THE U.S. FOOD MANUFACTURING INDUSTRY AND THE ENVIRONMENTAL HAZARDS OF TOXIC EMISSIONS TO SOCIALLY VULNERABLE POPULATIONS

A Dissertation

by

ALESHA T. ISTVAN

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Chair of Committee,	Harland Prechel
Committee Members,	Joseph Jewell
	Bethany DeSalvo
	John K. Thomas
	Walter Peacock
Head of Department,	Denis O'Hearn

December 2017

Major Subject: Sociology

Copyright 2017 Alesha T. Istvan

ABSTRACT

This dissertation examines the relationship between social vulnerability and plant level emissions. It utilizes a mixed methods approach that includes: 1) the historical context of the food manufacturing industry, environmental regulations, and environmental activism; 2) geographic mapping of population characteristics surrounding food manufacturing plants; and 3) quantitative multilevel analyses of how the relationship between a manufacturing facility's toxic emissions and the social vulnerability of the local population is mediated by community characteristics, organizational characteristics, and larger political-legal arrangements. This project extends organizational political economy theory of the environment to incorporate community characteristics and fills important gaps in the environmental justice literature.

This project had several findings. First, the research suggests that populations with higher levels of social vulnerability are more at risk for being affected by emissions from food manufacturing facilities. Second, organizational and political-economy factors have a direct impact not only on organizational behavior (i.e. amounts of emissions), but how organizational behavior relates to additional factors such as social vulnerability, facility density, and environmental regulatory climate. Third, the fewer opportunities organizations had to exploit their local populations, the less likely the emissions were to be higher or hazardous. Finally, this dissertation calls for further research refining the

use of a social vulnerability score with additional population characteristics as well as a longitudinal analysis of the mediating factors outlined in this project.

DEDICATION

I dedicate this dissertation to all those impacted by environmental injustice and all those fighting to right the wrongs. I dedicate this dissertation to those most vulnerable to the environmental ills perpetuated and reinforced by people and organizations with the most power in our society. Finally, I dedicate this dissertation to the countless, resilient communities that are able to construct and reconstruct their lives in the face of devastation. As I complete this dissertation, my thoughts are with all those most directly harmed by both man-made and natural disasters and the political structures that are unable or unwilling to mitigate that harm.

ACKNOWLEDGEMENTS

I would like to thank my dissertation committee members, Dr. Joseph Jewell, Dr. John Thomas, Dr. Bethany Desalvo, and Dr. Walt Peacock, for their guidance and support throughout the course of this research and through the various drafts of this dissertation over the last several years. Their feedback, advice, and expertise have been a pivotal part of making this project what it is today. Special thanks to Dr. Harland Prechel, my chair and faculty advisor since my beginnings in this program seven years ago. He taught me about the importance of rigorous research that takes seriously the radical sociological tradition and that uses theory to guide any empirical study. He taught me that there is no good writing, only good rewriting and I have utilized that lesson in all aspects of my work.

Thanks also go to my colleagues and the department faculty and staff for making my time at Texas A&M University a meaningful experience that has shaped me into the researcher-practitioner that I am today. I am particularly grateful for the friends that I have made that pushed me to be my best self even when things were more difficult than I expected and were willing to kick back and have fun with me when I needed a break. Special thanks to all those graduate school friends that thought critically with me about our world and laughed with me when that's all that we could do. These special people include Jessica Barron, CJ Murphy, Jenny Savely, Bryce Hannibal, Amber Fox Crowell, Mark Dawson, Walter Hart, Jocelyn Lewis, Kate Calle Willyard, Melissa Ochoa, Jesus

Gregorio Smith, Nicole Jones, Dadao Hou, Gwenetta Curry, and Michael Anthony Istvan Jr.

I want to also thank all of my colleagues and friends outside of academia that helped me become a well-rounded, social justice activist committed to not just researching but actually acting to make the world a better place. I thank all the members of the city of Austin environmental commission who work with me towards the important goal of local government decision-making. I am specifically indebted to Communities of Color United for Racial Justice, a group of committed organizers in the city of Austin that took me in and made me a part of the community. And I am most grateful to all the environmental justice activists in the city of Austin that I have been fortunate to learn from and who made it possible for me to check my previous assumptions as a researcher and examine how communities are really impacted by environmental degradation.

I thank my work family who made me a part of their lives. I am particularly grateful for Anna Chowdhury, Maria Limón, Jessica Moreno, Tyreena Heck, Krista Del Gallo, Molly Voyles, Rita Flores, Jasmine Uribe, Tonjie Reese, Baonam Giang, and Maya Pilgrim. Additionally, I would like to acknowledge Monika Johnson Hostler, Amy Sanchez, and Abe Louise Young. They came into my life later into my dissertation process and provided the encouragement, tough love, and space that I needed to finally complete this project.

I would like to thank my family of origin for their continued belief in me and most specifically my mom, Marsha Ignatius-Blizzard, for the strength and resilience she instilled in me and for continuing to ask me every semester whether I was going to be finished yet. A special acknowledgement to my son, Michael Anthony Istvan III, who has made my life so full, and for whom I have continued to push myself to be better in order to make the world better for him. I could not have made it through without his laughter and cuddle traps that made all the long nights and weekends worth it.

Finally, thanks to my partner, Morgan J Curtis, who encouraged me when things got the darkest, who believed that I would finish even when I didn't believe I would, who challenged me on my research assumptions and interpretations, who helped me think through unexpected findings, who woke up at 5 am with me for an entire year so we could be productive in solidarity, who made me get up out of bed on those weekends when I felt too exhausted after a long work week to work on this project, who celebrated each milestone with me no matter how small or insignificant I thought it was, and who pushed me through the finish line when things were too foggy for me to see it.

This dissertation belongs to all those captured in my acknowledgements above as well as all those who I inadvertently left out. I know that my success is the success of all those that have put their faith in me, even those I may not know or remember. And so I end by acknowledging all with whom I am connected, and who continue to co-create a beautiful, livable world with me.

CONTRIBUTORS AND FUNDING SOURCES

Contributors

This work was supervised by a thesis (or) dissertation committee consisting of Professor Harland Prechel [advisor] and Professor Joseph Jewell of the Department of Sociology, Professor Walter Peacock of the Department of Land Scape Architecture, Professor Emeritus John Thomas of the Department of Recreation and Tourism Sciences, and Dr. Bethany DeSalvo of the Census Research Data Center at Texas A&m University.

All work for the thesis (or) dissertation was completed independently by the student.

Funding Sources

Graduate study was supported by a diversity fellowship from Texas A&M University in addition to teaching and research assistantships from the Department of Sociology and the Texas Research Data Center.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Page

CHAPTER I

INTRODUCTION

Man lives on nature--means that nature is his body, with which he must remain in continuous interchange if he is not to die. That man's physical and spiritual life is linked to nature means simply that nature is linked to itself, for man is a part of nature.

Karl Marx, Economic and Philosophical Manuscripts

Nature shrinks as capital grows. The growth of the market cannot solve the very crisis it creates.

Vandana Shiva, Soil Not Oil: Environmental Justice in an Age of Climate Crisis

Introduction

Beginning with the rise of industrialization across the world, environmental degradation has become a very real concern. Increased development has meant increased exploitation of the natural world for short-term benefits to humanity. Production practices continue to involve the use of synthetic materials as well as the over use of finite energy resources (Harper, 2008). Even in sociological research about the environment, the *human exemptionalist paradigm* (Catton and Dunlap 1978) has focused on the uniqueness of humanity, historically attributing all social problems to culture and ignoring the human-nature relationship in the study of social problems. With the rise of environmental sociology and what Catton and Dunlap (1978) termed the *New Ecological Paradigm*, scholars have acknowledged humans as part of an ecological whole with the implication that the environment needs to be an important aspect in any sociological analysis.

Dunlap and Catton's analyses have become particularly poignant when confronted with the realities of pollution and its environmental effects. While climate change has become a politically controversial topic,[1] the consensus within the scientific community is that it is not only occurring at a significantly higher rate than pre-industrial times, but also that it is directly related to human production practices (Krause et al., 1992; Cunningham et al., 2007). Although less of a" mega-problem" than global warming (Giddens 2009), another outcome of pollution is the enormous amounts of toxic chemicals associated with production, most of which have the potential to do severe harm to humans in differing concentrations. Additionally, water pollution has led to decreases in drinkable water, with various illnesses arising from human consumption of polluted water.

In recent years, researchers have analyzed and acknowledged that the social impacts of toxic pollution are unequal and have worked towards understanding this environmental inequality. On the community level, environmental justice scholars are concerned with the disproportionate impacts of toxic plant siting on poor and minority, predominantly African American populations (Bullard 1983; Mohai and Saha 2007). This stream of research has expanded, incorporating other disenfranchised populations including Native Americans (Hooks and Smith 2004), Latino Americans (Pastor, Sadd, and Hipp 2001; Morello-Frosch, Pastor, and Sadd 2001), and recent immigrants (Faber 1998). Community-level researchers have also been concerned with how wealthier populations experience environmental privilege (Freudenburg 2005) and are able to

---

[1] Ehrlich and Erhlich (1996) explore the rhetorical strategies used by anti-environmentalists to misrepresent the empirical findings that clearly support the role of humanity in the degradation of the planet.

engage in environmentally destructive behaviors (e.g. cutting down forests to build a mansion on the top of a mountain), while blaming minority and immigrant populations for environmental degradation (Park and Pellow 2011).

Juxtaposed to research on environmental inequality, organizational researchers have focused on how plants (Grant and Jones 2003) and parent companies (Prechel and Zheng 2012; Prechel and Istvan 2016) pollute the environment. This research examines the interactions between plants and the local population (Grant, Trautner, Downey, and Thiebaud 2010), plants and their parent companies (Prechel and Zheng 2012), and parent companies and their larger political organizational embeddedness (Prechel and Zheng 2012; Prechel and Istvan 2016). Several sociologists have discussed the ability of large corporations to externalize environmental degradation to the population (Perrow 1984; Freudenburg 2005; Antonio 2009), and have examined environmental inequalities on the global level (York, Rosa, and Dietz 2003; Gould, Schnaiberg and Weinberg 1996; Jorgenson and Clark 2012). To date, however, little research has simultaneously examined social vulnerability, organizational proximity, and the macro-political context under which both industry and communities interact with one another. This dissertation adds to the literature on the intersections between risks associated with the social vulnerability (Blaikie et al. 1994; Cutter 1996; Van Zandt et al. 2012) of local communities and plant-level emissions (Tiefenbacher, Konopka, and Shelley 1997).

In this dissertation, I conduct a quantitative multilevel analysis of the toxic risk of food manufacturing plants. Using *organizational-political economy* theory (Prechel and Zheng 2012; Prechel and Touché 2014; Prechel and Istvan 2016), I examine the relationship between social vulnerability on the community-level with plant-level risky emissions. This analysis also includes a discussion of the historical context as well as the development of a social vulnerability measurement and mapping of population characteristics around these plants.

Research Questions

This project examines plant level pollution and extends organizational-political economy theory to emphasize the disproportionate risks to socially vulnerable communities. In the environmental justice literature, scholars have attempted to move beyond comparing race and class through the inclusion of other kinds of variables that focus on areal characteristics (Smith 2007), industrial based electrical utilities (Touché 2012), percent of population that votes (Hird and Reese 1998), industrial development (Anderton, Anderson, Oakes, and Fraser 1994), and population density (Hird and Reese 1998). Moreover, recent research has focused on how class and race are simultaneously important in different but similarly negative ways (Downey 2005: 2007). However, two major gaps exist in the literature. First, no comprehensive analysis addresses how community characteristics interact with one another and how these interactions change depending on place. Second, although past studies deal with the environmental risk posed by hazardous plants (e.g., Ringquist 1997), they do not incorporate plant-specific variables into the analysis or test the ways plant-specific variables interact with local community characteristics. To date, there are only three studies that have examined community and corporate variables in the same analysis (Grant et al. 2004; Grant et al.

2010; Touche 2012). To extend this literature, I ask two distinct, but interrelated questions:

1) *Are socially vulnerable populations at a disproportionate risk for being affected by emissions from food manufacturing plants?*
2) *How do organizational and political-economic factors affect the relationship between socially vulnerable populations and the toxic emissions of local food manufacturing plants?*

To answer these questions, I examined the United States food manufacturing industry.[2] This industry is an interesting one to examine for three reasons. First, the food manufacturing industry is structurally different from other industries in the United States.[3] Researchers argue that the significant competition in the food manufacturing industry makes it more responsive to consumers because companies need to maintain profits (Fryer and Versteeg 2008). Second, a large amount of research has been conducted on the sustainability of the food manufacturing process (Tilman, Cassman, Matson, Naylor, and Polasky 2002), the safety of these processes for the consumer (Antle 1996), and the safety of the process for workers (Komaki, Barwick, and Scott 1978). However, very few studies have been conducted to understand the impacts of the

[2] Food manufacturing refers to the process of physically or chemically changing raw materials into food, or changing food into different forms for human consumption. It is part of the larger food industry which incorporates agriculture, wholesale and distribution, and retail. It is regulated by at least three federal agencies, the U.S Department of Agriculture (USDA), the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA).

[3] Similarities exist also between the food industry and others, including historical changes that include periods of increased competition usually followed by increased consolidation through mergers and acquisitions (Papageorgiou, Michaelides, and Millions 2011).

production process on levels of risky emissions. Third, the U.S. food manufacturing industry has a "contradictory" relationship with the United States population. On the one hand, it is one of the largest industries in the country, affects much of the population, and employs a sizeable percentage of minority and low-income workers. According to the U.S. Department of Commerce, the food manufacturing industry includes over 28,000 plants and employs over 1.5 million people. It makes up over 10 percent of the U.S. manufacturing sector, and accounts for almost 13 percent of the nation's gross domestic product. The Bureau of Labor Statistics projects that employment in this industry will increase by 7 percent by the year 2020, which means an increasing number of people will depend on the food manufacturing industry for their livelihoods. On the other hand, according to the Toxic Release Inventory of the Environmental Protection Agency (EPA TRI), the food manufacturing industry has consistently been among the top 10 highest emitters of toxic pollution with significant variation in the amount of emissions from one plant to another.

I focus on several sectors within the food manufacturing industry. These include meatpacking, food packaging, and the processing of dairy and other products. The top emitting companies and companies with the most facilities include Tyson Foods (67 facilities), Land O Lakes Inc. (50 facilities), Dean Foods (41 facilities), Pilgrim's Pride (29 facilities), Archer Daniels Midland (22 facilities), Cargill Inc. (21 facilities), and Perdue farms (21 facilities).[4] Before examining the role of the food manufacturing

---

[4] Appendix A provides a complete list of all companies and the number of their facilities represented in the Toxic Release Inventory dataset for 2010.

industry in the United States and its connection to environmental regulation, I provide a brief history of the industry. This will be dealt with in further detail in chapter three.

The U.S. Food Manufacturing Industry[5]

The contemporary food manufacturing industry dates back to the industrial revolution which led to mass production of food and the development of factories for food packaging, standardization, and preservation. Very early on, the food manufacturing industry became one of few employment options for immigrants and domestic minorities and was the subject of controversy. In his famous novel, *The Jungle* (1991(1906)), Upton Sinclair exposed class and power in America and the horrific working conditions within the meatpacking industry. His novel would eventually lead to the development of the Pure Food and Drug Act (1906), responsible for the creation of the United States Food and Drug Administration (FDA). In addition to the FDA, the food manufacturing industry was also regulated by the United States Department of Agriculture, the United States Food and Drug Association (USDA), and beginning in 1970, the Environmental Protection Agency (EPA).

From its beginnings in the late part of the 19th century and through its rapid growth following World War II, the food manufacturing industry dealt with very little environmental regulation. With the creation of the EPA and the authorization by the

---

[5] Historical information came from an industry magazine, *Food Processing.* Additional information appears in summaries from the National Institutes of Health, U.S. Department of Commerce Industry report, Standard and Poor's industry profile, and the website of the United States Environmental Protection Agency.

United States Congress of the Clean Air Act in 1970, this all changed. Since this time, the food manufacturing industry has had to contend with emissions, waste containment, and community–right to-know regulations. The 1977 and 1990 amendments to the Clean Air Act further increased the regulatory reach of the EPA and gave facilities further instructions on reducing air toxics. In addition, the Emergency Planning and Community Right to Know Act of 1986 established the Toxic Release Inventory, which required larger facilities to report toxic releases of selected chemicals each year.

At the same time as the laws governing facility emissions were changing, the food manufacturing industry was also undergoing significant changes. By the 1970s, in order to maintain profits in a highly competitive market, companies undertook several different strategies including relying on marketing and advertising, downsizing through layoffs and plant closings, and mergers and acquisitions (Lo and Jacobsen 2011). At the same time, local governmental bodies and community development firms touted food manufacturing plants as a viable path for economic development in their local communities. To promote the siting of these plants within their communities, local and state governments established tax incentives and lax environmental regulations to entice companies to move into their areas (Broadway 2000; Fennelly and Leitner 2002; Leistritz and Sell 2001). For example, Leistritz and Sell (2001) documented how communities in North Dakota provided prospective plants an incentive package that included a five-year abatement on all county and school district taxes. I examine within this historical context, the emissions of food manufacturing as it relates to socially vulnerable populations.

Dissertation Structure

The dissertation is made up of seven chapters. In this chapter, I introduced the project. In chapter two, I outline a review of the literature connected to this work. Chapter three provides a detailed historical context. Chapter four describes social vulnerability theory and its methodology. Chapter five describes my hypotheses and research design for a multilevel analysis. Chapter six presents the results and findings from the multilevel analyses. Chapter 7, the closing chapter, includes a detailed discussion of the findings and concluding thoughts.

CHAPTER II

LITERATURE REVIEW

Introduction

This dissertation connects various fields of study within sociology and related disciplines to fill important gaps between the study of organizations, the political-legal context occupied by organizations and individuals, and the environmental inequalities present within these contexts. This chapter is broken up into several parts. In the first section, I discuss the macro theories of ecological modernization and the treadmill of production. In the second section, I focus on theories of community and environmental justice. The third section focuses on organizational characteristics and environmental behavior, and the last section lays out the conceptual framework, Organizational Political Economy, that I utilize throughout this dissertation.

Macro-Ecological Theories

For several decades, scholars have been studying the relationship between the natural environment and the economy. On the macro level, two opposing theories stand at the forefront: Ecological Modernization and Treadmill of Production.

