In J. Agyeman, R. Bullard & B. Evans (Eds.), *Just Sustainabilities: Development in an Unequal World* (pp. 38-64). Cambridge, MA: MIT Press.

Faber, D., & Krieg, E. (2001). *Unequal exposure to ecological hazards: environmental injustice in commonwealth of Massachusetts*. Retrieved March 18, 2014, from http://www.northeastern.edu/nejrc/wp-content/uploads/Final-Unequal-Exposure-Report-2005-10-12-05.pdf

Faber, D. (Ed.). (1998). *The struggle for ecological democracy. Environmental justice movements in the United States*. New York, NY: Guilford Press.

Figueroa, R. (2003). Bivalent Environmental Justice and the Culture of Poverty. *Rutgers University Journal of Law and Urban Policy*, 1(1), 27- 42.

Finch, J. (1986). *Research and Policy: The Use of Qualitative Methods in Social and Educational Research*. London: The Falmer Press.

First National People of Color Environmental Leadership Summit. (1991). Retrieved December 4, 2013, from http://www.ejnet.org/ej/principles.html

Fischer-Kowalski, M. (1997). Society's Metabolism: on the childhood and adolescence of a rising conceptual star. In M. Redclift & G. Woodgate (Eds.), International Handbook of Environmental Sociology (pp. 119-137). Northampton, MA: Edward Elgar.

Fisher, P. (2011). *Ecological Governmentality: The Displacement of the Local in the Rio Negro River Region of Brazil*. Retrieved on March 30, 2014, from http://astepback.com/EVSS695/Rio%20Negro.pdf

Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, 12(2), 219-245.

Foreman, C. (1998). *The Promise and Peril of Environmental Justice*. Washington, D.C.: Brookings Institution Press.

Forman, R. (1990). Ecologically sustainable landscapes: The role of spatial configuration. In I. S. Zonneveld (Ed.), *Changing landscapes: An ecological perspective* (pp. 261-278). New York, NY: Springer-Verlag.

Forman, R., & Godron, M. (1986). *Landscape Ecology*. New York, NY: John Wiley and Sons.

Formby, B. (2015, June 5). Nonprofit's role in Dallas' Trinity park raises questions of transparency, influence. *Dallas Morning News.* Retrieved on May 30, 2016, from http://www.dallasnews.com/news/transportation/20150605-nonprofits-role-in-dallas-trinity-park-raises-questions-of-transparency-influence.ece

Forrester, J., & Cinderby, S. (2012). *A guide to using community mapping and participatory-GIS*. Retrieved on December 12, 2014, from http://www.tweedforum.org/research/Borderlands_Community_Mapping_Guide_.pdf

Forsyth, T. (2003). *Critical Political Ecology: The Politics of Environmental Science*. New York, NY: Routledge.

Forsyth, T. (2008). Political ecology and the epistemology of social justice. *Geoforum*, 39 (2), 756-764.

Foster, J. (2013). Marx and the Rift in the Universal Metabolism of Nature. *Monthly Review*, 65(7).

Foster, J. (2009). *The Ecological Revolution: Making Peace with the Planet*. New York, NY: Monthly Review Press.

Foster, J. (2002). The Nature of the Contradiction. *Monthly Review,* 54(4).

Foster, J. (1999). Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology. *American Journal of Sociology*. 105(2), 366-405.

Foster, J. (1994). *The Vulnerable Planet: A Short Economic History*. New York, NY: Monthly Review Press.

Fotopoulos, T. (2008). Values, the Dominant Social Paradigm and Neoliberal Globalization. *The International Journal of Inclusive Democracy*, 4(1).

Foucault, M. (1980). *Power/Knowledge: Selected Interviews and Other Writings, 1972-1977*. New York, NY: Harvester Press.

Foucault, M. (2002). Power: The Essential Works of Michel Foucault 1954-1984. J. D. Faubion (Ed.). New York, NY: The New Press.

Fraser, N. (2000). Rethinking Recognition. *New Left Review*, 3, 107–120.

Fraser. (1997). *Justice Interrupts: Critical Reflections on "Post-Socialist" Condition*. New York, NY: Routledge.

Gee, G., & Payne-Sturges, D. (2004). Environmental health disparities: a framework integrating psychosocial and environmental concepts. *Environmental Health Perspectives*, 112(17), 1645-1653.

General Accounting Office (GAO). (1983). *Siting Hazardous Waste Landfills and Their Correlation with Racial and Economic Status of Surrounding Communities*. Retrieved March 4, 2014, from http://archive.gao.gov/d48t13/121648.pdf

Gergel, S., Turner, M. (2002).*Learning Landscape Ecology: A Practical Guide to Concepts and Techniques.* New York, NY: Springer-Verlag.

Gibbs, L. (1993). Celebrating ten years of triumph. *Everyone's Backyard*, 11(1), 2-3.

Gibson, W. (2004). *Eco-justice: the unfinished journey*. Albany, NY: State University of New York Press.

Girdner, E., & Smith, J. (2002). *Killing Me Softly: Toxic Waste, Corporate Profit, and the Struggle for Environmental Justice*. New York, NY: Monthly Review Press.

Glover, L. (2006). *Postmodern Climate Change*. New York, NY: Routledge

Goldman, B. (1996). What is the future of environmental justice? *Journal of Antipode*, 28(2), 122-143.

Goldman, B. (1994). *Not just prosperity: achieving Sustainability with Environmental Justice*. Washington, DC: National Wildlife Federation.

Grêt_Regamey, A., Brunner, S., Altwegg, J., Christen, M., & Bebi, P. (2013). Integrating Expert Knowledge into Mapping Ecosystem Services Trade-offs for Sustainable Forest Management. *Ecology and Society,* 18(3), 34.

Haines-Young, R. (2000). Sustainable development and sustainable landscapes: defining a new paradigm for Landscape Ecology. *Fennia*, 178(1), 7-14.

Haraway, D. (1999). *Simians, Cyborgs, and Women. The Reinvention of Nature*. New York, NY: Routledge.

Haraway, D. (1997). *Modest_Witness @Second_Millennium. FemaleMan_Meets_ OncoMouse: Feminism and Techno science*. New York, NY: Routledge.

Haraway, D. (1988). Situated knowledges: the science question in feminism and the privilege of partial perspective. *Feminist Studies*, 14(3), 575-599.

Harley, J. (1988). Maps, Knowledge, and Power. In D. Cosgrove & S. Daniels (Eds.), The Iconography of Landscape: Essays on the Symbolic Representation, Design, and use of Past Environments (pp. 277-312). Cambridge: Cambridge University Press.

Harris, T., & Weiner, D. (1998). Empowerment, marginalization, and "community-integrate" GIS." *Cartography and Geographic Information Systems*, 25(2), 67-76.

Hartley, T. (1995). Environmental justice: An environmental civil rights value acceptable to all world views. *Environmental Ethics*,17(3), 277-289.

Hartman, C., & Squires, G. (2006). *There Is No Such Thing as a Natural Disaster: Race, Class, and Hurricane Katrina*. New York, NY: Routledge.

Harvey, D. (1996). *Justice, Nature and the Geography of Difference*. Malden, MA: Blackwell Publishers.

Harvey, D. (1993). The Nature of Environment: The Dialectics of Social and Environmental Change. *The Socialist Register*, 29, 1-51.

Hawley, A. (1975). *Man and Environment*. New York, NY: Franklin Watts, Inc

Heath, R. (2015. September 21). What Redlining Looks Like: City Life/Vida Urbana Takes to the Streets to Outline Housing Discrimination. *Jamaica plain News*.

Hershey, M., & Hill, D. (1978). Is Pollution 'A White Thing'? Racial Differences in Preadults' Attitudes. *Public Opinion Quarterly*, 41 (4), 439-458.

Heynen, N. (2006 a). Green urban political ecologies: toward a better understanding of inner-city environmental change. Environment and Planning A, 38(3), 499–516.

Heynen, N. (2006 b). Justice of eating in the city: the political ecology of urban hunger. In N. Heynen, M. Kaika, & E. Swyn-Ggedouw (Eds.), *In the nature of cities. Urban*

political ecology and the politics of urban metabolism (pp.129-142). New York, NY: Routledge.

Hofricher, R. (1993). *Toxic Struggles: the Theory and Practice of Environmental Justice*. Philadelphia, PA: New Society Publishers.

Holifield, R. (2014). Environmental Reviews and Case Studies: Accounting for diversity in environmental justice screening tools: Toward multiple indices of disproportionate impact. *Environmental Practice*, 16(1), 77-86.

Holling, C. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics*, 4, 1-23.

Howe, H. (2007). Eco-Justice: Is Curiosity Good for Anybody? *Bulletin of the Ecological Society of America,* 88(2), 181-185.

Huehls, M. (2009). *Qualified Hope: A Postmodern Politics of Time.* Columbus, OH: The Ohio State University Press.

Ingegnoli, V. (2002). *Landscape Ecology: A Widening Foundation*. New York, NY: Springer.

Jablonski, L., & Poling, T. (2007). Eco-justice: Ecology and Environmental Justice: Developing an ESA Agenda. *Bulletin of the Ecological Society of America,* 88(2), 194-198.

Jones, R., & Carter, L. (1994). Concern for the Environment among Black Americans: An Assessment of Common Assumptions. *Social Science Quarterly*, 75(3), 560-579.

Jongman, R. (2008). Ecological networks, from concept to implementation. In S. Hong, N. Nakagoshi, B. Fu & Y. Morimoto (Eds.), *Landscape Ecological Applications in Man-Influenced Areas: Linking Man and Nature Systems* (pp. 57-71). Dordrecht, Netherlands: Springer.

Johnson. C., Bowker, M. (2004). African-American Wildland Memories. *Environmental Ethics*, 26(1), 57-75.