Ecological Modernization proposes an optimistic view of mutual relationships between environmental concern and capitalist development. Overall, Ecological Modernization attempts to "re-rationalize the division of labor of modern industrialism to be less ecologically destructive and to internalize costs and impacts that are currently externalized" (Buttel 2000). Theorists in this tradition have argued that although economic growth has caused environmental problems, greater economic development will eventually increase environmental consciousness and the gulf between the environment and economy will decrease (Mol and Sonnenfield, 2000; Spaargaren et al, 2000; Rudel, Roberts, and Carmin 2011). Scholars present an environmental Kuznets curve arguing that as affluence increases, public concern, pressure from nongovernmental organizations, and environmental state policies will make curtailing environmental problems more cost effective for industry (Mol and Sonnenfield, 2000; Spaargaren et al, 2000).

Ecological modernization theory has four main strands (Buttel 2000; Milanez and Buhrs 2007). The technological strand focuses on the ability of technological innovation to curb environmental degradation. Green technologies mean less degradation per unit output (Huber 2000). The policy strand focuses on the importance of government regulation in driving ecological modernization. Scholars argue that environmental accountability will increase with less government regulations and more incorporation of voluntary state-corporate agreements as well as market-based encouragement of innovation and self-regulation (Mol, 1995; Stretesky and Gabriel 2005; Young 2000). The social strand focuses on increasing environmental awareness within the society, which will inevitably change consumption patterns and have an indirect effect on production patterns (Christoff 1996; Buttel 2000). Finally, the economic strand focuses on the inevitability of the decoupling of economic growth from environmental impacts. This will occur as society moves away from manufacturing towards service oriented industries (Toke 2011).

In direct contradiction to Ecological Modernization, the Treadmill of Production contends that the goal of the capitalist society is continual capital accumulation. To fulfill this goal, producers must produce increasingly more. This continual production causes an irreconcilable conflict between the economy and the environment via the consumption of natural resources, the disposal of production wastes, and impacts on local communities and populations (Schnaiberg 1980; Schnaiberg and Gould, 1994). For the most part, because of an ideology of "progress," workers become more "socially dislocated" (Gould, Pellow, and Schnaiberg 2004), environmental concern decreases (Givens and Jorgenson 2011), and the environmental degradation of the natural world continues even through technological advancements (York et al. 2003; Bell 2004; Gould et al. 2004). For example, treadmill scholars critique the environmental Kuznets curve by positing Jevon's Paradox (York, Rosa, and Dietz 2010), which argues that rising production leads to increased consumption. This means that even if an industry adopts cleaner technologies, the treadmill effect is still occurring.

These two macro-sociological theories of the environment address the larger relationship between the economy and the environment. They provide a context for local community dynamics. In the next section, I focus on theories of community and connect them to the environmental justice literature.

Theories of Community and Environmental Justice

The "Great change" thesis of community (Warren, 1972) argues that in the United States, communities have become less autonomous and have been impacted by the introduction of corporations and non-local government systems that maintain control over these local communities. At the same time, members of the community have become less cohesive because of developments in technology and increased population diversity that have increased the amount of distinct interests and associations. This reality, in conjunction with 1) the movement of historically local functions into the hands of government and corporations and 2) technology which has enabled people to "develop relationships based on factors other than residential proximity" (Warren 1972; 11), has created community cohesion crises.

The interactional approach of community, however, argues that communities are never one cohesive unit. Distinct from the Great change thesis, the interactional approach takes on the question of fields of interaction (Kaufman 1959; Reiss 1959; Wilkinson 1999) to understand how a community is defined and operates, the roles of associations and networks within the community, the functions of leadership, power, and local social institutions' collective action, and the development or decline of a shared community identity (Wilkinson 1999). From this perspective, communities are not just one cohesive unit, but are made up of several groups that experience and respond differently to events, issues, and problems.

Environmental justice research has scrutinized: 1) the relationship between community demographics and where companies site their plants (Anderton 1996; Been 1994b; Downey 1998; Mohai and Saha 2007; Smith 2007), 2) the pollution output within those areas (Gelobter 1992; Bryant and Mohai 1992; Szasz and Meuser 1997), and 3) the government response to these localized environmental crises (Bullard 2005; Zimmerman 1993).

Much environmental justice research has found race to be a significant predictor of proximity to polluting plants (Bullard 1983; Gelobter 1992; Mohai and Bryant 1992; Brown 1995; Downey 1998; Ringquist 1997; Stretesky and Lynch 2002; Mohai, Pellow, and Roberts 2009). Furthermore, researchers have observed that hazardous waste sites in minority communities take longer to be cleaned up, that government penalties for polluters are lower in minority neighborhoods (Lavelle and Coyle 1992), and that the environmental organizing in minority neighborhoods is less effective (Zimmerman 1993). Newer research has begun to examine health outcomes. For example, EPA researchers (2002) have noted significant race differences in the occurrence of lead poisoning.

Other research has suggested that findings in line with an environmental racism model have been overstated, suggesting instead that class and socioeconomic status is at least as significant as race in understanding environmental inequality (Gould 1986; Anderton, Anderson, Oakes, and Fraser 1994; Hamilton 1995; Tiefenbacher 1998; Hird and Reese 1998; Smith 2007). This research has found that there is a mix of variables that create environmental inequalities (Hird and Reese 1998; Smith 2007), and that there are considerable regional differences in these variables (Anderton, Anderson, Oakes, and Fraser 1994; Mohai et al. 2009).

The environmental justice framework (Pellow 2004) pays specific attention to the complex social interactions within any given community that can affect organizational action. This framework has four components: (1) it views environmental inequality as a process, (2) it gives attention to the complex roles of people and organizations, (3) it considers the effects of pervasive inequality on stakeholders, and (4) it conceptualizes agency (i.e. the roles played by those confronted with environmental inequality to shape the outcomes of these conflicts). In short, environmental inequality is not just about correlations between environmental hazards and certain populations, it is about the mix of power dynamics, which includes the relationships between coalitions, fractions, and community organizations within local communities that produce and reproduce inequalities in relation to environmental risk.

In addition, some research suggests that environmental justice findings relating to social class are complicated to interpret because of the complex role it plays in determining a population's environmental vulnerability (Gould 1986). For example, working class neighborhoods may be more impacted by toxic waste because industries are more likely to be located in their neighborhoods than in the most impoverished areas (Gould 1986). Additionally, recent studies have examined how findings in the environmental justice literature are historically and spatially contingent (Pulido 2000). Furthermore, race and class do not necessarily operate as competing inequalities, but instead people of color and low social class status are affected by inequalities differently depending on their historical and contemporary context[6] (Krieg 1995; Wilson 1996; Pellow 2004; Downey 2005; Downey 2007; Fernandez 2008).

---

[6] Omi and Winant (1993) argue that race and class, for example, are complicated characteristics that are both part of a socio-historical process of change and transformation. While they form two different social hierarchies, they are not competing, but "mutually reinforcing" phenomena that strengthen overall social inequalities (Sewell 1992; Bonilla Silva 1997; Jewell 2007).

The spatial mismatch thesis (Wilson 1996; Fernandez 2008) is one way of examining the relationship between race and class in American society. It claims that urban minorities have been disproportionately affected by job relocation from cities to the suburbs. This places minorities at a disadvantage in the work force (Royce 2015). At the same time, however, this historical process has also meant that suburban working-class whites and minorities have increasingly become exposed to risky emissions (Downey 2005; 2007; Kreig 1995). This complex relationship calls for a new kind of analysis that deals with this reality. Researchers studying environmental vulnerability (and social vulnerability more specifically) began in the 1990s to address this concern and the complicated dynamics associated with environmental inequality.[7]

While moving in the direction of understanding the importance of organizations in these analyses, the Environmental Justice literature does not focus directly on the organizations that make up an important part of the social structure and that are intense polluters. Research in organizations and the environment has begun to fill this gap. The next section connects research on organizations with environmental research within the field of sociology.

Organizational Environmental Behavior

Within the organizational literature, there have been many attempts to explain organizational outcomes based on an organization's characteristics. Theorists concerned with the effect of an organization's environment on its actions have used one of two

---

[7] I address social vulnerability more specifically in Chapter four of this dissertation.

theoretical frameworks. Population ecologists have argued that once social structures are established they follow a process similar to biological evolution. Organizational forms develop a superior fit based on their environment and those that are unable to, "die off" (Hannan and Freeman 1977). Within this perspective, structural inertia variables such as an organization's size, age, or complexity affect its ability to change (Hannan and Freeman 1984). However, organizational decision making tends to be more complex than the linear model presented in this school of thought. Alternatively, Resource Dependency theory examines the ways organizations are both dependent and exert influence on their external environments (Pfeffer 1972; Prechel 2000; Sherer and Lee 2002). Resource Dependency theorists argue that the external opportunities and constraints of organizations can affect a variety of corporate behaviors. These behaviors include corporate acquisitions (Palmer et al. 1995) and corporate form change (Prechel 2000).

Corporate form has been an important variable within the organizational literature. Since Berle and Means (1932) first discussed the divergence of ownership and control within the modern corporation, scholars have studied the causes of corporate form changes. They argue that corporations change form for several reasons including: efficiency purposes (Chandler, 1962); the political-legal environment (Prechel 2000); the informal authority within the organizations (Fligstein 2000); and organizational networks (Palmer et al. 1993). Recent literature in this area has moved away from identifying the causes of corporate form change to using corporate form as an explanatory variable, for example identifying the effects of corporate form on corporate malfeasance (Prechel and Morris 2010) and corporate pollution (Prechel and Zheng 2014).

Including some of the main explanatory variables identified within research on complex organizations, scholars have examined organizational characteristics associated with high organizational pollution rates. Grant et al. (2002) studied the relationship between plant level pollution and organizational size. Within the chemical industry, they found that larger plants (i.e. plants with more employees) pollute at higher rates than smaller plants, but this relationship weakens as the plants get larger. Furthermore, they find that larger plants pollute at higher rates especially if they are a part of a large corporation. In another study, Grant and Jones (2003) use previous work by Prechel and Boies (1998) to show that corporations in the high-risk chemical industry were among the first to change to the multi-layered subsidiary form where liability firewalls exist.[8] They found that plants that were also subsidiaries polluted at higher rates than other plants.

In recent years, this literature has expanded to include the parent company of a corporation. Using previous research on the multilayered subsidiary-form and corporations' embeddedness within a larger political economy (Prechel 2000; Prechel and Morris 2010), Prechel and Zheng (2012) engaged in a large-scale analysis of the effects of firm level characteristics on pollution. The firm was used as the unit of

---

[8] According to Prechel and Boies (1998:325), a corporation operating using a multi-layered subsidiary form has "a hierarchy of two or more levels of subsidiary corporations with a parent company at the top operating as a management company."

analysis because that is where ultimate organizational decision-making power rests. These researchers reported significant variation between industries and discussed the need for more industry specific environmental research that would account for historically specific circumstances. To date, scholars have examined historical changes within the U.S. electrical energy industry (Prechel 2012) and their relationship to corporate toxic emissions rates (Prechel and Touché 2014; Prechel and Istvan 2016).

Three recent projects (Grant et al. 2004; Grant et al. 2010; Touché 2012) considered the relationship between environmental justice and organizational toxic emissions. In the first project, the researchers tested only interactions between absentee ownership (i.e., plants that are located in a different state from their headquarters) and its effect on community engagement (Grant et al. 2004). Grant et al. (2010) conducted a "fuzzy-set analysis"[9] to investigate the relationships between organizational variables and community level variables. Their findings indicated that certain "recipes of risk" for pollution exist in which race and socio-economic status matters and when they do not. They focused, however, on the qualitative relationships between selected demographic and organizational variables and did not consider the larger organizational political economy as conceptualized by Prechel and colleagues. Touché (2012) conceptualized this larger organizational political economy and included community-level variables, but did not examine ways that community-level variables interact with one another and with

[9] A fuzzy set analysis is a variant of Qualitative Comparative Analysis (QCA). This method uses Boolean algebra to determine the impact of certain combinations of descriptors on a specific outcome (Ragin 2000; Grant et al. 2010).

the local plant to produce environmental risk to local populations. Although my dissertation is in line with Touché's research and the conceptual framework that he used, I conceptualize community demographic variables as intersecting phenomena, rather than competing variables.[10] Furthermore, instead of comparing the importance of organizational factors versus community factors, I theorize that organizational and larger societal factors mediate community-plant relationships. In other words, organizational *and* other, macro-structural characteristics influence the way plants behave within local communities.

Conceptual Framework- Organizational Political Economy of the Environment

A theory of *Organizational political economy* begins with the understanding developed by classical sociologists that different parts of the social structure are entwined and must be understood in that way (Prechel and Istvan 2016). This theory suggests that "variations in social structures create different dependences, incentives, and opportunities for corporations to externalize pollution costs to society" (Prechel and Zheng 2012). Specifically, it argues that (1) in order to understand the actions of the capitalist class, historical conditions under which they act must be accounted for (Prechel 1990), (2) these historical conditions include the political-legal arrangements that determine the degree of embeddedness of the corporation within the state (Prechel

---

[10] This notion of community as relational and not made up of discreet, mutually exclusive identities is in line with the theory of intersectionality and the matrix of domination addressed by Patricia Hill Collins and other scholars of race and gender (Collins 2000; Collins 2010).

and Morris 2010), and (3) the embeddedness of corporations within interrelated ideological, political, and economic institutions in society that affects organizational behavior (Prechel 2000; Zald and Lounsbury 2010).

Within an organizational political economy framework, not all events or processes are made equal. Pulling from historical contingency theory (Prechel 2003), this framework, particularly suited for examining lengthy periods of time, allows the researcher to examine how multiple causes are time dependent and affect long term pathways and trajectories. It emphasizes the historical conditions that make distinct theories and explanations have more or less explanatory power. So, under certain conditions, X will have an effect on Y, and under certain conditions Z will have a more direct effect on Y. In other words, *time matters*.

George Steinmetz (2005) argues that

> "historical events are always produced by contingent conjunctures of causal mechanisms. Earlier conjunctures influence the intensity or particular value of any given mechanism in the present; they also codetermine whether a particular mechanism will be suppressed or expressed. What this means is that all events are partly shaped by earlier conjunctures, via historical paths (145)."

The key here is that these historical paths or trajectories are contingent upon a series of factors and critical points (Haydu 1998). There are always other options or trajectories given a critical juncture, however, once one moves down a certain path, the harder it is to shift from that path without significant forces at play. The path itself becomes a self-reinforcing feedback process (Pierson 2000; Mahoney 2000; Pierson 2005)

In studying the development of state policy, Prechel (1990: 650) argued that "the state is affected by: 1) internal organizational arrangements and 2) changes in the societal environment, which include the degree of economic power of capitalist groups, political unity among capitalist groups, and historical conditions under which these outside groups attempt to influence policy." These outcomes, although led by a rationalization process (Weber 2009; Prechel 2003), leads to irrationalities within the social structure (i.e., irrational outcomes arise out of rational decision-making processes within the capitalist framework).

Organizational Political Economy theory is equipped to deal with the complexity of organizational-community interactions because of two reasons. First, it takes into account the effect of the external environment on how organizations shape themselves in response to market and regulatory incentives, constraints, and opportunities present in that environment (Prechel and Morris 2010; Touché 2012; Prechel 2012; Prechel and Zheng 2012). Second, it examines the way organizations affect their external environments through externalizing pollution costs to society (Prechel and Zheng 2012; Prechel and Istvan 2013). For these reasons, organizational political economy can both help us understand organization-state relationships and the relationships between the organization and its local community, especially to the extent that an organization's risky emissions are impacted by both state and local contexts.

Concluding Remarks

Using organizational political economy theory, I theorize that community-plant relationships are mediated by other aspects of society. So, to understand the relationship between community demographics and toxic emissions, one must understand the organizational-political contexts in which these relationships are embedded. That is to stay, the development of the environmental behavior within the food manufacturing industry is a product of the development of the industry itself, the development of government policies, and the development of environmental collective action. Furthermore, the additions of exogenous shocks[11] serve to unexpectedly shift the trajectory of environmentalism in the U.S. over time. In the next chapter, I discuss these historical developments in some detail.

---

[11] Institutional scholars utilize the idea of exogenous shocks (Widmaier, Blythe, and Seabrooke 2007) to help understand contingent circumstances that can change a historical trajectory. These shocks can be in the form of unexpected significant occurrences that may have nothing to do with the path (e.g., terrorist attack) that nonetheless have a very real impact on its continued development. These shocks may also be more intentional acts of collective action that serve to push for changes in organizational or political arenas (e.g., social movements).

CHAPTER III

HISTORICAL CONTEXT

Introduction

In this chapter, I utilize an Organizational Political Economy framework (Prechel 2000; Prechel and Zheng 2012; Prechel and Istvan 2016) to document historical developments in environmental degradation and activism, government policies and regulations, and industry change and action in the United States. Although this chapter follows a chronological timeline, the organizing principle revolves around the opportunities and challenges experienced by three key actors (activists, government, and industry) during each period. Following a brief background, I begin the historical context with the 1960s-- a time of new environmental awareness and the rapid growth of the food industry. I then analyze the 1970s, characterized by a growth in public environmentalism and fragmentation around what it meant to be "environmentally friendly." The 1980s saw the upsurge of strong anti-environmentalist sentiment within the federal government as well as the coming together of environmentalists in direct response to this perceived threat. By the end of the 1980s and into the 1990s, large scale environmental problems, such as ozone layer depletion and global warming along with increases in mainstream recognition of environmental justice issues, renewed a public interest in environmentalism. By the 2000s, the "war on terror" marked a reduced prioritization of environmental issues in the federal governmental even as environmental justice issues gained momentum on local levels.

Background

Environmental Political Economy scholars have stressed that within the industrial city (Mumford 1956; Mumford 1968) there are two dynamics constantly in conflict. On the one hand, the industrial city is the site of capitalist growth, development, and prosperity (Buttel 2000). On the other hand, seen as a "necessary by-product of urban and industrial growth" (Gottlieb 2005), environmental decay disproportionately impacts poor workers and communities (Schnaiberg 1980; Bullard 1983; Gould, Pellow, and Schnaiberg 2004). Food production, in particular, has garnered specific attention from community members and community groups.

The modern-day food industry first began to take form during the late part of the 19th and the beginning of the 20th century. During the Gilded Age (1870-1900),[12] public policy encouraged unregulated corporate growth with companies expanding through the acquisition of subsidiaries.[13] For the manufacturing industry in general, the period between 1870 and 1920 was a time of substantial growth, increases in the scale of production, and decreases in the value of pure agricultural products compared to processed goods (Melosi 1980). In *Nature's Metropolis* (1992), William Cronon describes how Chicago became the linkage between the rural, undeveloped Western part

---

[12] The Gilded Age is the period between 1870 and 1900 where the United States began experiencing significant industrial development in various industries.

[13] This is largely due to the development of laws such as the New Jersey Holding Company Act. The Holding Company Act of New Jersey 1889 created weak rules around corporate incorporation and allowed for companies to buy and sell stock of other companies, allowing for a holding company structure to emerge (Berle and Means 1932; Prechel 2000).

of the United States and the manufacturing markets in the Eastern part of the country. The development of refrigeration made it easier for food products (specifically meat) to be transported longer distances and with an expanded railroad system routed through Chicago, these food products were able to move more quickly and freely across the country

Initially, the U.S. food industry was made up of small and medium size companies that were not particularly efficient and, unlike other developed sectors of the economy e.g. steel, was unable to conduct mass distribution across the United States (Connor et al. 1996; Prechel 1990; Prechel 1994). By the 1920s, however, food companies grew substantially as the U.S. government facilitated the industrialization of agriculture, tying small local producers directly to industry (Danborn 1979). This solidified the implementation of modern production technologies into the food manufacturing process and strengthened the dependence of local farmers on newer manufacturing practices (Friedman 1993). Furthermore, economies of scale were developing across the U.S., which made efficiencies in distribution of food products essential. The period between the 1920s and 1940s saw waves of mergers, which would eventually lead to the development of a block of large well-known companies, still present today.

Increasing size and power of the United States food manufacturing and processing industries meant the perception of increasing wealth for the communities where they were located. Both workers and the communities they lived in were immediately affected by the changing landscape of food production (Grindler 1980).

For this reason, early on we find that although environmental hazards such as smoke pollution became a mainstay of urban living (Grindler 1980), local government officials were unwilling to take any significant stand against manufacturing development.[14] Within these communities, there were limited waste restrictions or industrial dumping regulations (Colten 1988). Additionally, working conditions in many of the factories within this industry was deplorable. Locally, companies were not held responsible for any environmental damage they caused. Rather, the problems associated with industrial development continued throughout the early part of the twentieth century and any response to localized environmental destruction was led by concerned community members (Gottlieb 2005).[15]

As early as the late 19th century, individuals and community groups were documenting both the plight of the worker in the factory and the hazards in communities located next to factories—with local populations subject to toxins as a byproduct of these factories.[16] Additionally, the later part of the 19th and early 20th century saw the

---

[14] Although much of the progressive movement was local, several national leaders became reformers as well. As a leader of this movement, Theodore Roosevelt pushed for increased regulations on corporations (Murray and Blessing 2004) and environmental conservation (Brinkley 2009).

[15] Women's groups, as part of the progressive movement, were some of the first to take up the charge against local environmental damage. Because it was women/homemakers that were consistently exposed to the ills of smoke pollution, these issues became the domain of middle and upper-class women. Groups worked to garner support for environmental ordinances such as stronger regulations on smoke stacks and at times even worked assisting stack inspectors during their monitoring visits (Grindler 1980).

[16] These concerns are the precursors of public health, social work, and the more radical environmental movements in the United States (Gottlieb 2005).

development of professional groups and government agencies focused on combatting some of these issues. The Air Pollution Control Association, first made up of smoke inspectors, was later broadened to those interested in technical solutions for industrial air pollution (Christy 1960). The group focused on updating procedures and materials to cause less environmental harm (Gottlieb 2005). Sanitarians, precursors to modern day public health workers, focused on community members. They promoted sanitary practices, developed public education, and worked to improve laws associated with public health (Melosi 2000). Additionally, the Pure Food and Drug Act (1906) that created the United States Food and Drug Administration (FDA), the United States Department of Agriculture (USDA) and, as we will discuss later in this chapter, the Environmental Protection Agency (EPA) were all designated as government agencies tasked with regulating industries, including food manufacturing and processing.

This brief background sets the stage for developments during more contemporary times. In the following sections, I outline key historical developments over the last forty years of the twentieth century and the first decade of the twenty-first century that provide a comprehensive context for the quantitative analyses in this dissertation.

The 1960s: New Environmental Awareness and the Growth of the Food Industry

After World War II, along with increases in consumption and production, the U.S food industry grew exponentially. The food processing technologies developed during war time became a mainstay as the U.S. population continued to grow. Particularly between 1963 and 1972, the industry showed a "clear upward trend (Papageorgious, Michaelides, and Milios 2011)." During this time, merger activity to connect geographic regions and product lines was high and public opinion showed an overall satisfaction with the food industry. According to an Australian article (Gruen 1968), the U.S. was a *major innovator* in food processing.

As the food industry continued to grow, government engagement also developed. In 1958, congress enacted the Food Additives Amendment to the Federal Food, Drug, and Cosmetic Act of 1938. The *Delaney Clause* within the amendment stated that any substance found to cause cancer could not be used as a food additive. In 1964, Congress set up the National Commission on Food Marketing to report on changes in the food industry. Originally introduced by Sen. Gale W. McGee, who was a democrat from Wyoming, this commission, which went completely unopposed[17], was tasked with investigating the "purchasing, processing, marketing and pricing practices of large chain stores to determine whether there may have been any violation of antitrust laws" (CQ Alamanac 1964). The commission, composed of five senators, five representatives, and five members appointed by the President [18](CQ Alamanac 1964), released a final report

[17]Although, this bill was unopposed, in her endorsement of the commission, Esther Peterson, special assistant to the President on Consumer Affairs, suggested that the Commission include representatives of the public, rather than of the food industry, but indicated that spokesmen for the food industry should be allowed to express their full views to the Commission.

[18] President Johnson appointed the five public members of the Commission on Food Marketing. They were: William M. Batten, a Republican, president of the J. C. Penney Co.; Albert K. Mitchell, a cattle producer and Republican National Committeeman from New Mexico, former president of the American National Livestock Assn., and a member of several advisory committees to the Secretary of Agriculture; former U.S. Rep. J. Fred Marshall (D Minn. 1949-63), a farmer and former state director of the Minnesota Farm Security Administration (1941-48); Elmer R. Kiehl, a professor of agricultural economics, former dean of the College of Agriculture at the University of Missouri, and

in 1965. This report, totaling about 3,800 pages, presented several significant findings. First, it outlined the U.S shift from small farming to industrial farming—showing that most of the farming decisions were being made by “feed manufacturers, slaughter houses or processors of food and vegetables (Gruen 1968; 26).[19] Second, it outlined the growing profitability of industries that incorporate a high amount of processing (e.g., TV dinners, baby food, and soft drinks to name a few) (Gruen 1968; 27). Third, the commission found that prices for processed products were higher in small independent stores that tended to be located in low income areas, making it more difficult for people in those neighborhoods to purchase the best food products. Fourth, the commission noted that the food industry operated at elevated levels of efficiency, innovation, and general progressiveness (Connor 1982; 95).”[20]

As the industry continued to grow and government support was solidified through reports like the one illustrated above, conflict between the ways the public prioritized improving living standards and material comforts (Gottlieb 2005; Kline 2011)

---

member of the advisory commission to the Secretary of Agriculture; and Marvin Jones, of Texas, former Chief Justice of the U.S. Court of Claims (1947-64), a Democrat, who was named Commission Chairman. Jones resigned as chairman Sept. 1 and President Johnson appointed Phil S. Gibson, former chief justice of the California Supreme Court, to replace him on September17th.

[19] These decisions are backed by long term contracts between the processors and the farmers themselves (Leonard 2014). This is particularly important as small farmers continued to believe in their own independence from the larger structures and that they have more control over the process than they actually had at the time.

[20] The commission also expressed concern over the industry’s heavy emphasis on advertising and product differentiation and the growing centralization of both food manufacturing and distribution

and the development of a new environmental awareness also grew. In 1959 alone, industrial, private, and other sources of pollution emitted 24.9 million tons of soot into the air throughout the nation. As in previous decades, the development and increase in landfills was exorbitant. These landfills were public health hazards and contaminated both urban and rural communities. Furthermore, these landfills were showing signs of being discriminatory i.e. being placed in areas with minority and poor populations (Gottlieb 2005). These ecological threats associated with increasing manufacturing, created a context where the public would now, more systematically examine the dangers of industrial pollution and environmental degradation.

In the early 1960s, the wider public was becoming increasingly aware of the dangers associated with industrial development. Murray Bookchin (1962) warned of the ecological problems and public health issues caused by technological and industrial growth. He promoted the development of technology in environmentally friendly ways (Kline 2011). In 1962, Rachel Carson published *Silent Spring*, unearthing the dangers of pesticide use. In an interview with the New Yorker, Carson warned that the American public was living in "an era dominated by industry, in which the right to make money, at whatever cost to others, is seldom challenged." (Gottlieb 1993). As Carson's research became popular, President Kennedy's Science Advisory Committee examined her claims about pesticide use and provided recommendations (Kline 2011). The Panel on the Use of Pesticides, made up of scientists from several universities outlined the benefits and risks of pesticide use and recommended more research on the effects of pesticides, federal funds to assist states in pesticide monitoring, and the development of an education program regarding the hazards of pesticide use (Panel Report 1963).

At the same time as the food industry was undergoing significant changes and some public scrutiny, the first law attempting to *control* air pollution was passed.[21] The Clean Air Act of 1963[22] provided guidance to states on how to reduce pollution,[23] maintained the responsibility of state and local governments to control pollution within their bounds, and increased the authority of the federal government to continue researching air pollution and pollution abatement practices. Its precursor, the Air Pollution Control Act of 1955, provided funding for research associated with air pollution. However, the act had no provision for actual pollution abatement and enforcement (CQ Almanac 1963). The 1963 law provided federal funds for state and local enforcement and empowered the federal government to "bring suit" against polluters with the governor's approval. The provision empowering the federal

---

[21] The air pollution control Act of 1955 was the first act involving air pollution and in line with the focus on environmental research, it provided funds for federal research into pollution (EPA website, Clean Air Act).

[22] Lyndon B. Johnson (LBJ), and his Great Society battled what he called the problem of the vanishing beauty, of increasing ugliness, of shrinking open space, and of an overall environment that is diminished daily by pollution and noise and blight. Congress strengthened the Clean Water and Clean Air Acts in 1964. LBJ got most of what he requested from Congress after he won a landslide over Barry Goldwater (Boyer et al. 2005).

[23] Most Republicans voted against this act and it was opposed by the National Association of Manufacturers. Stating that "communities are entirely capable of carrying out effective air pollution control programs without federal financial aid and federal enforcement activities (CQ Almanac 1963)

government turned out to be a pivotal point that solidified federal participation in pollution reduction. This act would set the stage for increasingly comprehensive provisions in air pollution abatement over the next 15 years of U.S. history.

In 1964, President Johnson empowered an Environmental Pollution Panel from his Science Advisory Committee to research pollution in the United States. The committee acknowledged pollution as an inevitable outcome of development, but noted that it was important to reduce the magnitude of problems associated with pollution, stating explicitly:

> Society must take the position that no citizen, no industry, no municipality has the right to pollute. We must rely on economic incentives to discourage pollution. Under this plan, special taxes would be levied against polluters. The manpower, knowledge, and facilities now at hand are insufficient for the complete task of pollution abatement and management. Large numbers of well trained technicians, engineers, economists, and scientists will be needed (Johnson 1965).

Although this was a significant turning point for the government response to pollution associated with industrial development, naming polluters other than industry gave leeway to what pollution regulations would prioritize. Furthermore, the emphasis on trained practitioners, solidified the focus on technical solutions over any other.

The late 1960s and early part of the 1970s showed a growing food industry coupled with an increase in public concern for the environment, with environmental movements and organizations proliferating across the country. Mainstream communities as well as the growing counterculture were both looking at the environmental problems that continued to develop (Gottlieb 2005; Gitlin 1980).[24] By 1970, 53% of respondents to a public opinion survey saw pollution reduction as one of three major problems that needed government attention. This was up from 17% only five years earlier in 1965 (Kline 2011). Additionally, scientists/activists such as Barry Commoner, were influential in centering the negative role of industry in increasing environmental degradation. This was the context in which, President Richard Nixon took office— a strong industry outlook and a public pushing for cleaning up the environment as a priority (Kline 2011).

The 1970s: Environmental Crescendo and Then a Crisis

Environmental consciousness came in with a surge in the early part of the 1970s, with various actors vying for a place at the environmental agenda table. Two arenas where this cacophony of voices met was in the development and implementation of the first federal earth day and the changes in the federal government's environmental bureaucracy. In this section, I engage with these two arenas. This section ends with a discussion of the OPEC Oil Crisis.

Earth Day

By Earth Day 1970, there was a groundswell of public concern about the environment. This series of events, seen as marking the beginning of the new environmental movement solidified the main actors in U.S. environmentalism (Kline

[24] One example of radical responses to industrial pollution was the radical protests of a group called the *MotherFuckers* led by Amira Baraka in the garbage strike of 1967-1968. The group transferred bags full of garbage dumped in poor communities such as the Lower East side to Lincoln Center (Gottlieb 2005; Gitlin 1980).

2011).[25] First conceptualized as a National Teach-In Day on the crisis of the environment, Earth Day was supposed to serve two goals: 1) "help crystallize the new environmentalist constituency" and 2) "distancing the new environmentalist constituency from more radical New left and counterculture activities (Gottlieb 2005; 148-149)." President Nixon's administration sought to gain the support of the middle-class environmentalists thereby neutralizing the *radicals* in the process (Gottlieb 2005; 153). This mainstream goal, however, was outdone by several factors and Earth Day became a microcosm of the important actors in the ongoing struggle for an environmental consensus.

In addition to the federal government, two additional competing interests attempted to utilize opportunities in earth day participation. The radical left developed alternative earth day events and protested the mainstream events to connect environmental activism to other issues including the Vietnam War, racial injustices in the U.S., and more broadly the actions of unethical, irresponsible corporations and government conservatives (Gottlieb 2005). Although, not yet named, environmental justice proponents sought to get recognition that environmental awareness was not just about preserving and conserving nature, but also about the disproportionate impacts of environmental ills on minorities. In reference to Earth Day, Denis Hayes stated that the intent was "not to clean the air while leaving slums and ghettos, nor is it to provide a

[25] Up until this point the key players in environmentalism were large environmental non-profits such as the Sierra Club. Earth Day, however, included mainstream middle-class voters, government actors, radical leftist activities, as well as corporate support and sponsorships.

healthy world for racial oppression and war (Egan 2010)." While, everyone was impacted by environmental harm and all needed to participate, there was the growing realization that minority and poor communities were being impacted in different, stronger ways.

As a third set of actors in the ongoing conflicts around the environment, industry groups and companies used Earth day to position themselves as willing participants in preserving the environment (Time Magazine 1969). Monsanto, for example, "heralded their readiness to become environmental leaders in the coming decade by applying pollution control technologies in their own facilities (Gottlieb 2005; 153-154)." Having significant resources and power to drive the flow of information from media sources, corporate interests were particularly successful in getting their message to mainstream audiences, while media attention on alternative events was limited (Gottlieb 2005).

While at the same time as Earth Day showed the fractures in what it meant to be environmentally conscious it also turned environmentalism into a consensus issue. It provided an opportunity for corporations, to use environmental marketing as a way to increase their profit margins and allowed for the Nixon Administration to pass more palatable legislation (Gottlieb 2005). The next few years would see significant changes in the government bureaucracy set to regulate the environment.

New Environmental Regulations and a New Regulatory Agency

With the momentum from Earth Day planning and festivities, the support for environmental legislation was high. To show his unwavering support for this issue, Nixon's 1970 state of the union address asked, "shall we surrender to our surroundings, or shall we make our peace with nature and begin to make reparations for the damage we have done to our air, to our land, and to our water?" He goes on to say "We still think of air as free. But clean air is not free, and neither is clean water. The price tag on pollution control is high. Through our years of past carelessness we incurred a debt to nature, and now that debt is being called." These statements mirrored environmental legislation already in the works as well as foreshadowed the slew of environmental legislation to come.[26] By January 1st, 1970, President Nixon signed the National Environmental Policy Act (NEPA), which was the first law to require an environmental impact statement for construction projects that were federally funded. The legislation also created the Council for Environmental Quality to oversee this process. In a 1971 report, the council acknowledged the disproportionate impact of environmental hazards on poor and minority communities[27] (Kline 2011; Gottlieb 2005). In response, Nixon and his White House Commission on Executive Reorganization called for the development of a new government bureaucracy that would deal with all pollution issues (Kline 2011; Gottlieb 2005).

[26] One change in environmental regulations was the 1972 revision to the Federal Insecticide, Fungicide, and Rodenticide Act. In this revision, oversight of pesticide regulations moved from under the purview of the U.S. Department of Agriculture into the realm of the Environmental Protection Agency. Along with this shift in agency oversight, the emphasis of the act expanded from providing information for consumer safety to promoting public and environmental health through increased enforcement.

[27] This is only one example of studies during the 1970s and 1980s that began to focus primarily on these groups as victims of air pollution. The Urban Environment Conference also sought to begin turning that realization into action (Gottlieb 2005).

In the very beginning, it was unclear what exactly the role of the Environmental Protection Agency (EPA) was going to be. Initially, it became a "dumping point" for all the federal government's environmental programs.[28] The first head of the EPA, William D. Ruckelhaus, was tasked with developing the new agency's structures and goals (Kline 2011). With a budget of 1.3 billion dollars and almost six thousand staff made up of government workers that had previously been housed in various parts of the government, this new agency upended the environmental status quo and shifted the dynamics in environmental politics within the United States. Mainstream environmentalism needed to evolve to keep up with all the changes happening during this period. With the EPA in charge of implementation of many of the new environmental policies, the large environmental non-profit organizations, needed to increasingly look to the EPA as important to their agendas and concerns (Gottlieb 2005; Landy, Roberts, and Thomas 1994).

In addition to the EPA and NEPA, another very influential piece of legislation that occurred in the same year was the 1970 amendment to the Clean Air Act,[29] which

---

[28] The newly created EPA housed the federal water quality administration, all the department of interior's pesticide programs, the national air pollution control administrations' pesticide research, the bureau of water hygiene, parts of the Bureau of Radiological Health from the Department of Health, Education, and Welfare, the Department of Agriculture's pesticide activities, both the Atomic Energy Commission's and Federal Radiation's Council radiation and standards program, and the ecological research from the Council on Environmental Quality.