Johnston, R., Gregory, D., Pratt, G., & Watts, M. (2000). *The Dictionary of Human Geograph*y (4th ed.). Oxford: Blackwell.

JUSTIA US Law. (2009). *Lopez, et al v. City of Dallas, TX. No. 08 - 10911*. Retrieved April 20, 2014, from http://law.justia.com/cases/federal/appellate-courts/ca5/08-10911/08-10911.0.wpd-2011-02-26.html

Kaika, M. (2006). The political ecology of water scarcity. The 1989–1991 Athenian drought. In N. Heynen, M. Kaika, & E. Swyn-Ggedouw (Eds.), *In the nature of cities. Urban political ecology and the politics of urban metabolism* (pp.157-172). New York, NY: Routledge.

Kameri-Mbote, P., & Cullet, P. (1996). *Environmental Justice and Sustainable Development: Integrating local communities in environmental management. International Environmental Law research Center*. Retrieved September 20, 2013, from http://www.ielrc.org/content/w9601.pdf

Kelly, M., Davis, J., & Charlton, B. (1993). Healthy cities: modern Problem or a postmodern solution? In J. Davies & M. Kelly (Eds.), Healthy Cities: Research and Practice. New York, NY: Routledge.

Kennedy-Stoskopf, S. (2011). *NC One Health Collaborative*. Retrieved April 20, 2015, from http://www.ncbiotech.org/business-commercialization/connect-with-colleagues/intellectual-exchange-groups/OHG

Keil, R. & Boudreau, J. (2006). Metropolitics and metabolics. Rolling out environmentalism in Toronto. In N. Heynen, M. Kaika & E. Swyngedouw. (Eds.), *In the nature of cities: Urban political ecology and the politics of urban metabolism* (pp. 41-62). New York, NY: Routledge.

Khan, M. (2013). Theoretical frameworks in political ecology and participatory nature/forest conservation: the necessity for a heterodox approach and the critical moment. *Journal of Political Ecology*, 20, 460-472.

Kilbourne, W. (2004). Sustainable Communication and the Dominant Social Paradigm: Can They Be Integrated? *Marketing Theory*, 4(3), 187-208.

Kilbourne, W. (1998). Green marketing: A theoretical perspective. *Journal of Marketing Management,* 14(6), 641-655.

King, L., & McCarthy, D. (2005). *Environmental Sociology: From Analysis to Action.* Lanham, MD: Rowman & Littlefield Publishers.

King, C., Feltey, K., & Susel, B. (1998). The Question of Participation: Toward Authentic Public Participation in Public Administration. *Public Administration Review*, 58(4), 317-326.

Kirwan Institute. (2016). Retrieved December 4, 2015, from http://kirwan.maps.arcgis.com

Kolagani, N., Ramu, P., & Varghese, K. (2012). *Participatory GIS in empowering rural communities: A framework for iterative development and evaluation*. Retrieved on September 10, 2015, from http://www.iemss.org/sites/iemss2012/images/PGIS_Framework.pdf

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro environmental behavior? *Environmental Education Research*, 8(3), 239-260.

Komen, S. (2014). *Quantitative Data: Measuring Breast Cancer Impact in Local Communities*. Retrieved on September 10, 2015, from http://komen-dallas.org/wp-content/uploads/2012/08/Susan-G.-Komen-Dallas-County-Quantitative-Data-Report-2015-2019.pdf

Koren, H., & Bisesi, M. (2003). *Handbook of Environmental Health: Biological, Chemical, and Physical Agents of Environmental Related Disease* (vol. 1). New York, NY: Lewis Publishers.

Koren, H. (1980). *Handbook of Environmental Health and Safety: Principles and Practices*. New York, NY: Pergamon Press.

Krieg, E. (1998). *Review of The promise and peril of environmental justice*. Retrieved November 13, 2013, from http://www.asanet.org/images/members/docs/pdf/special/cs/CS_29_1_Review_26_Foreman.pdf

Kriega, E., & Faberb, D. (2004). Not so Black and White: environmental justice and cumulative impact assessments. *Environmental Impact Assessment Review*, 24 (7-8), 667-694.

Kroll-Smith, S., Brown, P., & Gunter, V. (2000). *Illness and the Environment: A Reader in Contested Medicine*. New York, NY: New York University Press.

Kumar, C. (2002). *GIS Methods for Screening Potential Environmental Justice Areas in New England.* Retrieved November 13, 2013, from file:///C:/Users/Owner/Downloads/50822071-MIT.pdf

Kurtz, H. (2009). Acknowledging the Racial State: An Agenda for Environmental Justice Research. *Journal of Antipode*, 41(4), 684-704.

Laituri, M., & L. Harvey. (1995). Bridging the space between indigenous ecological knowledge and New Zealand conservation management using geographic information systems. In A. Saunders, J. Craig & E. Mattiske (Eds.), *Nature Conservation 4: the Role of Networks* (pp. 122-131). Chipping North, Australia: Surrey Beatty & Sons.