[29] Other laws were developed under the same approach as the Clean Air Act. The Clean Water Act; otherwise known as the Water Pollution Amendments of 1972, the 1970 Resource Recovery Act, and the 1972 Federal Insecticide, Fungicide, and Rodenticide

established standards to regulate toxic air emissions (Kline 2011). Although becoming a significant piece of legislation, the struggles over this amendment was substantial. Within the federal government, conflict between the Nixon Administration and Senator Edmund Muskie fractured government interests (Kline 2011); the administration's bill first passing through the house and the partner bill, written by Muskie's office passing through the senate. Differences in the two bills included deadlines to curb automobile emissions (more rigorous in the Muskie bill) and the actual role of the federal government in setting standards and enforcement. Some scholars argue that this led to a stronger set of plans within the amendment than would have otherwise been presented (Jones 1978; Gonzalez 2001).

The fight over the clean air act also showed industry fractures. With much of the bill focusing on changes in automobile standards, the automobile industry as well as companies associated with fuel additives, such as lead were particularly vocal against it. Other industry representatives were less so, and in fact many were in support of some form of extension to this act (CQ Almanac 1970). The development of an ecological conscience within the general population and the opportunities to market themselves as environmentally friendly, meant industries not directly impacted by the provisions in these new bills sought to show their direct support of new environmental legislation. The unintended results of this support included the outlining of six specific criteria pollutants

---

Act Amendments. The scope of this dissertation is air pollution so I will not discuss these in detail, although they were very important in the period discussed.

(Gottlieb 2002) and 19 harmful air pollutants (Kline 2011) to be regulated. This would come to have an important impact on future emissions reporting and regulations under the EPA (Gottlieb 2002; Gottlieb 2005; Gonzalez 2001).

The Oil Crisis of 1973 and the Carter Administration

As the new environmental movement became mainstream and public support continued to increase, the Oil Crisis of 1973 would change the trajectory of environmentalism in the United States. In 1973, a bloc of oil producing countries (OPEC) substantially increased the prices of oil barrels. One of the reasons for this imposed embargo was listed as the sharp increase in the cost of U.S. food manufacturing exports (Rothschild 1976; Timmer 2010). This led to an economic crisis within the United States and other countries dependent on foreign oil to maintain their consumption practices and patterns.

The food manufacturing industry was specifically linked to these developments in the 1970s and into the early 1980s. Designed to protect U.S. farming interests, annual U.S. farm bills allow government intervention in the production mechanisms. Although a domestic policy, the international ramifications included trade restrictions such as import controls and subsidies for exports. The federal government described these government interventions as support for family farms. However, U.S. industrialization of agriculture[30] and continued dependence of family farms on the technological

[30] Research in this area has examined the impacts of industrial transformation on rural and farming communities within the United States (Thomas, Howell, Wang, and Albrecht 1996; Albrecht 1997; Albrecht 1998).

developments of agro-business and the food manufacturing industry meant that most of the positive impacts of government protectionist policies profited mostly large corporations. While at the same time, increases in oil prices and by extension energy prices, made it more difficult for U.S. farmers to support their own smaller production (Friedman 1993). Because of this scenario and the linkages between the U.S food trade policies and the oil embargo, the environmental ramifications of the oil crisis reduced public oil consumption as well as U.S oil dependence. In short, it created a significant opportunity for U.S. based oil companies.

While from one perspective the oil crisis seemed to serve the interests of an increasingly environmental agenda; from the perspective of production, the OPEC oil embargo provided an opportunity for companies to shift public policy away from production regulations to more business-friendly policies. High producing industries were now able to strongly condemn environmental regulations on production because these regulations reduced their ability to "compete with foreign competitors, reduced employment, and hurt profits (Kline 2011; 106)." Many local, state, and federal leaders rationalized the need to reduce environmental standards to support industry in increasing production (Melosi 1980). It was under this context that President Carter took office.

By 1976, much of the public momentum around public environmentalism had decreased substantially[31]. The OPEC embargo was still on and the U.S. economy was in

---

[31] Nevertheless, there continued to be environmental amendments that strengthened laws during the late 1970s and early 1980s. For example, the 1977 amendment to the Clean Water Act, the Surface Mining Control and Reclamation Act (1977), the National

the middle of a recession. The strategy of the Carter Administration was to focus on the side of consumption as opposed to production. The administration set fuel standards, limited the federal speed limits, attempted to regulate energy use through the creation of the Department of Energy, and tried to institute tax incentives for industries and individuals that practiced conservation. Many of the proposed tax reforms, however, did not pass congress (Kline 2011; 108). President Carter's support of powerful and influential environmental reformers through government appointments solidified their connection to the presidency. As a result, federal protective actions became increasingly disconnected from local environmental reforms[32], which served to be detrimental as big business mobilized.

While strategically moving the focus away from regulating production left little for industry to lobby against on the federal level. This created an opportunity for businesses to mobilize local groups against all forms of environmental regulation. As the Carter administration failed to engage local communities in their plans for reform, businesses utilized this opportunity. Coalitions led by the Business Roundtable systematically attacked environmental regulations coming out of all environmental

---

Energy Conservation Policy Act (1978), CERCLA (1980), the Fish and Wildlife Conservation Act(1980), and the Nuclear Waste Policy Act (1982).

[32] There were some cases where local struggles were highlighted in the Carter Administration. One example was the "Love Canal Tragedy (Beck 1979)," where an entire neighborhood was found to have been built on a toxic dump site. Lois Gibbs, was a community member in the Love Canal area that led the way in bringing attention to this travesty. This work would eventually lead to the creation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) also known as Superfund.

departments. The EPA became the subject of much ridicule. Businesses successfully argued that environmental regulations weakened the American economy because of the prohibitive costs associated with regulation, the hit to "business morale," and the inefficiencies they caused (Gottlieb 2002; 184; Kline 2011). Consequently, the Carter Administration's strong environmental record backfired for both the presidency and the most powerful environmental organizations in the nation.

The 1980s: Decreasing Environmental Support, Policy Rollbacks, and the New Environmental Justice Agenda

With strong support from the big business and Americans coping with the economic recession, the Reagan administration was able to roll back much of the environmental progress of the 1960s and 1970s. The administration cut the budgets of government agencies such as the EPA and worked to reduce the reach of already established environmental regulations.[33] During the early part of his presidency, Reagan appointed several conservative anti-environmentalists to key environmental positions in his administration. For example, James Watt, a huge supporter of utilizing open federal lands for mining, drilling, and ranching development, was appointed as the Secretary of the Interior (Kline 2011). Watt was influential in the appointment of, Ann Gorsuch Burford, a business attorney that had been committed to increasing state power in

[33] The Environmental Education Act, which was promoted by the Nixon administration and established a government agency, later housed under the department of education, was one of the first to go in the early 1980s. The goal of this law was to develop environmental education curricula and provide teachers with professional development. Although on the books until 1975, the program was defunded and then repealed in 1981 (Shabecoff 1993).

environmental regulation enforcements, as the first female EPA administrator (Martin 2004). In office for less than two years, Burford reduced the EPA's budget by $200 million, downsized staff, and reduced the number of cases against industry polluters. By 1983, both James Watt and Ann Gorsuch Burford[34] resigned their posts because of controversy.

The Reagan administration's aggressive anti-environmentalism was a crisis for mainstream environmental organizations. Fractures between the large environmental organizations and states with large natural resource-based tourist attractions (e.g., national parks) were temporarily mended towards the end of pushing back a strong environmental agenda. During this time, the membership of the largest environmental organizations grew exponentially (Boyer et al. 2005). Chief Executive Officers of the *Big 10* environmental organizations, saw an opportunity to develop a unified voice that was pro environmental and against the anti-environmentalism in the current federal government (Gottlieb 2002; 3). The Group of 10, as they were called, produced "An Environmental Agenda for the Future" and the "Blueprint for the Environment", which solidified a unified approach to this crisis. This was a new opportunity to recommit to environmentalism, regain the support of the public by new grassroots efforts, and defend the system that had been put in place in the previous decades (Gottlieb 2002). Many of the mainstream environmental tactics were successful.

---

[34] Burford was replaced by the first EPA administrator, William Ruckelhaus. The EPA had been developing as an enforcement bureaucracy and Ruckelhaus continued that tradition (Ember 1995). His key role was getting Congress to renew Superfund in 1986.

By the later part of the 1980s there was renewed support for environmental regulations. In 1986, Congress reauthorized the Safe Drinking Act and the Emergency Planning and Community Right to Know Act, which encouraged the reporting of toxic releases from production facilities (Kline 2011). Furthermore, the public's participation in the environmental agenda substantially increased. By 1985, membership in the top 10 mainstream environmental organizations was at approximately 3.3 million people, up from 500,000 twenty years earlier (Kline 2011). Additionally, the amount of new environmental organizations and membership in those organizations grew as well. This would set the stage for the next several decades of information about toxic emissions and the growth of the environmental justice movement.

By 1988, as part of the Community Right to Know Act, the EPA began to report findings of industrial pollution known to the public through the development of the Toxic Release Inventory. While the mainstream environmental organizations were busy developing a coherent environmental plan to counteract the anti-environmental backlash of the 1980s, environmental justice groups had also begun to develop the language (e.g., Not in my Backyard (NIMBY)) for the movement against disproportionate risks. Local communities were fighting back against industrial dumping and their increased risks of toxic emissions. The experiences of local communities being subject to environmental ills, were being documented more systematically. In Warren County, North Carolina community members documented the siting of a toxic waste landfill in an African American Community (Bullard 1990). By 1987, the United Church of Christ Commission for Racial Justice released a report that showed systematically how race was the most important predictor of where toxic sites were located across the nation (Payne and Newman 2005). Key players in the movement strategized about using a civil rights framework and began packaging these experiences from the lens of antidiscrimination (Gottlieb 2002). Although, these experiences were being documented, Environmental Justice did not become centered in national politics for another several years.

The 1990s: Environmental Resurgence and the Centering of Environmental Justice

During the 1990s several competing environmental issues continued to gain momentum. Although they varied in scale and focus, they all showed an increase focus on environmental issues affecting the United States. In this section, I discuss the global environmental issues, the clean air amendment, the environmental connection to the food movement, and the federalization of the environmental justice movement.

Large Scale Problems and International Solutions

In the late 1980s two large scale environmental problems surfaced, global warming and ozone depletion. Scientists found that chlorofluorocarbon (CFC) gases, carried by CFC molecules were rising into the earth's stratosphere and reducing the earth's ozone layer (Kline 2011). To illustrate, a 1991 EPA study found that pollutants were depleting the ozone shield at twice the rate that scientists had previously predicted (Boyer et al. 2005). An international response was necessary, so in 1987, nations signed on to the Montreal protocol, which was a pledge to phase out the use of CFCs by the year 1999. Additionally, in 1988, the National Aeronautics and Space Administration (NASA) scientists warned about the Earth's greenhouse effect triggering global warming, which would have a significant effect on rising sea levels as well as global climate change (Kline 2011). The U.S. was not quick to support making pro-environmental changes based on these observations. In fact, legislation to reduce air pollution that were postulated to be associated with global warming was contentious. The federal government's response to these two issues would have a direct impact on the way air emissions were regulated over the next several decades.

By the end of the 1980s, air pollution had become a particularly dramatic problem in the United States. "In Louisiana alone, industry pumped 2 million pounds of pollutants into the air every day (Kline 2011; 118)". By 1990, the largest industrial chemical users had "released some 4.8 billion pounds of 320 toxic chemicals into the air, water, or, land, or transferred these chemicals to treatment, storage, and disposal facilities (STDFs).

Although the federal government's response to the two large scale issues was mixed, these issues brought concerns about the environment back to the forefront of people's minds. A New York Times/CBS survey of a sample of the U.S. population in 1990 found that "74% of respondents supported protecting the environment regardless of cost, an increase from 31% in 1981 (Kline 2011; 118-119). Membership in the largest environmental organizations doubled in size and the 1990 Earth Day, the first nationally organized one since 1970, brought back the deluge of actors. Corporations used the event to capitalize on the resurgence of environmentalism in the population. This event "triggered a frenzy of green marketing" (Kline 2011; 122) that has become a mainstay of American corporate responsibility trademarks. Even the largest polluters (e.g., Polaroid, Monsanto, British Petroleum, and Honeywell) were all successful in sponsoring different Earth Day celebrations across the country. For example, the largest sponsor for Boston events was Polaroid (Gottlieb 2002; 265; Cohen 1991).

The Final Clean Air Act Amendment and the Centralization of Environmental Justice

By 1990, the Clean Air Act Amendments were passed, placing stricter standards on air pollution. They called for "a significant reduction in the emissions that cause acid rain and smog, airborne toxic chemicals, and substances that deplete stratospheric ozone." After years, of limited environmental support, this was a significant point in U.S. environmental history. With corporations interested in showing their support for pro environmental policies[35], they were particularly invested in the passage of these amendments. To that end, they supported the amendment's passage in so far as it "relied heavily on market incentives such as voluntary compliance credits and performance standards." Additionally, the Pollution Prevention Act focused on cost effective changes in "production, operation, and raw material use" to incentivize a shift into less emissions from production facilities (Kline 2011; 119-120). These laws expanded opportunities for buy-in from various groups including corporations, mainstream environmentalists, government environmental bureaucrats, and to some extent the radical environmental

[35] This support was limited to domestic policies. During this time, several environmental treaties were presented and the U.S. was one nation that did not support most them. The Rio Conference in 1992 (Earth Summit) saw President Bush's lack of support for these treaties from the position of harming American business interests (Kline 2011; 123). For example, although 160 nations signed the BioDiversity Treaty, the U.S. did not. Additionally, the countries represented could not agree on deadlines for curbing carbon dioxide emissions. (Kline 2011; Gottlieb 2002).

groups as well. These successes were temporary, however, as issues of disproportionate impacts of poor environmental behavior on poor and minority communities continued to surface. Furthermore, the lack of connection between environmental issues and issues around food and consumption made it particularly difficult to recognize the ways people were being impacted on multiple levels (Gottlieb 2002).[36]

The relationship between environmentalists and food activists was particularly wrought. Environmentalists, in particular sought to differentiate their work against pesticide use and "other agricultural practices from issues such as support for local farmers. As seen during the debates over the 1995 Farm Bill[37], environmentalists were less interested in corporate farming than the food industry restructuring and its impacts on workers and communities (Gottlieb 2002: 18). This relationship would significantly change during the early part of the 1990s. By 1999, demonstrations at the Seattle World Trade Organization meeting linked food issues with environmental issues. The increasing visibility of the food movement made it strategically important for environmentalists to link themselves. Unlike the 1995 farm bill debates, the 2002 debates around the farm bill saw linkages "with different food movements to save and

---

[36] One exception to this was the Farm Bill of 1990, which included "several environmental provisions, including soil conservation, water quality, and other environmental impact questions that the national environmental groups had helped steer through Congress (Gottlieb 2002:17)."

[37] In debates over the Farming Bill, environmentalists showed a lack of support for the local farming movement.

extend environmental programs while providing support and building coalitions around other food related issues (Gottlieb 2002:19)."

The development of linkages between food activists and environmentalists were occurring within a context of an administration prioritizing safeguarding manufacturing companies. In May of 1992, the U.S. Department of Labor announced that by the year 2005 job opportunities would decline in 30 occupations, with more than half being manufacturing jobs. To counteract this report, President Bush issued a moratorium in January 1992 on new regulations including those that affected the environment, purportedly to save American businesses money and protect employment. In April of that year, he extended the moratorium continuing the decline of environmental regulations at the federal level (CQ Researcher 1992). At the same time, however, environmental justice activists and researchers became central to the growing environmental agenda. Funding sources slightly increased for activities and research associated with linking issues of race and environment as well as a new "risk discrimination policy infrastructure" that would have a significant impact on the language associated with this work (Gottlieb 2002: 269- 270).

The People of Color Environmental Leadership Conference and its Aftermath

A crucial point for the environmental justice movement in the U.S. was the People of Color Environmental Leadership Conference Summit in Washington D.C. in 1992. The planning of this summit incorporated various perspectives that all seemed to have a key place in the Environmental Justice agenda. These included questions of place as a marker for understanding the "governance of production decisions" around the control of toxic emissions, dumping, and pollution in general. This summit developed a unified purpose, even as it continued to have questions around structure and uncertainty (Gottlieb 2002: 345). It was this summit, however, that would pave the way for the support of environmental justice by the Clinton Administration and the ability of this new alternative environmental movement to be taken seriously by mainstream environmental groups.

In 1994, President Clinton signed Executive Order 12898, which committed the federal government in addressing inequalities in how federal environmental policies impacted minorities and low-income populations (Gottlieb 2002). Although, environmental justice had been on the radar for several years, the movement never had the elevated power of other environmental issues (Kline 2011).

Except for the executive order, the Clinton Administration steered away from promoting new environmental regulations. However, it did strongly support using the market to curb environmental ills perpetrated by big business. This moved government management of the environment away from clean up and control and more toward pollution prevention (Kline 2011). In 1994, Carol Browner proposed a Common-Sense Initiative that government work more closely with industry in forming environmental policy (EPA Journal 1995). Strategies included tax incentives and increasing taxes for certain anti-environmental activities (Kline 2011). Corporations capitalized on this new business friendly environmental policy setting with their own focus on green marketing.

Although environmental issues were once again seen as important in national policies, the North American Free Trade Agreement (NAFTA) showed the fractures within U.S. environmentalism. On the one hand, the mainstream environmental groups supported NAFTA and worked to get assurances from the Clinton Administration that any environmental issues to come out of this treaty would be addressed as well. One glaring exception among these groups was the Sierra Club who opposed NAFTA along with many anti-globalization activists representing food, labor, and environmental justice, to name a few (Gottlieb 2002: 21).

The NAFTA dilemma showed the precarious position of environmentalism during the middle of the 1990s. While the 1980s saw environmental organizations working together against a commonly perceived threat, the loosening of the threat and the perception that the new presidential administration had a high esteem for environmental policies, caused new fissures to emerge. Environmental groups were conflicted about the Administration's mixed results. While the 1994 budget supported increasing the study of natural and human influences on the environment as well as new environmental technology programs, the EPA's budget was reduced by 540 million dollars (Kline 2011: 137). With mixed support of environmentalists and the Administration's popularity rating very low, a Republican congress gained widespread support for its conservative agenda.[38] In 1995, the House attempted to rewrite the 1972 Clean Water Act. To moderate the more radical congressional regulatory reforms,

---

[38] By 1994, there was a conservative resurgence against environment policy. Clinton proposed measures to overhaul laws governing mining on federal lands, to elevate the EPA administrator to the Cabinet, and to revamp the Superfund, the Clean Water Act and the Safe Drinking Water Act. None of which were supported by the 1994 Congress (Kline 2011).