Lee, S., Mohai, P. (2012). Environmental Justice Implications of Brownfield Redevelopment in the United States. *Society and Natural Resources*, 25(6), 602-609.

Lee, H. (2009). *The political ecology of environmental justice: environmental struggle and injustice in the Yeongheung Island coal plant controversy*. (Doctoral dissertation). Retrieved from ProQuest Digital Dissertations. (UMI 3298537).

Leff, E. (2013). Political Ecology: A Latin American Perspective*. Desenvolv. Meio Ambiente,* 35, 29-64.

Lester, J., Allen, D., & Hill, K. (2001). Environmental Injustice in the United States: Myths and Realities. Boulder, CO: Westview Press.

Lipietz, A. (2000). Political Ecology and the Future of Marxism. *Capitalism, Nature, Socialism*, 11(1), 69-85.

Liu, F. (2001). *Environmental justice analysis: Theories, methods, and Practice*. BocaRaton, FL: CRC Press.

Lovelock, O. (1987). *A new look at life on earth*. (2nd ed.). Oxford: Oxford University Press.

Lovett, A., Parfitt, J., & Brainard, J. (1997). Using GIS in risk analysis: a case study of hazardous waste transport. *Risk Analysis*, 17(5), 625–633.

Low, N., & Gleeson, B. (1998). *Justice, Society and Nature: an Exploration of Political Ecology*. London: Routledge.

Lupton, D. (1998). A Postmodern public health? *Australian and New Zealand Journal of Public Health*, 22(1), 3-5.

Luz, F. (2000). Participatory landscape ecology: innovative approaches for holistic landscape planning in Germany. *Landscape Urban Planning*, 50(1-3), 157-166.

Maantay, J., & McLafferty, S. (2011). *Geospatial Analysis of Environmental Health*. New York, NY: springer.

Maantay, J. (2007). Asthma and air pollution in the Bronx: Methodological and data considerations in using GIS for environmental justice and health research. *Health & Place,* 13(1), 32–56.

Maantay, J. (2002). Mapping Environmental Injustices: Pitfalls and Potential of Geographic Information Systems in Assessing Environmental Health and Equity. *Environmental Health Perspectives,* 110 (2), 161-171.

Mark, D., Egenhofer, M., Bian, L., Rogerson, P., & Vena, J. (1999). *Spatial-Temporal GIS analysis of Environmental Health*. Retrieved March 30, 2014, from http://www.spatial.maine.edu/~max/NIHproposal.pdf

Massachusetts House of Representatives. Retrieved September 20, 2015, from https://malegislature.gov/People/House

Massey, D., & Denton. N. (1993). *American Apartheid: Segregation and the Making of the Underclass*. Cambridge, MA: Harvard University Press.

Mayer, J. (1996). The political ecology of disease as one new focus for medical geography. *Progress in Human Geography,* 20(4), 441-456.

McAlpine, C., Seabrook, L., Morrison, T., & Rhodes, J. (2013). Strengthening Landscape Ecology's Contribution to a Sustainable Environment. In B. Fu & K. B. Jones (Eds.), *Landscape Ecology for Sustainable Environment and Culture* (pp. 21-35). New York, NY: Springer.

McCarthy, J. (2005). *Clean Air Act: A Summary of the Act and Its Major Requirements. CRS Report for the Congress*. Retrieved on September 10, 2014, from http://fpc.state.gov/documents/organization/47810.pdf

McKivigan, J.R., & Kaufman, H.L. (Eds.). (2012). *In the Words of Frederick Douglass: Quotations from Liberty's Champion*. Ithaca: Cornell University Press.

McMaster, R., Leitner, H., & Sheppard, E. (1997). GIS-based environmental equity and risk assessment: Methodological problems and prospects. *Journal of Cartography and Geographic Information Systems*, 24(3), 172-189.

Methodist Dallas Medical Center. (2013). *Community Health Needs Assessment*. Retrieved on September 10, 2014, from https://www.methodisthealthsystem.org/workfiles/CHNA/Dallas-Community-Health-Needs-Assessment.pdf

Mennis, J. (2002). Using geographic information systems to create and analyze statistical surfaces of population and risk for environmental justice analysis. *Social Science Quarterly,* 83(1), 281-297.

Mészáros, I. (1970). *Conceptual Structure of Marx's Theory of Alienation*. Retrieved October 20, 2014, from http://marxists.org/archive/meszaros/works/alien/meszaro3.htm

Milbrath, L. (1993). The World is Relearning Its Story about How the World Works. In S. Kamieniecki (Ed.), *Environmental Politics in the International Arena: Movements, Parties, Organizations, and Policy* (pp. 21-39). Albany, NY: State University of New York Press.

Miller, C.(2001). *Gifford Pinchot and the Making of Modern Environmentalism*. Washington, D.C.: Island Press.