President Clinton proposed a landmark package of twenty-five environmental reforms. Although there were small successes, most of these reforms did not pass. Nevertheless, in 1995, the EPA received a modest increase of $727 million.

The Role of International Conferences on the Environment

Beginning in the early 1990s, domestic and international environmental issues became intricately connected.[39] As discussed earlier, countries realized that large scale problems such as ozone depletion and climate change could only be solved with cooperation among various nations. Furthermore, because of increasing globalization, environmental decisions that occurred abroad could have a direct effect on American industry (Kline 2011). For example, in a letter written by Al Gore to the U.S. State department, he outlined the interconnections of environmental policy with American diplomacy (Gore 1997).

While the Bush administration was less interested in supporting international treaties regarding the environment, arguably the most important event in environmentalism during the second term of the Clinton Administration was the Climate-Change Conference held in Kyoto, Japan.[40] During this Conference, Clinton proposed a Joint Implementation plan, linking business investments with greenhouse gas

---

[39] One example of these connections was the World Sustainable Development Conference in Johannesburg, where the environmental justice activists numbered in the hundreds resulting in both the language and issues associated with environmental justice becoming figured prominently in several of the sessions.

[40] Other important milestones during the Clinton's second term included Congress strengthening pesticide regulation and the EPA implementing new air quality standards as well as creating a "superfund" to clean up hazardous waste sites.

emissions. (Kline 2011; Clinton 1997). The Kyoto Protocol required the industrialized (developing countries were exempted) countries to cut their carbon emissions. Although President Clinton signed the protocol in 1998, by 1999 the U.S. Senate still had not passed it.

By 1999, U.S. Foreign policy on the environment deprioritized multilateral agreements with the U.S. opposing proposals on limiting flexible mechanisms under the Kyoto protocol as well as the development of an international fund for environmental crises. Instead, the U.S. pursued bilateral agreements with countries of economic interest and took that approach to environmental changes as well. This approach satisfied business interests and the hope was to "convince such industries that being environmentally friendly could also be profitable" (Kline 2011: 162). Although, moderate in its approach, the Clinton Administration continued a consistent support for environmental reform. The beginning of the 2000s would shift this support considerably.

The 2000s: Decreased Environmental Regulation and its Aftermath (2001 -2010)

Any advances of environmentalism and the environmental justice movement in the 1990s became significantly less important early in the new decade. Priorities of the United States and around the globe changed on September 11, 2001. The federal government focused on homeland security and the *War on Terrorism*. It created an exogenous shock that served to deprioritize any environmental changes. While the government and the overall public supported the shift towards protecting the United States from potential terrorist threats, the Bush administration quietly used the opportunity to significantly impact environmental policies.

In his first three years in office, Bush appointed industry-connected individuals with interests in weakening environmental standards to key posts in his administration. This included Marianne L. Horinko as administrator of the EPA. Prior to her appointment, Horinko served as the President of Clay and Associates, a consulting firm that represented industry clients regulated by the EPA (Kline 2011). Additionally, Bush announced that he would not implement proposed EPA measures to reduce carbon dioxide emissions from power plants and even created an order that permitted higher levels of arsenic in drinking water (Boyer et al. 2005).

The following numbers illustrate the extent and impact of environmental deregulation during this time. Federal lawsuits against companies violating environmental laws declined by 75% between the Clinton and Bush administration. By 2004, criminal prosecution had been reduced by 17%, civil citations had been reduced by 57%. The Superfund tax for polluting industries was not renewed, which caused 34 superfund sites in 19 different states to go unfunded. The EPA showed 52% decrease in clean air inspections and a 68% reduction in the number of violations submitted to refineries across the country (Kline 2011). After years of consistent decline, the Toxic Release Inventory (TRI) showed an increase of 5 percent in the release of toxic substances into the air, water, and land.

President Bush's lack of support for environmental developments was evident in his insistence on withdrawing from any negotiations regarding the Kyoto Protocol because of the "potential strain that he believed the treaty would put on the economy" (Kline 2011: 174). The mainstream environmental groups criticized the administration and were powerless to have any real impact because of the larger perceived threats looming around war and public safety (Boyer et al. 2005). Without support at the national level, locally based environmental and environmental justice groups focused their efforts on more specific initiatives on the local, state, and regional levels (Gottlieb 2002).

Seven years into the second decade of the 21st century, the struggle between business interests, mainstream environmentalists, environmental justice activists, and government regulations continue. These relationships, however have been directly impacted by the history outlined in this chapter. For example, the EPA's Toxic Release Inventory has become an increasingly valuable resource for analyzing environmental inequalities. It has also served to provide legitimacy to claims of disproportionality in toxic emissions. Furthermore, this legitimacy has spilled over into the work of the mainstream environmental organizations with organizations such as the Sierra Club putting out information about how race impacts emissions.

From the perspective of organizations, businesses have developed very strategic marketing programs to show their environmental support. Corporate environmental responsibility has become a buzzword and a way for corporations to market themselves to an environmentally conscious public. Within the food industry, specifically, environmental degradation, organic processing, ethical farming, and worker treatment have all become connected issues. At the same time, it is notable that many of the largest corporations no longer manufacture their goods in the United States. The ones that are left, however, still produce toxic emissions. A large amount of toxic waste associated with industry is not the exception but the rule in American (and global) capitalism and so clarity around where they are located within the United States and who are most at risk for this harm are particularly important to determine.

The table below shows the prevalence of toxic emissions for all industries as well as the food manufacturing industry since the TRI began collecting data.[41]

[41] Over this period, chemicals were added to the core chemical list. Emissions for the years 1988-1990 use the 1988 core chemical list. Emissions for the years 1991-1994 use the 1991 core chemical list. Emissions for the years 1995-1997 use the 1995 core chemical list. Emissions for the years 1998-1999 use the 1998 core chemical list. Emissions for 2000 use the core chemical list for that year. Emissions for the years 2001-2010 use the 2001 core chemical list. Emissions for the years 2011-2016 use the 2011 core chemical list. Of note is that no chemicals were added to the list of toxic chemicals for the entire presidency of George W. Bush.

Table 1: Total Food Industry and All Industry Toxic Emissions 1988-2016

Year	Total Emissions (All Industries)	Total Emissions (Food Industry)	Percent of Total Emissions
1988	2,985,745,772	9,114,601	0.31%
1989	2,727,839,836	8,719,594	0.32%
1990	2,531,917,614	6,443,936	0.25%
1991	2,205,199,402	7,557,623	0.34%
1992	2,047,902,485	8,253,040	0.40%
1993	1,846,766,621	7,045,884	0.38%
1994	1,832,515,827	6,035,909	0.33%
1995	2,493,865,782	126,391,555	5.07%
1996	2,452,156,724	121,019,902	4.94%
1997	2,692,684,146	122,220,918	4.54%
1998	6,734,482,931	130,041,623	1.93%
1999	6,897,093,531	135,043,551	1.96%
2000	6,286,908,961	131,996,555	2.10%
2001	5,587,593,432	138,556,612	2.48%
2002	4,745,852,144	146,324,522	3.08%
2003	4,444,461,416	137,634,346	3.10%
2004	4,233,680,951	151,711,811	3.58%
2005	4,361,242,653	147,441,506	3.38%
2006	4,330,575,366	144,973,325	3.35%
2007	4,130,959,276	141,627,620	3.43%
2008	3,887,442,756	147,553,214	3.80%
2009	3,396,965,067	129,966,690	3.83%
2010	3,813,550,660	127,761,373	3.35%
2011	4,115,437,132	123,938,429	3.01%
2012	3,617,991,858	126,535,009	3.50%
2013	4,119,026,930	126,056,257	3.06%
2014	3,905,379,163	128,968,144	3.30%
2015	3,346,569,933	123,719,260	3.70%
2016	3,415,093,368	120,847,408	3.54%

The beginning of the Trump administration has seen much of the environmental advances of the last two decades rolled back. The lasting impact of these rollbacks are yet to be seen, but the changes in the EPA priorities will likely mean significant decreases in environmental justice initiatives along with pollution abatement policies.

The remainder of this dissertation will seek to explain this phenomenon in some detail. In the next chapter, I will focus specifically on the differences in community demographics surrounding food manufacturing facilities, develop a standardized social vulnerability score, and use geographic information systems (GIS) to analyze differences in populations' risk from toxic emissions across the United States.

CHAPTER IV

SOCIAL VULNERABILITY THEORY, METHODOLOGY, AND METHODS

This chapter provides an overview of social vulnerability and focuses specifically on how this area of research relates to the risk associated with a particular population's proximity to food manufacturing facilities. In the first section, I discuss social vulnerability as a concept. The following sections delve further into the research design for the vulnerability mapping portion of this dissertation as well as the methods used to develop a social vulnerability score for use in the multilevel modeling discussed in later chapters.

Social Vulnerability

As a reaction to 1970s research on risks and hazards that spent little or no time engaging in the role of human agency (Cutter 2016), vulnerability research focuses on the disproportionate risk to hazards experienced by certain groups over others. Based in political economy (Wisner 2016), vulnerability scholars began to think about the role of socio-economic status, gender, race, and ethnicity (Cutter 2016) in a population experiencing harm.

Although the concept of vulnerability is widely used, there is considerable variation in its uses. Cutter (1996: 530) defines social vulnerability as the "susceptibility of social groups or society at large to potential losses." It considers social inequalities in order to understand environmental risks posed to certain groups of individuals (Cutter 1996; Blaikie et al. 1994). A population's social vulnerability affects its access to information, financial resources, political capital, and social networks (Van Zandt et al. 2012) and can also affect their perception of their vulnerability (Brody et al. 2008).

Social vulnerability as a measurement includes various characteristics, many of which are found in the environmental justice literature. For example, characteristics are as varied as racial and ethnic categorization (Wilson 1987; Zahran et al. 2008), capacity for collective action, (Hamilton 1995), population density (Stockwell et al. 1993; Rogge 1998), a community's relationship to local infrastructure (Gasser and Snitofsky 1990; Platt 1991), poverty levels (Zahran et al. 2008), educational and income levels (Cutter 1996), and gender (Cutter 2017). For the most part, social vulnerability is conceptualized as a continuum where being on the low end of having social resources means having a higher level of social vulnerability. However, depending on the hazard and its context, specific factors can mitigate vulnerability as well (Cutter 1996; Cutter, Boruff, and Shirley 2003 Rogge 1998). For example, living in a poorer neighborhood may mean higher vulnerability to toxic emissions if there are manufacturing plants that are actually sited in the neighborhood. However, organizations may choose to have facilities in working class rather than the poorest neighborhoods.

The larger societal and organizational forces that impact the overall vulnerability of a population are the least studied within both the environmental justice and social vulnerability literature (Cutter 2003). However, researchers have examined some causes of these vulnerabilities such as the underlying social conditions that are separate from the physical vulnerability or hazard exposure itself. Scholars working in this area have argued that the interplay of larger structural forces including economic, political,

political economy characteristics (Watts and Bohle 1993; Blaikie et al. 1994; Peacock and Ragsdale 1997; Peacock, Dash, and Zhang 2007), and a history of politically motivated segregation (Peacock and Girard 1997) as well as their interactions with biophysical characteristics and probabilities of exposure to hazards (Alexander 1993; Highfield, Peacock, and Van Zandt 2014) are important to understanding causal mechanisms.

Arguing that socially created variables are the least studied, Cutter, Boruff, and Shirley (2003) proposed a social vulnerability index that takes into account demographic and socioeconomic data. Factors included in this index include socioeconomic status, gender, race and ethnicity, age, commercial and industrial development, employment loss, rural/urban, residential property, infrastructure and lifelines, renters, occupation, family structure, education, population growth, medical services, social dependence, and special-needs populations. They found that the factors that contribute to the overall score varied depending on the area of the United States (Tiefenbacher, Konopka, and Shelley 1997; Cutter and Solecki 1996). Additionally, while some components increase vulnerability, others moderated the effects. The remainder of this chapter will describe a process of developing social vulnerability scores for this context.

Vulnerability Mapping: Research Design

In recent years, environmental justice researchers have incorporated spatial modeling to strengthen their work in determining environmental inequality (Anderton et al. 1994; Downey 2006; Mohai and Saha 2007; Mohai and Saha 2015). Pastor, Sadd, and Morello-Frosch (2004) used geographic information systems (GIS) to determine proximity using the radii around toxic plants and found that there was a disproportionate exposure to toxic air releases by populations of color with the "unit-hazard methodology." They used census tracts and calculated proximity by including data for an entire census tract if any portion of a tract, no matter how small, was in the distance buffers around plants. Consequently, a population could be relatively far from the actual plant, but would still be considered in close proximity. Three years later, Mohai and Saha (2007) used a similar technique (i.e., areal apportionment method), except instead of including an entire tract, they measured the proportion of the tract located within the distance buffer. If a percentage of the population was located within this buffer, then data from the tract was apportioned and included in the radial area around the plant. These kinds of refinements in the analysis of exposure risk are especially important because scholars have found that the correlation between variables on the community-level changes with spatial sampling to produce very different results simply because of the geographic units being used (Cutter 1996; Hodgson and Cutter 2001). I take these issues into account when conducting my spatial analysis.

I used GIS mapping to determine the proximity of socially vulnerable populations to food manufacturing plants. In line with the studies discussed above, I mapped food manufacturing plants that reported to the U.S. Environmental Protection Agency's Toxic Release Inventory in 2010. The following is a visual representation of facilities across the United States. The green dots are where the facilities are located.[42]

---

[42] In many areas of the country, the green dots represent several facilities depending on how close they are together.

Appendix A provides visual representations of each of the 10 EPA regions within the United States.

Figure 1: Map of TRI Food Manufacturing Facilities in the U.S. (2010)

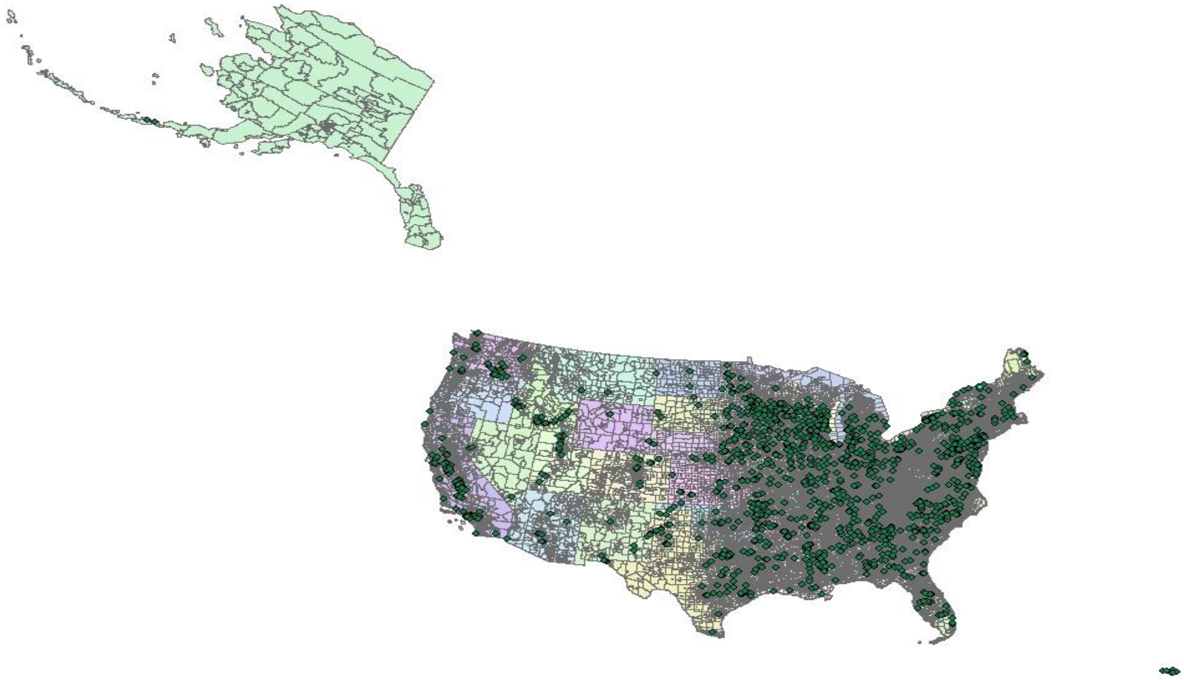


Table 2 shows the number of facilities located in each state within the analysis.[43]

[43] The facilities in Table 2 were the ones for which accurate longitude and latitude were available.

Table 2: TRI Food Manufacturing Facilities in the U.S. (2010)

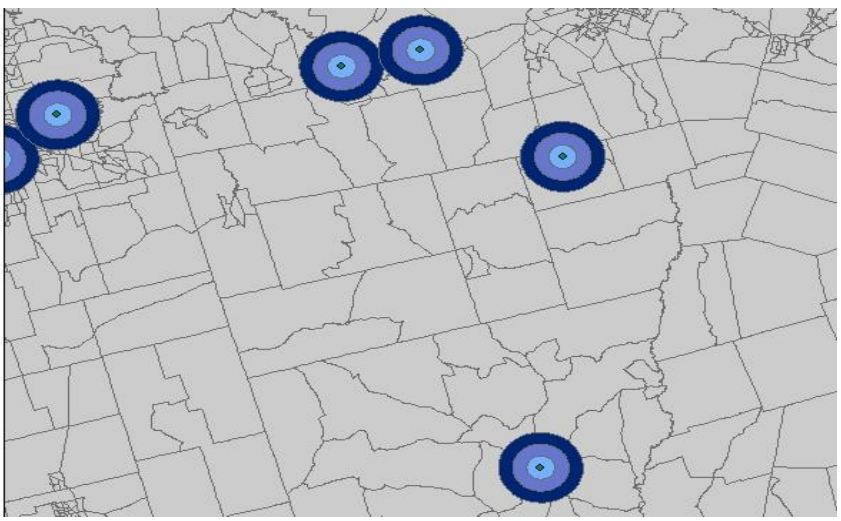
EPA Region	State	Number of Facilities	Percentage of Facilities by Region
1		**27**	
	Connecticut	3	13.0
	Maine	6	26.1
	Massachusetts	9	39.1
	New Hampshire	1	4.4
	Rhode Island	0	0.0
	Vermont	4	4.0
2		**46**	
	New Jersey	11	23.9
	New York	35	76.1
3		**101**	
	Delaware	11	10.9
	Pennsylvania	43	42.6
	Virginia	26	25.7
	West Virginia	3	2.9
	Maryland	18	17.8
4		**228**	
	Alabama	27	11.8
	Florida	21	9.2
	Georgia	41	17.9
	Kentucky	27	11.8
	Mississippi	24	10.5
	North Carolina	47	20.6
	South Carolina	13	5.7
	Tennessee	28	12.3
5		**204**	
	Illinois	39	19.1
	Indiana	30	14.7
	Michigan	28	13.7
	Minnesota	57	27.9
	Ohio	37	18.1
	Wisconsin	13	6.4

Table 2 (cont.)