Mitchell, G., & Dorling, D. (2003). An environmental justice analysis of British air quality. *Environment and Planning*, 35, 909-929.

Mohai, P., & Saha, R. (2006). Reassessing Racial and Socioeconomic Disparities in Environmental Justice Research. *Journal of Demography*, 43(2), 383-399.

Mohai, P. (1995). The Demographics of Dumping Revisited: Examining the Impact of Alternate Methodologies in Environmental Justice Research. *Virginia Environmental Law Journal*, 13(4), 615-653.

Mohai, P., & Bryant, B. (1992). Environmental Racism: Reviewing the Evidence. In B. Bryant & P. Mohai (Eds.), *Race and the Incidence of Environmental Hazards: A Time for Discourse.* Boulder, CO: Westview Press.

Mol, A. (2010). Social theories of environmental reform: Towards a third generation. In M. Gross & H. Heinrichs (Eds.). *Environmental Sociology: European Perspectives and Interdisciplinary Challenges* (pp.19-39). New York, NY: Springer.

Moor, J. (2010). Marx's Ecology and the Environmental History of World Capitalism. *Capitalism Nature Socialism,* 12(3), 134-139.

Morello-Froscha. R., & Lopez, R. (2006). The riskscape and the color line: Examining the role of segregation in environmental health disparities. *Environmental Research*, 102(2), 181-196.

Nada-Rajah, R. (2010). *A review of 'Environmental Justice' research in the UK*. Retrieved March 28, 2014, from http://environmental-justice.com/wp-content/uploads/EJR.pdf

National Cooperative Highway Research Program (NCHRP). (2004). *Effective Methods for Environmental Justice Assessment*. Retrieved on December 10, 2014, from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_532.pdf

National Environmental Justice Advisory Council. (2008). Retrieved December 4, 2013, from http://www.epa.gov/oecaerth/resources/publications/ej/nejac/state-ejca-letter-101508.pdf

Naveh, Z. (1987). Biocybernetic and thermodynamic perspectives of landscape functions and land use patterns. *Journal of Landscape Ecology*, 1(2), 75-83.

Neighborhood Pesticide Action Committee (NPAC). (2009). *Inner-city pesticide use as an environmental injustice*. Retrieved November 4, 2014, from http://www.northeastern.edu/nejrc/wp-content/uploads/NPAC_Environmental-Justice-Report1.pdf

Neighborhood Plus, (2015). *Neighborhood Revitalization Plan in Dallas*. Retrieved November 4, 2015, from http://dallascityhall.com/departments/pnv/DCH%20Documents/Neighborhood-Plus-June17-small.pdf

Nethengwe, N. (2007). *Integrating Participatory GIS and Political Ecology to study Flood Vulnerability in the Limpopo Province of South Africa* (Doctoral Dissertation). Retrieved from Pro Quest Dissertation and Thesis Global. (UMI Number: 3298733)

Newman, P. (1992). Killing Legally with Toxic Waste: Women and the Environment in the United States. In E. Girdner & J. Smith. *Killing me softly: Toxic Waste, Corporate Profit, and the Struggle for Environmental Justice*. New York: Monthly Review Press.

North Central Texas Council of Government's (NCTCOG). (2013). *Title V Program*. Retrieved December 4, 2013, from http://www.nctcog.org/edo/docs/201305Item13AttachmentExecBoard_TitleVIProgram.pdf

Novotny, P. (2000). *Where we live, work, and play: The environmental justice movement and the struggle for a new environmentalism*. London: Praeger.

Nussbaum, M. (2006). *Frontiers of Justice: Disability, Nationality, Species Membership*. Cambridge, MA: Harvard University Press.

Nweke, O., Payne-Sturges, D., Garcia, L., Lee, C., Zenick, H., Grevatt, P., Sanders, W., Case, H., & Dankwa-Mullan, I. (2011). Symposium on Integrating the Science of Environmental Justice into Decision-Making at the Environmental Protection Agency: An Overview. *American Journal of Public Health*, 101(1), 19-26.

O'Connor, J. (1973). *The Fiscal Crisis of the State*. New York, NY: Martin's Press.

Opdam, P., Foppen R., & Vos, C. (2002). Bridging the gap between ecology and spatial planning in landscape ecology. *Landscape Ecology*, 16(8), 767-779.

Palanga, H., Mandera, U., & Naveh, Z. (2000). Holistic landscape ecology in action. *Landscape and Urban Planning*, 50 (1), 1-6.

Parkland Health & Hospital System. (2011). *Community Health Assessment: South Dallas Service Area*. Retrieved March 20, 2015, from http://www.healthyntexas.org/javascript/htmleditor/uploads/South_Dallas_SA_Dashboard_final_5.11.pdf

Pastor, M., Bullard, R., Boyce, J., Fotehrgill, A., Morello-Frosch, R., & Wright, B. (2006). In the Wake of The Storm: Environment, Disaster, and Race after Katrina. New York, NY: Cambridge University Press.