EPA Region	State	Number of Facilities	Percentage of Facilities by Region
6			
	Arkansas	40	29.2
	Louisiana	15	10.9
	New Mexico	6	4.4
	Oklahoma	16	11.7
	Texas	60	43.8
7		**131**	
	Iowa	53	40.5
	Kansas	19	14.5
	Missouri	42	32.1
	Nebraska	17	12.9
8		**25**	
	Colorado	9	36.0
	Montana	2	8.0
	North Dakota	1	4.0
	South Dakota	5	20.0
	Utah	7	28.0
	Wyoming	1	4.0
9		**83**	
	Arizona	5	6.0
	California	76	91.6
	Hawaii	1	1.2
	Nevada	1	1.2
10		**49**	
	Idaho	18	38.3
	Oregon	9	19.2
	Washington	20	42.6
	Alaska	2	4.1
Total		**1,031**	

In line with Mohai and Saha (2007), I plotted population characteristics using 1-, 2-, and 3- mile buffers around the plant location.[44] I used an *areal apportionment method*,[45] which calculates the proportion of the geographic unit that falls within the buffer and weights the population characteristics according to that proportion.[46] Once all population characteristics were plotted, I constructed social vulnerability scores for each area and radius. Proportional characteristics were calculated for every time the area fell within the buffer of a facility.

Figure 2: A Portion of New York State Facilities with Added Buffers (2010)



[44] Currie and colleagues (2013) found that toxic emissions from plants have been detected up to one mile away by pollution monitoring stations. They also found that significant differences in health risks and housing values occurred between households that are less than one mile from a plant and those located 1 to 2 miles away from a plant.

[45] See Appendix B for steps taken to utilize the areal apportionment method for data analysis.

[46] Communities may be calculated more than once if they fall into the buffer zone of more than one plant.

Constructing Social Vulnerability Scores

To construct social vulnerability scores using the demographic characteristics of the populations around each of the 1,031 plants in the United States for 2010, I began with a list of eleven widely used variables in the social vulnerability and environmental justice literature. I collected data for all variables from the 2010 Decennial Census and the 2008-2012 American Community Survey. As discussed earlier in this chapter, these characteristics have, to varying degrees, all been suggested as important indicators of environmental inequality and vulnerability. They include: age (Cutter, Mitchell, and Scott 2000), sex (Blaikie et al. 1994), race (Mohai et al. 2009), ethnicity (Pastor et al. 2001), marital status (Blaikie et al. 1994), home ownership (Morrow 1999), poverty (Gould 1986), educational attainment (Been 1994a, Smith 2007), disability (Morrow 1999), and unemployment (Bezdek 1995). Table 3 shows the measurements used for each of the variables identified. Measurements were determined by considering what was used in previous studies as well as based on data availability.

Table 3: Variables and Measurements for Social Vulnerability Score

Variables	**Measurements**
Age	Percent Minors (less than 17 years of age)
Age	Percent Elderly (greater than 65 years of age)
Sex	Percent Female
Race	Percent nonwhite
Ethnicity	Percent Hispanic (includes both white and nonwhite)
Marital Status	Percent Unmarried
Home Ownership	Percent Homes occupied by the owner
Poverty	Percent Below poverty level ($10,380 in 2010)
Schooling	Percent adults no high school (greater than 25 years of age)
Disability	Percent Disabled
Unemployment	Percent Unemployed

In determining which of the variables made the most sense as components to the social vulnerability score, I used two related techniques. First, I calculated bivariate correlations for the measurements. Since, I assume that all the measurements are a part of social vulnerability, I would expect that they are at least moderately correlated (.300 or higher). I used higher correlations as an indicator that the variables could be used together in the development of a social vulnerability score. Table 4 shows the correlation matrix.

Table 4: Correlation Matrix for Proposed Variables in the Social Vulnerability Score

	Female	Un-employed	Disabled	No high school	Below poverty	Owner Occupied	Un-married	Elderly	Minors	Hispanic
Female	1									
Unemployed	0.839	1								
Disabled	0.732	0.843	1							
No high school	0.854	0.825	0.699	1						
Below Poverty	0.424	0.475	0.458	0.451	1					
Owner Occupied	0.659	0.592	0.682	0.731	0.286	1				
Unmarried	0.836	0.875	0.794	0.937	0.565	0.687	1			
Elderly	0.804	-0.740	0.734	0.777	0.343	0.703	0.763	1		
Minors	0.139	0.141	0.140	0.090	0.164	0.120	0.149	0.112	1	
Hispanic	0.380	0.393	0.194	0.397	0.156	0.086	0.371	0.240	0.001	1

From a quick glance at the correlation matrix, it was clear that the variable measuring minors was only weakly correlated to the other variables. Before, I decided to reduce the data by removing percent minors, I verified the weak correlation more systematically.

The second technique I used to determine which measurements would become parts of the social vulnerability score was common factor analysis using STATA. This analysis is based on shared co-variation. It is designed to explain all the variance between factors and to help identify all the variance components that could potentially make up a specific scale or index (Acock 2010; Treiman 2010). The factor loadings are used to assess the degree to which each variable is correlated with a specific factor. Ideally, all of the variables would load highly on a single factor. In this case, the factor is social vulnerability with all of the variables' measurements that are loaded strongly. The eigenvalue for the factor was 6.41 compared to an eigenvalue of 1.2 of the second factor. This shows a strong first factor. The following scree plot provides a visual comparison of the eigenvalue for the first factor compared to other factors.

Figure 3: Scree Plot of Eigenvalues by factor

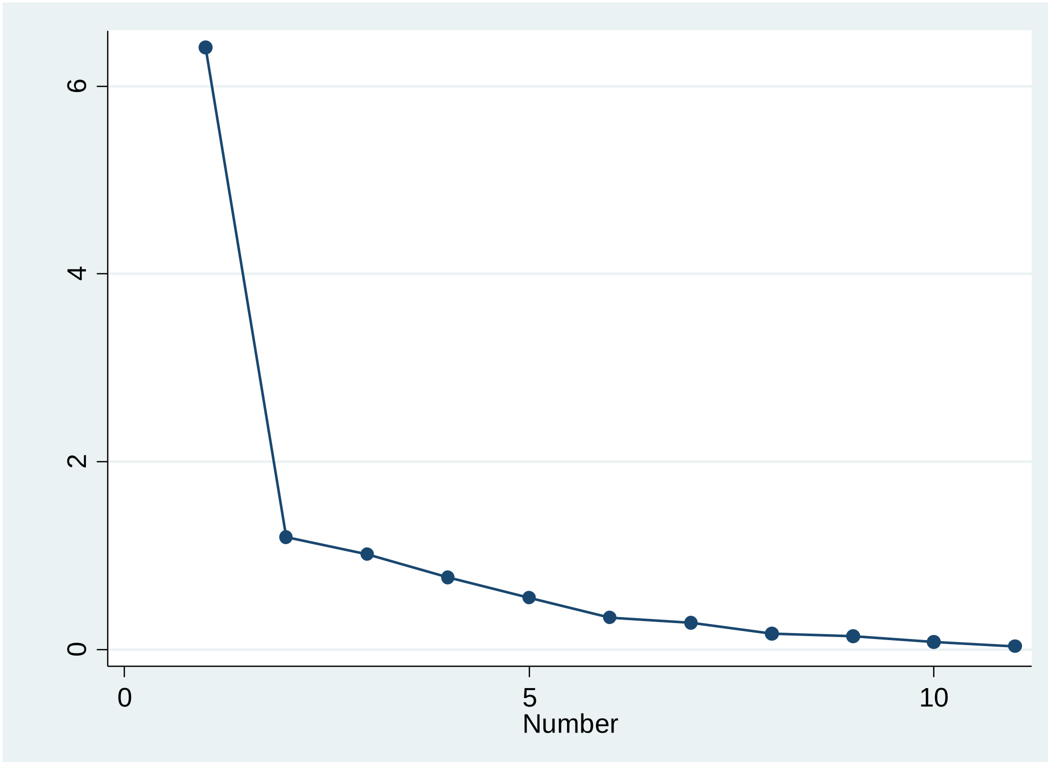


Table 5 shows the loadings for the strongest factor. This factor accounts for 58 percent of the variance of the 11 items.

Table 5: Factor Loadings from Common Factor Analysis

Variable	Factor 1
Percent Female	0.913
Percent Unemployed	0.932
Percent Disabled	0.858
Percent No high school	0.931
Percent Below poverty	0.557
Percent Owner occupied	0.741
Percent Unmarried	0.961
Percent Nonwhite	0.642
Percent Elderly	0.844
Percent Minors	0.170
Percent Hispanic	0.412

According to Treiman (2010), a factor loading of more than .4 is a good indicator of a component's relationship with the factor. With a factor loading of less than .4, the common factor analysis confirmed that the *percent minors* measure was the only variable/component not strongly connected to the factor.[47]

After removing *percent minors* from the list of components, there were 10 variables that made up the social vulnerability score. This factor accounts for 64 percent of the variance of the 10 items. The omega reliability coefficient for this factor is .87. Table 6 shows the factor loadings after percent minors was removed from the list.

Table 6: Factor Loadings from Common Factor Analysis Without Percent Minors

Variable	**Factor 1**
Percent Female	.912
Percent Unemployed	.932
Percent Disabled	.858
Percent No high school	.933
Percent Below poverty	.555
Percent Owner occupied	.741
Percent Unmarried	.961
Percent Nonwhite	.642
Percent Elderly	.844
Percent Hispanic	.414

In line with Cutter et al (2003), I standardized each variable using z-score standardization: $z = x\text{-}\mu / \sigma$. Z-scores are calculated by determining how many standard deviations the actual observation is from the mean for the variable. Once the variables

[47] Using an assumption that the factors were correlated with one another, I ran an oblique rotation. The first two factors were positively correlated with one another.

were standardized, I calculated social vulnerability scores by adding the values for each variable together.[48] Distinct social vulnerability scores were calculated for each distance around each facility: one mile, two miles, and three miles. Table 7 shows the descriptive statistics for the social vulnerability scores by distance.

Table 7: Descriptive Statistics for Social Vulnerability Score by Distance

Social Vulnerability Scores	Total Observations	minimum score	maximum score	Mean score	Standard Deviation
One mile	1027	-14.295	25.282	-0.906	8.517
Two mile	1036	-14.295	25.323	1.018	8.055
Three mile	1036	-14.295	24.933	-0.121	7.855
Total	**3099**	**-14.295**	**25.323**	**-3.680**	**8.186**

Social Vulnerability and Toxic Emissions

Using the social vulnerability scores that were derived from the process outlined above, I conducted two bivariate regressions to analyze the relationship between vulnerability scores and emissions from food manufacturing facilities. The first dependent variable (i.e., air emissions) is categorical and ordinal and captures the total emissions from each facility. The second variable (i.e., risk of emissions) is dichotomous and captures the risk associated with the facilities' emissions. This variable was

[48] In addition to a simple sum of all the scores, I also created a social vulnerability score that used a proportion of each variable using the factor loadings from the principal components analysis. In conducting the regression analyses discussed in the next chapter, I compared the findings from both sets of scores and there were no significant differences.

developed using TRI RSEI scores and includes toxicity measures for each of the chemicals within the emissions. I discuss these procedures in more detail in Chapter 5.

Since neither of the dependent variables in the analyses are continuous variables, ordinary least squares regression was inappropriate. Instead, for the risk variable, I utilized a logistic regression model, $p = \frac{e^{a+b_1 X_1}}{1+e^{a+b_1 X_1}}$, and for the emissions variable I utilized an ordered logistic regression model, $Pr = (k_{i-1} < b_1X_1 + b_2X_2 + b_kX_k + u_j \leq k_i)$. These analyses set the foundation for the multilevel analysis described in the following chapter.

The bivariate relationship between the social vulnerability score and the amount of emissions (in pounds) is significant and negative, r = -.016 with significance at

p >0.00. In other words, for each increase in the social vulnerability score, the odds of a facility having higher emissions rates decreased by 1.6%. This means that a facility with the highest level of emissions is 6.4% less likely to be impacted by a community's social vulnerability than a facility at the lowest level of emissions. On the other hand, the bivariate relationship between the social vulnerability score and whether or not the facility had risky emissions was positive, r = .007 with significance at p>0.05. In other words, for each increase in the social vulnerability score, the odds of a facility having risky emissions is .7% higher. Considering the social vulnerability scores have a wide range (-14.295 to 25.323), the difference in the odds of risky emissions for social vulnerability scores that are negative (little or *no* social vulnerability) and the odds of risky emissions for social vulnerability scores that are positive (more social vulnerability) is considerable. Although these r values are small, when interpreted they show that the changes are potentially significant. Furthermore, this tells us that there are other influences occurring that affect this relationship, which makes the case for continuing with the multilevel analysis.

Concluding Remarks

In the next chapter, I detail my use of multilevel models to measure the differential impacts of organizational and contextual characteristics on the relationship between toxic air emissions from food manufacturing facilities and populations' social vulnerability.

CHAPTER V

MULTILEVEL MODELING OF TOXIC EMISSIONS: HYPOTHESES AND RESEARCH DESIGN

In the previous chapter, I discussed social vulnerability theory and the methodology and methods I used in the creation of a social vulnerability score. The last part of the chapter focused on the social vulnerability scores and their relationship to the emissions (i.e. amount and level of risk) from food manufacturing facilities. However, social vulnerability does not spontaneously occur. Larger contextual variables impact how social vulnerability relates to any given hazard. An organizational political economy of the environment framework (discussed in Chapter 2) takes these larger contextual variables into account. I used a multilevel analysis that models these theoretical relationships. In this chapter, I outline and discuss my hypotheses and describe in detail the research design used to test them.

Hypotheses

The multilevel analyses begin with the assumption that plant-level behavior is connected to complexities at all levels of society. Based on findings from research in environmental justice and hazards, I expected to find that social vulnerability scores, which combine several characteristics deemed important predictors of a neighborhood's ability to anticipate, cope with, and respond to a toxic release, are predictors of the amount and level of risky emissions of local manufacturing plants. Furthermore, organizational and state characteristics influence the degree of relevance for various dimensions of social vulnerability.

Variations in Social Vulnerability

For the first research question, "*Are socially vulnerable populations at a disproportionate risk for being affected by emissions from food manufacturing industries?"* I developed one hypothesis.[49]

Social Vulnerability Hypothesis

Research within the environmental justice tradition has found that race and class are significant predictors for the location of polluting facilities as well as their toxic emissions (Bullard 1983; Gelobter 1992; Mohai and Bryant 1992; Brown 1995; Downey 1998; Ringquist 1997; Stretesky and Lynch 2002; Mohai, Pellow, and Roberts 2009). Fewer, but a still considerable number of studies have noted that in addition to race and class, other socioeconomic variables, including types of employment and housing prices have a real effect on creating these inequalities (Hird and Reese 1998; Smith 2007; Downey 2005). With this in mind, my first hypothesis is as follows:

H1) The higher a community's social vulnerability score, the higher odds having risky emissions from food manufacturing plants.

Mediating Hypotheses

The second research question asks, *"How do organizational and political-economic factors affect the relationship between a community's social vulnerability and the toxic emissions of local plants?"* To answer this question, I examined the

---

[49] I am interested mainly in the populations' risk of exposure to the chemicals released from local facilities. However, since I used a toxicity measure as my dependent variable and since I assumed increased toxicity to be related to adverse health, I am also indirectly testing the populations' increased risk of more severe health consequences.

interaction/mediating effects between social vulnerability and other context-level variables. The following hypotheses focus on the mediating influences of certain variables on the relationship between social vulnerability and plant-level emissions.

Social Vulnerability-Community Organization Hypotheses

From one perspective, researchers have found that increases in the number of community organizations signals increased investment in the community by its members (Putnam 2001; Tolbert, Lyson, and Irwin 1998; Tolbert et al. 2002). The existence of these organizations leads to increased community cohesion and a higher potential for community mobilization in response to an increased risk to the health and well-being of the local population. Additionally, researchers have found that the existence of non-profit and church organizations in a local community is correlated with lesser industrial emissions (Grant and Jones 2001; Grant, Jones, and Trautner 2004; Touché 2012). From another perspective, scholars have argued that because of class, race, and ethnic divisions, community organizations serve to decrease community cohesion (Kadushin et al. 2005). Furthermore, communities and community organizations have competing interests and competing agendas as well as unequal power to organize for environmental protection (Pellow 2004). For example, a community organization focused on economic development is likely to have more power than a community organization focused on environmental justice. In cases where their goals run in conflict with one another, economic development will likely win out. Taking these nuances into account, I hypothesized that the number of community organizations present in a local area will impact the relationship between social vulnerability and the plant-level emissions. Since

I did not hypothesize a direction for this hypothesis, I used a two-tailed statistical test. Additionally, I hypothesized that the number of environmental organizations will have a direct positive effect on that relationship.

H2) More community organizations strengthen the relationship between plant-level risky emissions and social vulnerability.

H3) More environmental organizations in a community weaken the relationship between plant-level risky emissions and social vulnerability.

Social Vulnerability-Organizational Characteristics Hypotheses

Researchers have studied the relationship between organizational size and pollution. On the firm-level, researchers suggest that innovation of production processes is potentially riskier for larger companies (Hannan and Freeman 1984; Fryer and Versteeg 2008) so they may produce more pollution. On the other hand, current research on pollution and corporations has shown that larger firms pollute at lower rates.[50] It suggests that this relationship exists because larger firms are more visible, tend to be more accountable for their actions to the public, and have the financial resources to spend money on pollution abatement technologies (Ambec and Lanoie 2008; Prechel and Zheng 2012; Prechel and Istvan 2016). I hypothesized along with this line of research that the size of a plant's parent company has a direct impact, either positive or negative, on the relationship between a plant's emissions and the community's social vulnerability.