Pastor, M. (2003). *Environmental Justice: Reflections from the United States*. Retrieved March 28, 2014, from http://www.peri.umass.edu/fileadmin/pdf/conference_papers/CDP1.pdf

Pavlovskaya, M. (2006). Theorizing with GIS: A tool for critical geographies? *Environment and planning A*, 38(11), 2003-2020.

Peet, R. (1998). *Modern Geographical Thought*. Oxford: Blackwell Publishers.

Peet, R., Watts, M. (1996). Liberating Political Ecology. In R. Peet & M. Watts (Eds.), Liberation Ecologies: environment, development, social movements (pp. 3-48). New York, NY: Routledge.

Pellow, N., Brulle, R. (Eds.). (2005). *Power, Justice, and the Environment. A Critical Appraisal of the Environmental Justice Movement*. Cambridge, MA: The MIT Press.

Pellow, N. (2000). Environmental inequality formation: Toward a theory of environmental injustice. *American Behavioral Scientist*, 43(4), 581-601.

Pelstring, L. (1997). *The NEP and Measurement Validity*. Retrieved November 13, 2013, from http://www.socialresearchmethods.net/tutorial/Pelstrng/validity.htm#NEP

Phillips, M. (2006). *White Metropolis: Race, Ethnicity, and Religion in Dallas, 1841-2001*. Austin, TX: University of Texas Press.

Picket, S., Parker, T., & Fiedler, P. (1992).The new paradigm in ecology: implications for conservation biology above the species level. In P. Fiedler & S. Fain (Eds.), *Conservation Biology: The Theory and Practice of Nature Conservation, Preservation and Management* (pp. 65-88). New York, NY: Chapman & Hall, Inc.

Pickles, J. (1997). Tool or science? GIS, Techno science, and the Theoretical Turn. *Annals of the Association of American Geographers*, 87(2), 363-372.

Pickles, J. (1995). Representation in an electronic age: Geography, GIS, and democracy. In J. Pickles (Ed.), *Ground Truth: The Social Implications of Geographic Information Systems* (pp. 1-30). New York, NY: The Guilford Press.

Pimm, S. (1984).The complexity and stability of ecosystem. *Journal of Nature*, 307(26), 321-326.

Platt, D. (2014). *A Strangely Organic Vision": postmodernism, environmental justice, and the new urbanist novel* (Doctoral Dissertation). Retrieved from ProQuest Digital Dissertations. (UMI 3673109).

Policy Agendas Project. Retrieved January 1, 2016 from http://www.policyagendas.org/

Potschin, M., & Haines-Young. R., (2006). 'Rio + 10', sustainability science and the landscape agenda. *Landscape and Urban Planning*, 75(3-4), 162-174.

Prudham, S. (2009). Pimping climate change: Richard Branson, global warming, and the performance of green capitalism. *Journal of Environment and Planning*, 41(7), 1594-1613.

Pulido, L. (2000). Rethinking Environmental Racism: White Privilege and Urban Development in Southern California. *Annals of the Association of American Geographers,* 90(1), 12-40.

Pulido, L. (1996). *Environmentalism and Social Justice: Two Chicano Struggles in the Southwest*. Tucson, AZ: University of Arizona Press.

Quan,J., Oudwater, N, Pender, J., & Martin, A. (2001). *GIS And Participatory Approaches in Natural Resources Research.* Retrieved on December 10, 2014, from http://www.nri.org/projects/publications/bpg/bpg09.pdf

Ramsey, M. (2009). Uncertainty in the assessment of hazard, exposure and risk. *Environ Geochem Health*, 31(2), 205-217.

Rawls, J. (2005). *A Theory of Justice*. Cambridge, MA: Belknap Press of Harvard University Press.

Repetto, R. (2006). *Punctuated Equilibrium and the Dynamics of U.S. Environmental Policy*. New Haven, CT: Yale University Press.

Richmond, S. (2015). *Environmental Justice in Massachusetts.* Retrieved on June 7, 2016, from http://www.environmentallawportal.com/environmental-justice-in-massachusetts

Rivera, N., Calderon-Ayala, J., Calle, L., Du, S., Gerald, B., Lanas, M., Lualhati, M., Moreno, L., Pérez, A., Sylvain, I., Vieira, D., & Armstrong, M. (2010).

Multidisciplinary and Multimedia Approaches to Action-Oriented Ecology. *Bulletin of the Ecological Society of America,* 91(3), 313-316.

Robbins, P. (2004). *Political Ecology: A Critical Introduction*. Oxford: Blackwell Publishing.

Robbins, P. (2003). Beyond Ground Truth: GIS and the Environmental Knowledge of Herders, Professional Foresters, and Other Traditional Communities. *Human Ecology*, 31(2), 233-253.

Roberts, D. (2011). *Is Climate Denialism postmodern?* Retrieved September 10, 2014, from http://grist.org/climate-skeptics/2011-03-03-is-climate-denialism-postmodern/

Roberts, J., & Bacon, D. (1997). Exploring the subtle relationship between environmental concern and ecologically conscious consumer behavior. *Journal of Business Research,* 40(1), 79–89.

Rochon, T., & Mazmanian, D. (1993). Social movements and the policy process. *The Annals of the American Academy of Political and Social Science*, 528, 75-87.

Rollfing, P. (1996). *Is Our Pursuit of Life, Liberty and Domestic Tranquillity, Wreaking Havoc on the Environment?* Retrieved November 13, 2013, from http://www.shsu.edu/~pin_www/T@S/1996/BK.html

Russett, B. (1967). *International Regions and the International System: A Study in Political Ecology*. Chicago, IL: Rand McNally.

Sawyer, S. (2004). *Crude Chronicles.* Durham, NC: Duke University.

Schlosberg, D. (2007). *Defining Environmental justice: Theories, Movements, Nature*. Oxford: Oxford University Press.

Schlosberg, D. (2004). Reconceiving Environmental Justice: Global Movements and Political Theories. *Environmental Politics*, 13 (3), 517-540.

Schroeder, R. (2000). Beyond Distributive Justice: Resource Extraction and Environmental Justice in the Tropics. In C. Zerner (Ed.), *People, Plants, and Justice: The Politics of Nature Conservation* (pp. 52-67). New York, NY: Columbia University Press.

Schubert, J. (2005). *Political Ecology in Development Research*. Retrieved March 28, 2014, from http://www.swisspeace.ch/fileadmin/user_upload/Media/Topics/Statehood___Conflict/Publications/Schubert__Jon_2005_Political_Ecology_in_Development_Research._An_Introductory_Overview_and_Annotated_Bibliography.pdf

Sessions, G. (1995). Postmodernism and Environmental Justice: The Demise of the Ecology Movement? *The Trumpeter*, 12(3). Retrieved March 10, 2016, from http://trumpeter.athabascau.ca/index.php/trumpet/article/view/305/456

Sessions, G. (1996). Reinventing nature, the end of wilderness? A response to William Cronon's Uncommon Ground. *The Trumpeter,* 13(1), 33-8.

Sheffield, J. (2010). Theodore Roosevelt, "Conservation as a National Duty". *Voices of Democracy*, 5, 89-108.

Sheppard, E., Leitner, H., McMaster, R., & Tian, H. (1999). GIS-based measures of environmental equity: Exploring their sensitivity and significance. *Journal of Exposure Analysis and Environmental Epidemiology*, 9, 18-28.

Sheppard, E., & Poiker, T. (1995). GIS and Society Special issues. *Cartography and Geographic Information Systems*, 22 (1), 5-21.

Shortt, N., Rind, E., Pearce, J., & Mitchell, R. (2014). Integrating environmental justice and socioecological models of health to understand population-level physical activity. *Environment and Planning A,* 46(6), 1479-1495.

Stern, P., Young, O., & Druckmen, D. (1992). *Global Environmental Change: Understanding the Human Dimensions*. Washington , D.C.: National Academy Press.

Swyngedouw, E. (2003). The Marxian Alternative: Historical-Geographical Materialism and the Political Economy of Capitalism. In E. Sheppard & T. J. Barnes (Eds.), *A Companion to Economic Geography* (pp.41-60). Oxford: Blackwell.

Swyngedouw, E., & Heynen, N. (2003). Urban Political Ecology, Justice and the Politics of Scale. *Antipode*, 35(1), 898-918.

Szasz, A. (1994). *Ecopopulism: Toxic Waste and the Movement for Environmental Justice.* Minneapolis, MN: University Of Minnesota Press.

Sze, J., & London, J. (2008). Environmental Justice at the Crossroads. *Sociology Compass,* 2(4), 1331-1354.

Tarocco S., Amoruso, I., & Caravello, G. (2011). Holistic model-based monitoring of the human health status in an urban environment system: pilot study in Verona City, Italy. *Journal of Preventive Medicine and Hygiene*, 52(2), 73-82.

Taylor, D. E. (2009). *The Environment and the People in American Cities, 1600s - 1900s*. Durham, NC: Duke University Press.

Taylor, D. (2000). The rise of the environmental justice paradigm: Injustice framing and the social construction of environmental discourses. *Journal of American Behavioral Scientist*, 43(4), 508-580.

Teelucksingh, C. (2002). Spatiality and Environmental Justice in Parkdale (Toronto). *Ethnologies*, 24(1), 119-141.

Texas House of Representatives. Retrieved September 12, 2015, from http://www.house.state.tx.us/

The California Energy Commission. (2013). *Environmental Justice*. Retrieved February 12, 2012, from http://www.energy.ca.gov/public_adviser/environmental_justice_faq.html

The Office of Health, Safety and Security (HSS). (2014). *Recourse Conservation and Recovery Act*. Retrieved September 15, 2014, from http://homer.ornl.gov/sesa/environment/policy/rcra.html

Therborn, G. (1970). What Does the Ruling Class Do When It Rules? Some Reflections on Different Approaches to the Study of Power in Society. *Critical Sociology,* 25(2), 224-243.