H4) The larger the parent company, the stronger the relationship between plant-level risky emissions and social vulnerability.

---

[50] Rates refer to the amount of organizational pollution standardized by the size (usually measured by number of employees, sales, or assets) of the organization.

In addition to size, researchers have also found that an organization's complexity has a direct impact on organizational behavior. Prechel and Istvan (2016) found that for each additional subsidiary layer and for each additional facility within a corporate structure, emissions increased. A complex corporate structure creates a liability firewall (Prechel 1997; Prechel and Zheng 2012; Prechel and Istvan 2016), where a parent company is less legally liable for the actions of their subsidiaries. This creates a disincentive for parent companies to maintain tight controls over the decision making for smaller facilities in their corporate family and means that decision making may more likely be allocated to the local facility. On the other hand, as with size, larger companies are more visible to the public and therefore can be more impacted by public opinion in their corporate decision making (Prechel and Istvan 2016). Along with this line of thinking, I hypothesized that facilities that have a parent company will have less emissions than independent facilities. Additionally, facilities with a parent company will have less variations in emissions and risk based on the social vulnerability of the local population than independent facilities.

H5) Independent facilities will have a stronger impact on the relationship between plant-level risky emissions and social vulnerability than facilities with a parent company.

Social Vulnerability-State Characteristics Hypotheses

Research has reported that political-legal arrangements have a significant impact on organizational behavior (Prechel 2000). The legal environment under which corporations operate influences the strategies they undertake as well as the structures they develop. Additionally, research has found that, based on the hope of economic development, local community governments may provide plants with incentives to move to certain neighborhoods (Cole and Foster 2001). In turn, corporations locate their plants in certain areas in return for tax breaks and lax environmental regulations (Bluestone and Harrison 1988; Szasz and Meuser 1997; Broadway 2000). Additionally, local populations themselves may welcome high polluting industries because they assume job opportunities will be created (Yandle and Burton 1996). These findings lead me to hypothesize that plants in regional states, which place a greater emphasis on creating a successful business climate, will have greater emission rates regardless of the level of social vulnerability of the local population.

H6) The relationship between plant-level risky emissions and social vulnerability is weaker in states with stronger business climates.

Further, scholars have examined how the environmental reputation of the state in which a plant is located has a significant effect on its toxic emissions. Plants located in states with stronger environmental reputations have fewer emissions (Prechel and Touché 2014; Prechel and Istvan 2016). Greater emphasis on environmental reputation in certain states may lead to higher standards for polluting plants and a greater likelihood of negative community response to a plant’s poor environmental behavior (Soule 2009; King and Pearce 2010). Still, research from the environmental justice literature asserts that plants located in minority communities may have lower reputational risk based on their poor environmental records (Lavelle and Coyle 1992; Zimmerman 1993). This may make them more likely, in states with a positive environmental reputation, to be sited in locations with more socially vulnerable populations. The combination of these research findings suggest that plants in regional states with a good environmental reputation will have emission rates that are impacted by their location.

H7) The relationship between plant-level risky emissions and social vulnerability is stronger in states with stronger environmental records

Research Design

The research design is an innovative approach to combining environmental justice and organizational research. It brings together several factors that indicate social vulnerability and analyzes its relationship with the toxic emissions from a manufacturing facility. Additionally, it captures the context in which this relationship exists. While other studies have looked at the relationship between many of the contextual independent variables and emissions, none have focused on how these contextual variables affect the relationship between social vulnerability and emissions.

The study group comprises the universe of food manufacturing facilities reporting to the Environmental Protection Agency's Toxic Release Inventory in 2010. These facilities have a three-digit NAICS code of 311. Facility and parent company level data were taken from 2010. This year was significant in that organizations were feeling the shift between the lack of regulatory will under the administration of George W. Bush (Parenteau 2004; Solomon and Eilperin 2007) and the increased attention to the Environmental Protection Agency following the election of Barack Obama. The demographic data were taken from both the 2010 Decennial Census and the American Community Survey 2008-2012 summary files. All other contextual variable data were taken from 2009. I chose the one-year lag to avoid any simultaneity bias (i.e., the independent variables could be construed as either the cause or the effect of the dependent variables in question). There are a total 1,093 plants in the research design, with social vulnerability scores calculated at one-mile, two-mile, and three-mile radii. The completed dataset included 3,279 observations.

Dependent Variable- Plant Level Emissions

For this project, I compared findings for two dependent variables. The first dependent variable was plant-level air emissions. According to the Toxic Release Inventory, the food industry was the fourth highest emitter, with almost 128 million pounds of toxic releases. Over 40 million pounds of those releases were fugitive and stack air emissions.[51] The total air emissions for 2010 for the food industry was a little over 3% of total disposal and other releases. The chemicals most emitted were nitrate compounds, n-hexane, ammonia, hydrochloric acid, barium compounds, methanol, acetaldehyde, and sulfuric acid.

Almost half of the facilities in the dataset reported zero emissions. To account for the skew in the variable, I transformed the continuous emissions data into an ordinal variable based on the accumulated amount (i.e., pounds) of air emissions. I took the 2010 emissions of each plant, ranked the plants based on emissions, calculated the percentile categories, and assigned each plant to one of the six categories. I created six categories: 1) *no* emissions made up of all observations with zero emissions; 2) *very low* emissions made up of all observations between 0 and the 1st percentile of emissions; 3)

---

[51] Fugitive air emissions refer to the releases that are not confined and can include spills and leaks. Stack emissions refer to confined, targeted, and intentional releases.

low emissions made up of all observations over the 1st percentile up to the 25th percentile; 4) *moderate* emissions made up of all observations above the 25th percentile up to the 50th percentile; 5) *high* emissions made up of all observations above the 50th percentile up to the 75th percentile; and 6) *very high* emissions made up of all emissions above the 75th percentile.

The second dependent variable measures emissions risk. Researchers have developed several ways of measuring toxicity from emissions (Scott et al. 1997; Bouwes and Hassur 1997; Toffel and Marshall 2004). The Environmental Protection Agency's Risk Screening Indicators (RSEI), is a toxicity score that is widely used in academic research (Sicotte and Swanson 2007; Grant et al. 2010). Although RSEI has been critiqued for not being adequate in estimating non-human environmental impacts, scholars have recommended it as the best measure for estimating risk to human health (Toffel and Marshall 2004). The RSEI score uses emissions data from the TRI to develop a toxicity score based on the actual amount of toxic emissions, a toxicity weight of the chemicals involved, and a calculated risk hazard from the emissions (Bouwes and Hassur 1997). Like the emissions data, the toxicity score variable was significantly skewed. To account for this skew, I transformed the continuous variable into a dichotomous variable with one representing some toxicity and zero representing no toxicity.

Independent Variables Level 1: Measures of Social Vulnerability

After years of debate about the most important characteristics associated with environmental inequality (e.g., whether race or class is more important), there has been little consensus or resolution regarding this issue. To move the literature forward, I used social vulnerability, which combines various characteristics that have been consistently dealt with in the environmental justice and vulnerability literatures, to create a more comprehensive measure. As described in the previous chapter, social vulnerability scores were calculated using an additive procedure that combined several measurements that, according to the vulnerability and environmental justice literature indicated the level of the social vulnerability of a population.

Independent Variables: Mediating Influences on Social Vulnerability

Part of the gap in the current environmental justice literature is that while there are debates as to whether certain demographic populations are affected by environmental inequity over others, consensus is limited regarding what causes these vulnerabilities to have more or less importance. For example, scholars have argued that environmental racism has caused these issues, but there is no consensus on what that means. On the one hand, environmental racism can refer to intentional discrimination resulting in "racially inequitable environmental outcomes" (Been 1994a; Downey 1998, 769). On the other hand, scholars argue that environmental racism is more institutional and refers to any actions that lead to the disproportionate environmental impacts on communities based on race or color, regardless of intention (Downey 1998; Mohai and Bryant 1992; Bullard 1996).[52] I use this latter position, to argue that in order to understand the

---

[52] Laura Pulido (2000) describes suburbanization as a way that white privilege plays out spatially by examining how historically white Americans have been able to move outside of the industrial areas of cities, into cleaner areas through this process. This

disproportionate environmental risk to socially vulnerable populations we must understand the mediating factors that influence these effects.

An organizational political economy theory asserts that corporations are embedded within different states as well as different levels of the social structure (Prechel and Zheng 2012; Prechel and Istvan 2016). To this end, a populations' social vulnerability is related to plant-level emissions because of mediating forces at different levels of society. This analysis tested the mediating influences of several variables on social vulnerability. Table 8 lists the independent variables identified in the hypotheses above, their corresponding measurements, and the source of the data.

Table 8: Context-level Independent Variables

Hypotheses	Concept	Measurement	Source
H2/H3	Non-Profit Organizations	Number of non-profit organizations in the state/ number of environmental organizations in the state	Center for Charitable Statistics
H4	Parent Company size	Total assets	ReferenceUSA/ Compustat
H5	Corporate Structure	Facility is independent or the subsidiary of a parent company	Lexis Nexis Corporate Affiliations/ Toxic Release Inventory/ Compustat
H6	State Business Climate	Business Tax Climate Index	The Tax Foundation
H7	State Environmental record	State Green Score	Forbes

structural change is less conscious, but leads to a disproportionate amount of people of color living in the most environmentally toxic parts of an area.

The Forbes green score uses six weighted categories including the state's "carbon footprint, air quality, water quality, hazardous waste management, policy initiatives, and energy consumption (Forbes 2007)." None of these categories overlap with the other variables in the dataset. The Business Tax Climate Index scores all 50 states based on taxes that "matter most to business" including the "corporate income, individual income, sales, property, and unemployment insurance" taxes (Tax Foundation 2009). I consulted three sources to determine the structure of the facility, (i.e., whether it was independent or a subsidiary). The Parent company size was measured based on its total assets.[53] These data were found using Compustat and were cross-referenced using ReferenceUSA. The number of community organizations was measured using the number of organizations (non-profit) within the state.

I used three control variables including the calculated distances from the facility, the total population within each given buffer, and the number of similar TRI food manufacturing plants in the county (Grant et al. 2010).

Table 9 presents descriptive statistics for the variables in this section and Table 10 is a correlation matrix for all the variables listed

---

[53] Parent Company size was also measured by total employees, but did not significantly change the findings for the analyses.

Table 9: Means/Percent and Standard Deviations of Variables Used in Analyses

Variables	Mean/Percent	Standard Deviation	Minimum	Maximum
Dependent Variables				
Toxic Emissions	2.77	1.924	1	6
Hazardous Emissions*	0.45	0.498	0	1
First-Level Variables				
Social Vulnerability (SV)	-0.037	8.182	-14.295	25.32
Total population	32.5	152.125	0	1585.28
Distance from facility	2	0.816	1	3
Plant density	36.2	19.04	1	76
Mediating Variables				
Stand-alone facility*	0.22	0.412	0	1
Environmental climate	4.91	7.22	14.2	43.6
Business climate	28.73	0.717	3.6	7.42
Community organizations	46035	43370.85	4760	166716
Environmental organizations	1603.3	1607.966	134	5895
Parent size (assets)	6128.25	17744.91	0	195014

*dummy variable

Table 10: Correlation Matrix for Variables Used in Multilevel Analyses

Variables	Toxic Emissions	Hazardous Emissions	Social Vulnerability	Total Population	Distance from Facility	Plant Density	Stand alone facility	business climate	environmental climate	community organization	environmental organizations	parent size (assets)
Toxic Emissions	1											
Hazardous Emissions	0.781	1										
Social Vulnerability	-0.076	0.03	1									
Total Population	-0.0389	0.019	0.483	1								
Distance from Facility	-0.001	-0.001	0.039	-0.023	1							
Plant Density	-0.065	-0.083	-0.074	0.047	-0.004	1						
Stand alone facility	0.106	0.117	0.04	0.075	-0.002	0.004	1					
business climate	0.067	0.063	0.127	-0.027	0.003	-0.433	-0.029	1				
environmental climate	-0.099	-0.047	0.086	0.102	0.003	0.107	0.042	-0.261	1			
community organization	-0.084	-0.086	0.160	0.116	-0.002	0.643	0.008	-0.194	0.188	1		
environmental organizations	-0.074	-0.069	0.166	0.112	-0.003	0.521	-0.015	-0.192	0.182	0.857	1	
parent size (assets)	0.022	0.050	0.126	0.051	-0.001	0.003	-0.163	-0.038	0.028	0.019	0.028	1

Multilevel Analyses

I theorized that social vulnerability is mediated by or "nested" within larger community, organizational, and political contexts which makes the use of a multilevel model a statistically appropriate method (Bryk and Raudenbush 1992; Diprete and Forristal 1994). With a multilevel logistic model, I did away with the assumption that all the variables are independent from one another. Rather, I assumed that the observations at the highest level (regions) are uncorrelated with one another. Furthermore, I needed only assume that the level one residual variance is constant. The variables are nested within states that are nested within EPA regions. This clustering analysis assumes that there is less variance within clusters than between clusters. In this case, the variance among facilities is less within states and regions than among them. Thus, use of an unclustered model is inappropriate (Kahn and Shaw 2011). In other words, I assumed that communities and organizations in the same states and region are more similar than communities and organizations from different states and regions. I utilized STATA melogit and meologit commands to run the multilevel models. Melogit models are multilevel logit models and meologit are multilevel ordered logit models.

Equations

For each of the dependent variables, there are different regression equations. The first level of the multilevel model describes the relationship between plant emissions and the population's social vulnerability score. The regression equation for the dichotomous dependent variable is as follows:

$P = \frac{e^{a+b_1\ X_1}}{1+e^{a+b_1\,X_1}}$ where p is the predicted probability of the non-linear function of the x variables (emissions ranking and hazardous emission probability).

The regression equation for the ordinal and categorical dependent variable is as follows: $Pr = (k_{i-1} < b_1X_1 + b_2X_2 + b_kX_k + u_j \leq k_i)$, where Pr is the probability of observing a specific category, i, for the x variables. k refers to the cut points for each category (see table 9 for variables' names).

The second level of the model incorporates context level variables theorized to influence the relationship between social vulnerability and plant emissions. The addition of the second level of the model accounts for the ways in which the behavior of the facilities are not just random, but are nested within states.

The regression equation for the second level of the multilevel model for the dichotomous dependent variable is as follows:

$P(Y_{ij} = 1|x_{ij}, u_{0j}) = \frac{\exp[\gamma_{00}+ \gamma_{01}\,x_{1ij}+U_{0j}]}{1+\exp[\gamma_{00}+ \gamma_{01}\,x_{1ij}+U_{0j]}}$, where p is the predicted probability of the non-linear function of the x variables, clustered within j states. The regression equation for the second level of the multilevel model for the ordinal and categorical dependent variable is as follows: $\Pr(y_{ij} > k|x_{ij,}k, u_j \ = H(x_{ij}\beta + z_{ij}u_j - K_k)$, where Pr is the probability of observing a particular category for the x variables by, i, which refers to the food manufacturing plants clustered by j states. As in the one level model k refers to the cutpoints for each category. In this case, H represents the cumulative probability. In this model, there is no constant, because that is accounted for in the cutpoints.

Although, two-level models capture all the variables and clusters all facilities at the state level, this cluster does not account for all the variance. While facilities are nested within states, states are nested in EPA regions. For the dichotomous dependent variable, the remaining portion of the equation finds the probability of observing the occurrence (i.e., risky emissions). For the ordered, categorical dependent variable the remaining portion of the equation finds the probability of the particular category (i.e., no emissions, very low emissions, etc.). This is based on the outcome of the x variables (i.e. social vulnerability score etc.) for i facilities, clustered within j states, and within M regions.

Concluding Remarks

This chapter outlined the hypotheses and research design for this dissertation. In the following chapter, I describe the results from the two sets of analysis, and discuss how these results relate to social vulnerability and context variable hypotheses.

CHAPTER VI

RESULTS AND FINDINGS

In this chapter, I outline the results and findings from the two sets of multilevel analysis. As discussed in detail in the previous chapter, I conducted two multilevel analyses to test my hypotheses associated with the relationship between social vulnerability scores and toxic emissions. In the next two sections of this chapter, I report on the preliminary results for both the logistic multilevel regression and the multilevel ordered logistic regression[54].

Both sets of results include three tests of model fit. The Likelihood Ratio Chi-Squared Statistic tests the null hypothesis that all the x variables are zero. If it is significant, then we can reject the null hypothesis and conclude that information about the x variables allows us to make better predictions than we would without them. The Bayesian Information Criterion (BIC) and the Akaike's Information Criterion (AIC) are similar tests of overall model fit. The smaller the number on both the BIC and AIC, the better the overall fit of the model.

Multilevel Ordered Logistic Regression

In this section, I discuss the results from the models using the dependent variable of total emissions percentile. The first model shows the results from the one level ordered logistic regression measuring the relationship between the social vulnerability

---

[54] I also ran both full regressions as unclustered models that assume independence of all the variables within the model. Overall, the findings remained the same, with a couple of exceptions that I will discuss.

scores and the emissions rankings. The two control variables included the distance from the facility and the total population of the area. The second model introduces the multilevel analysis, which included all the hypothesized independent variables (n=10). The third model included all the interaction variables stated in the hypotheses in the previous chapter. This final model included measuring how the majority of the independent variables affect the relationship between the social vulnerability score and the total emissions percentile.

Table 11 shows the results from the three models as well as the results from the three tests of model fit. It shows that the nested model, which included the interaction variables (Model 3), has the best fit.