Thompson, A., Prokopy, L., Floress, K., & Weinkuaf, D. (2011). A method for incorporating community priorities into GIS: challenge, choices, and directions for landscape planners. *Landscape Journal,* 30 (2), 299-312.

Torres, G. (2002). Foreword. In K. M. Mutz, G. C. Bryner, & D. S. Kenney (Eds.), *Justice and Natural Resources: Concepts, Strategies, and Application* (pp. xxi-xxix). Washington, D.C.: Island Press.

United Church of Christ, Commission for Racial Justice. (1987).*Toxic Wastes and Race in the United States: A National Report on the Racial and Socioeconomic Characteristics of Communities with Hazardous Waste Sites*. Retrieved March 4, 2014, from http://www.ucc.org/about-us/archives/pdfs/toxwrace87.pdf

Urban Oasis. (2016). Retrieved January 4, 2016, from http://www.urbanoasis.org/

Vale, L. (2007). *From the Puritans to the Projects*. Harvard University Press.

Vernon, C. (2007). A Political Ecology of British Columbia's Community Forests. *Capitalism Nature Socialism,* 18(4), 54-74.

Walker, G. & Bulkeley, H. (2006).Geographies of environmental justice. *Journal of Geoforum*. 37(5), 655-659.

Walker, P. (2005). Political ecology: where is the ecology? *Progress in Human Geography*, 29 (1), 73-82.

Walker, P. (2003). Reconsidering 'regional' political ecologies: toward a political ecology of the rural American West. *Progress in Human Geography*, 27(1), 7-24.

Waller, L., Louis, T., & Carlin, B. (1999). Environmental justice and statistical summaries of differences in exposure distributions. *Journal of Exposure Analysis and Environmental Epidemiology*, 9, 56-65.

Walton, J. (1992). Making the Theoretical Case. In C. C. Ragin & H. S. Becker (Eds.), What Is a Case? Exploring the Foundations of Social Inquiry (pp. 121-137). Cambridge, UK: Cambridge University Press.

Watts, M., & Bohle, H. (1993). The space of vulnerability: the causal structure of hunger and famine. *Progress in Human Geography*, 17(1), 43-67.

Watts, M. (1983). *Silent violence: food, famine and peasantry in northern Nigeria*. Berkeley, CA: University of California Press.

White, B., & Hall, E. (2015). Perceptions of environmental health risks among residents in the "Toxic Doughnut": opportunities for risk screening and community mobilization. BMC Public Health, 15(1). **DOI:** 10.1186/s12889-015-2563-y

Whyte, W. (1989). Advancing Scientific Knowledge Through Participatory Action Research. *Sociological Forum*, 4(3), 367-385.

Williams, R. (1999). The contested terrain of environmental justice research: community as unit of analysis. *Social Science Journal*, 36 (2), 313-328.

Winant, H. (1994). *Racial Conditions: Politics, Theory and Comparisons*. Minneapolis, MN: University of Minnesota Press.

Wingspread Statement on the Precautionary Principle. (1998). *Wingspread Conference on the Precautionary Principle*. Retrieved on December 10, 2014, from http://www.sehn.org/wing.html

World Health Organization. (2016). *Summary report on proceedings minutes and final acts of the international health conference held in New York from 19 June to 22 July 1946*. Retrieved on December 10, 2014, from http://apps.who.int/iris/bitstream/10665/85573/1/Official_record2_eng.pdf

World Health Organization. (2006). *Preventing Disease through Healthy Environments: Towards an estimate of the environmental burden of disease*. Retrieved May 1, 2015, from http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

Wu, J. (2013). Key concepts and research topics in landscape ecology revisited: 30 years after the Allerton Park workshop. *Landscape Ecology*, 28(1), 1-11.

Wu, J., & Loucks, O. (1995). From balance of nature to hierarchical patch dynamic: a paradigm shift in ecology. *The Quarterly Review of Biology*, 70(4), 439-466.

Wu, J. (1992). Balance of nature and environmental protection: A paradigm shift. *Journal of Landscape Ecology*, 11(1), 39-49.

Yandle, T., & Burton, D. (1996). Methodological Approaches to Environmental Justice: A Rejoinder. *Social Science Quarterly,* 77(3), 520-527.

Young, I. (1990). *Justice and the politics of difference*. Princeton, NJ: Princeton University Press.

Zimmer, A. (2010). Urban Political Ecology: Theoretical concepts, challenges, and suggested future directions. *Erdkunde,* 64 (4), 343–354.

Zimmerman, M. (1994). *Contesting Earth's Future: Radical Ecology and Postmodernity*. Berkeley, CA: University of California Press

Zimmerman, R. (1993). Issues of Classification in Environmental Equity: How We Manage is How We Measure. *Fordham Urban Law Journal*, 21(3), 633-669.