Table 11: Effects of Independent Variables on Total Emissions Ranking

_	Model 1			Model 2			Model 3		
	Coef.	odds ratio	S.E.[a]	Coef.	odds ratio	S.E.	Coef.	odds ratio	S.E.
Main Effects									
Social Vulnerability (SV)	-.0133*	-1.3	0.006	-0.026***	0.975	0.007	0.008^	1.008	0.047
Total population	-0.002	0	0.003	-0.0000934	0.9999066	0.0003536	-0.0002	0.9999066	0.0003536
Distance from facility	0.004	0.4	0.041	0.004	1.004335	0.0418	-0.00003	1	0.042
Plant density				-0.010*	0.9903823	0.0048147	-0.011*	0.989	0.0049
Stand alone facility				0.560***	1.75065	0.1438897	0.554***	1.7401	0.1433
Business climate				-0.004	0.996	0.007	0.052	1.053	0.124
Environmental climate				-0.031**	0.97	0.011	-0.034**	0.966	0.011
Community organizations				0.00000112	1.000001	0.0000035	0.00000163	1	0.00000353
Environmental organizations				0.0000505	1.0001	0.0001	0.00004	1	0.00008
Parent size (assets)				0.00001**	1.00001	0.00000186	0.00000318	1.000003	0.00000218
Interaction Effects									
SV x plant density							-0.0024	0.9976	0.004
SV x stand alone facility							0.193^	1.2127	0.122
SV x business climate							-0.003	0.9971	0.0651
SV x environmental climate							-0.013*	0.9867	0.007
SV x community organizations							-0.00000157	0.99999	0.00000231
SV x environmental organizations							0.0000756	1.0001	0.0001
SV x parent size (assets)							0.000005*	1	0.00000242
Group Variables									
Region				10			10		
State				49			49		
AIC	8840.21			8689.198			4095.899		
BIC	8888.52			8791.858			4210.636		
LR test: chi-square	16.08			77.18			75.8		
Prob > chi-square	0.0011			0			0		
p<.10^ p < .05 * p<.01** p<.001***									
[a] Standard Error (S.E.)									

Results

In the first and second models, the lower the social vulnerability score, or the less vulnerable, the higher the total emissions ranking. A higher ranking equals more total emissions. In this model, the relationship was statistically significant.[55] With all the independent variables included in the second model, the relationship between the social vulnerability score and the total emissions ranking became stronger and more significant. In the final model, the direct relationship between the social vulnerability score and the total emissions ranking switched direction and maintained significance at the $p > .10$ level.

In models two and three, the number of food manufacturing plants located in the county, had a significant effect on the level of emissions. The more facilities in the area, the lower the emissions from any one facility. However, in the third model, the number of plants in the area did not have a significant effect on the relationship between the social vulnerability score and the total emissions ranking.

In both models, whether or not the facility was independent or a subsidiary of a parent company, had a significant effect on the total emissions ranking. Facilities that were independent had higher total emissions rankings than facilities that were a subsidiary of a parent company. Furthermore, whether or not the facility was an independent plant had a significant effect on the relationship between the social

---

[55] I also ran a bivariate ordered logistic regression that included the social vulnerability score and the total emissions percentile. The negative relationship between the two variables was also significant in this model.

vulnerability score and the total emissions ranking. Specifically, the relationship between social vulnerability scores and the total emissions ranking was stronger for independent facilities than for facilities that are subsidiaries of a parent company.

In the second model, the size of the parent company had a significant effect on the total emissions ranking: the larger the parent company, in total assets, the higher the emissions ranking for the facility. In model three, the size of the parent company was not significant. However, the interaction between parent company size and social vulnerability was significant. This finding tells us that the larger the parent company, the stronger the relationship between social vulnerability and the total emissions ranking.

The overall climate of the state had mixed effects on the relationship between social vulnerability and the toxic emissions ranking. The state's tax climate had no significant effect on the total emissions in either in the second model or the third model.[56] However, the state's environmental climate did have a significant effect on the total emissions ranking. The higher a state's environmental score, the lower the emissions from the facility. Additionally, in the third model, a state's environmental score also had a significant effect on the relationship between social vulnerability and total emissions ranking. In other words, the higher the state's environmental score (i.e., the stronger the state's environmental reputation) produced a weaker relationship between the social vulnerability score and the total emissions ranking.

---

[56] When the model was run with variables unclustered, the state tax climate had a significant effect on the total emissions rankings. The more business friendly, a state's tax climate, the higher the levels of emissions from each facility.

For all three models, the total population and the distance from the facility had no significant effect on the total emissions ranking. In addition, for the two models in which they are included, the number of community organizations and the number of environmental organizations[57] in the state, had no significant effect on the total emissions ranking. Additionally, the number of community organizations and environmental organizations had no significant effect on the relationship between social vulnerability and the total emissions ranking.

In the following section, I review the findings from the second set of multilevel models.

Multilevel Logistic Regression

In this section, I discuss the results from the models using the dependent variable of whether or not a facility has hazardous emissions. The first model reports results from the one level logistic regression measuring the relationship between the social vulnerability scores and whether or not a facility has hazardous emissions. The two control variables included the distance from the facility and the total population of the area. The second model introduces the multilevel analysis, which included all the

[57] The final model was run with both community organizations and environmental organizations in the analysis. In alternative models, they were run individually. This did not influence the significance or the relationship.

independent variables hypothesized about. The third model included all the interaction variables outlined in the hypotheses in the previous chapter. This includes measuring how the majority of the independent variables affected the relationship between the social vulnerability score and the probability of having hazardous emissions.

Table 8 shows the results from the three models as well as the results from the three tests of model fit. It shows that both nested models (model 2 and 3) are similar in fit.

Table 12: Effects of Independent Variables on Whether a Facility Has Hazardous Emissions

	Model 1			Model 2			Model 3		
	Coef.	odds ratio	S.E.[a]	Coef.	odds ratio	S.E.	Coef.	odds ratio	S.E.
Main Effects									
Social Vulnerability (SV)	0.004	1.004	0.006	-0.002	0.998	0.008	0.090^	1.094	0.059
Total population	0.000	1.000	0.000	0.00	1.00	0.00	0.0005	1.00	0.04
Distance from facility	-0.008	1.00	0.044	0.00	1.00	0.05	0.0007	1.00	0.05
Plant density				-0.015*	0.99	0.01	-0.017**	0.98	0.01
Stand alone facility				0.703***	2.02	0.19	0.696***	2.01	0.19
Business climate				-0.01	0.990	0.009	0.124	1.132	0.180
Environmental climate				-0.026*	0.975	0.014	-0.030*	0.970	0.015
Community organizations				0.00000	1	0.000005	0.000001	1	0.000005
Environmental organizations				0.0001	1.0001	0.0001	0.0001	1.0001	0.0001
Parent size (assets)				0.00001***	1.00001	0.000002	0.00001*	1	0.000003
Interaction Effects									
SV x plant density							0.000	1.0003	0.004
SV x stand alone facility							-0.07	0.93	0.12
SV x business climate							-0.094	0.91	0.076
SV x environmental climate							-0.017*	0.984	0.008
SV x community organizations							0.000	1.000	0.000
SV x environmental organizations							0.000	1.000	0.000
SV x parent size (assets)							0.000007*	1.0	0.0
Group Variables									
Region				10			10		
State				49			49		
AIC	4271.447			4093.975			4097.004		
BIC	4295.602			4172.48			4217.78		
LR test: chi-square	3.4			99.33			102.83		
Prob > chi-square	0.3343			0.00			0.00		
p<.10^ p < .05 * p<.01** p<.001***									
[a] Standard Error (S.E.)									

Discussion

In the first model, the social vulnerability score had a statistically significant relationship with the hazard dummy.[58] With all the independent variables included in the second model, the relationship between the social vulnerability score and the probability of hazardous emissions switched direction, but was not significant. In the final model, the direct relationship between the social vulnerability score and the probability of hazardous emissions switched direction again in line with model 1 and regained significance. Overall, the higher the social vulnerability score, or the more vulnerable, the higher the odds that a facility would have hazardous emissions.

In models two and three, the number of food manufacturing plants located in the county, had a significant effect on the probability of hazardous emissions. That is to say, the more facilities in the area, the lower the probability that there would be hazardous emissions from any one facility. Moreover, in the third model, the number of plants in the area also had a significant effect on the relationship between the social vulnerability score and the probability of hazardous emissions.

In both models, whether or not the facility was independent or a subsidiary of a parent company, had a significant effect on the probability of hazardous emissions. Independent facilities were more likely to have hazardous emissions than facilities that were a subsidiary of a parent company. However, whether or not the facility was

---

[58] I also ran a bivariate logistic regression that included the social vulnerability score and the hazard variable. The relationship between the two variables was also significant in this model.

independent had no significant effect on the relationship between the social vulnerability score and the probability of hazardous emissions.

In both model 2 and model 3, the size of the parent company had a significant effect on the probability of hazardous emissions. The larger the parent company, in total assets, the higher the probability that the facility had hazardous emissions. Furthermore, the interaction between parent company size and social vulnerability was also significant and positive, telling us that the larger the parent company, the stronger the relationship between social vulnerability and the probability of hazardous emissions.

The overall climate of the state had mixed effects on the relationship between social vulnerability and the odds of a facility having hazardous emissions. The state's tax climate had no significant effect on the probability of hazardous emissions in either the second model or the third model. However, the state's environmental climate had a significant effect on the probability of hazardous emissions. The higher a state's environmental score, the lower the probability that a facility had hazardous emissions. Additionally, in the third model, a state's environmental score also had a significant effect on the relationship between social vulnerability and the probability of hazardous emissions. High state environmental scores had weaker relationships between the social vulnerability scores and the probability of the facility having hazardous emissions.

For all three models, the total population and the distance from the facility had no significant effect on the odds of a facility having hazardous emissions. For the two models in which they were included, the number of community organizations and the number of environmental organizations in the state, had no significant effect on hazardous emissions variable.[59] Additionally, the number of community organizations and environmental organizations[60] had no significant effect on the relationship between social vulnerability and the probability that a facility had hazardous emissions.

Findings: Reviewing Hypotheses

The two previous sections within this chapter detailed the results for each of the independent variables. In this section, I synthesize these results to determine which of the seven hypotheses outlined in Chapter 5, were supported.

H1) The higher a community's social vulnerability score, the higher the odds of a plant having risky emissions.

In the full model (Model 3) for the ordered logistic regression, the relationship between the social vulnerability score and the total emissions ranking was significant and positive. With every increase in the social vulnerability score, the odds of a facility having higher emissions increases by .8%, holding all other variables constant. Furthermore, in the full model (Model 3) for the logistic model, the relationship between the social vulnerability and the odds of a facility having higher emissions was significant and positive. For every increase in the social vulnerability score, other variables being equal, the odds of a facility having hazardous emissions increases by 9.37%.

---

[59] When the model was run with variables unclustered, a higher number of community organizations within the state, increased the odds of a facility having hazardous emissions. This relationship was significant.

[60] The final model was run with both community organizations and environmental organizations in the analysis. In alternative models, they were run individually. This did not influence the statistical significance or the magnitude and direction of the relationship.

These two sets of findings suggest that the first hypothesis was supported. The fact that the direction of the relationship switched in both final models, indicated that focusing on social vulnerability without additional context can lead to misleading results.

H2) More community organizations strengthen the relationship between plant-level risky emissions and social vulnerability.[61]

According to the full model (model 3) for the total emissions ranking variable, there was no change in the odds of a facility having higher emissions with changes in the amounts of community organizations, holding all other variables constant. Moreover, other things equal, there was no change in the relationship between social vulnerability and the odds of a facility having higher total emissions with changes in the amount of community organizations, holding all other variables constant. Additionally, according to the full model (Model 3) for the hazard dependent variable, other variables being equal, there was no change in the odds of a facility having hazardous emissions with changes in the amounts of community organizations. Moreover, other variables being equal, there was no change in the relationship between social vulnerability and the odds of a facility having hazardous emissions with changes in the amount of community organizations.

These two sets of findings indicated that this hypothesis was not supported.

---

[61] Since I did not hypothesize a direction for this hypothesis, I used a two-tailed test.

H3) More environmental organizations weaken the relationship between plant-level risky emissions and social vulnerability.

According to the full model (model 3) for the total emissions ranking variable, there was no change in the odds of a facility having higher emissions with changes in the amounts of environmental organizations, holding all other variables constant. Moreover, other variables being equal, there was no change in the relationship between social vulnerability and the odds of a facility having higher total emissions with changes in the amount of environmental organizations, holding all other variables constant. Additionally, according to the full model (Model 3) for the hazard dependent variable, other variables being equal, there was no change in the odds of a facility having hazardous emissions with changes in the amounts of environmental organizations. Moreover, other variables being equal, there was no change in the relationship between social vulnerability and the odds of a facility having hazardous emissions with changes in the amount of environmental organizations.

These two sets of findings indicated that this hypothesis was not supported.

H4) The larger the parent company, the stronger the relationship between plant-level risky emissions and social vulnerability.

According to the full model (Model 3) for the total emissions ranking variable, for every increase in the size of the parent company, the odds of a facility having higher emissions increased by .0003%, holding all other variables constant. Furthermore, for every increase in the size of the parent company, the odds of a population's social vulnerability impacting the odds of a facility having higher emissions increased by

.0005%, holding all other variables constant. Likewise, according to the full model (Model 3) for the hazard dependent variable, other variables being equal, for every increase in the size of the parent company, the odds of a facility having hazardous emissions increased by .0006%. Furthermore, other variables being equal, for every increase in the size of the parent company, the odds of a population's social vulnerability impacting whether a facility has hazardous emissions increased by .0007%. This is a small but significant effect and can mean the difference between negligible amounts of toxic emissions and considerable amounts of toxic emissions.

These two sets of findings indicated that this hypothesis was supported.

H5) Independent facilities will have a stronger impact on the relationship between plant-level risky emissions and social vulnerability than facilities with a parent company.

In model 3 for the total emissions ranking variable, facilities that are independent are 74% more likely to have higher emissions than facilities that are subsidiaries, holding all other variables constant. Furthermore, the odds of a population's social vulnerability impacting the odds of a facility having higher emissions is 21% more likely than if a facility is a subsidiary, holding all other variables constant. Additionally, in model 3 for the hazard dependent variable, other variables being equal, facilities that are independent are 101% more likely to have hazardous emissions than facilities that are subsidiaries. Moreover, other variables being equal, the odds of a population's social vulnerability impacting whether a facility has hazardous emissions is 7% more likely if a facility is independent than if a facility is a subsidiary of a parent company.

These two sets of findings indicated that this hypothesis was supported.

H6) The relationship between plant-level risky emissions and social vulnerability is weaker in states with stronger business climates.

In model 3 for the total emissions ranking variable, for every increase in the strength of a state's business climate, the odds of having higher emissions increases by 5.34%, holding all other variables constant. Furthermore, for every increase in the strength of a state's business climate, the odds of a population' social vulnerability impacting the odds of having higher emissions decreases by .3%, holding all other variables constant. Additionally, in model 3 for the hazard dependent variable, other variables being equal, for every increase in the strength of a state's business climate, the odds of a facility having hazardous emissions increases by 13%. Moreover, other variables being equal, for every increase in the strength of a state's business climate, the odds of a population's social vulnerability impacting whether a facility has hazardous emissions decreases by 9%.

These two sets of findings indicated that this hypothesis was supported, although the findings were not significant.

H7) The relationship between plant-level risky emissions and social vulnerability is stronger in states with stronger environmental records

In model 3 for the total emissions ranking variable, for every increase in the strength of a state's environmental record, the odds of having lower emissions increased by 3.37%, holding all other variables constant. Furthermore, for every increase in strength of a state's environmental record, the odds of a population's social vulnerability impacting the odds of having lower emissions decreased by 1.3%, holding all other variables constant. Additionally, in the full model (Model 3) for the hazard dependent variable, other variables being equal, for every increase in the strength of a state's environmental record, the odds of a facility having hazardous emissions decreased by 3%. Moreover, other variables being equal, for every increase in the strength of a state's environmental record, the odds of a population's social vulnerability impacting whether a facility has hazardous emissions decreased by 1.64%.

These two sets of findings indicated that this hypothesis was supported.

Plant Density: An Additional Finding

In the analysis, plant density (i.e. number of plants in the county) was used as a control variable. The relationship between plant density and emissions was not hypothesized. However, in the full model (model 3) for both the total emissions ranking variable and the hazard dependent variable, plant density was a significant factor in predicting the odds of emissions.

In model 3 for the total emissions ranking variable, for every increase in the number of plants within the county, the odds of a facility having lower emissions increased by 1.07%, holding all other variables constant. Furthermore, for every increase in the number of plants within the county, the odds of a population's social vulnerability impacting the odds of having lower decreased by .2%, holding all other variables constant. Additionally, in model 3 for the hazard dependent variable, other things being equal, for every increase in the number of plants within the county, the odds of a facility having hazardous emissions decreased by 2%. Moreover, other variables being equal, for every increase in the number of plants within the county, the odds of a population's social vulnerability impacting whether a facility has hazardous emissions increased by .03%.

Concluding Remarks

This chapter presented the results and findings associated with the relationship between social vulnerability and toxic emissions using two different dependent variables. The findings from these analyses, showed that five of the seven hypotheses were supported to varying degrees, while two of the hypotheses were not supported using any of these models. Additionally, the models showed that plant density was a significant factor in facility emissions.

The next chapter will include a substantive discussion of the findings outlined in this chapter as well as implications of these outcomes for further research and social action.

CHAPTER VII

DISCUSSION AND CONCLUSIONS

In the previous chapter, I presented the findings from the multilevel analyses. The first part of this chapter, focuses on ways to interpret the findings using an organizational political economy of the environment framework. Overall, these findings indicated how important it is to model context and how modeling intersecting vulnerabilities provide a simplified, yet more comprehensive picture of the relationships between people and organizations. Said in another way, multiple factors on multiple levels of the political-economic structure impacts not just the behavior of organizations, but how organizational behavior is related to the communities where they are located.

Community Discussions

Social Vulnerability is a complex concept. The straightforward hypothesis that socially vulnerable populations are more likely to experience increased hazards becomes more complicated once the concept and the resulting measurements are unpacked. Developing a new way to measure social vulnerability so that it captures a broad, but still related spectrum of vulnerable characteristics that impacts or are impacted by these hazards is a tricky undertaking. The components chosen in these analyses were determined theoretically to be important indicators in both environmental justice and hazards literature. However, this was the first time that these concepts were combined to measure their relationship with toxic emissions from food manufacturing facilities.

In the initial analyses, findings seemed to indicate that higher social vulnerability meant less emissions and a reduced likelihood that a facility would have hazardous emissions. However, once the context variables were controlled for, the relationship was clearly and significantly positive. Here is one instance in which the nested model, provided a stronger analysis. The facilities in the analysis were located across the United States. Earlier research has shown that social vulnerability shifts depending on where you live in the United States (Cutter, Boruff, and Shirley 2003; Mohai and Saha 2015). In other words, variance between regions or states is stronger than variance within regions or states. The original models assumed the same variance between all facilities and communities regardless of where they were located, while the nested models accounted for ways in which the data was clustered. This provided a more accurate view of how social vulnerability plays out in the analysis, and in this case had the effect of switching the direction (from negative to positive) of the relationship between social vulnerability and toxic emissions. While this was methodologically interestingly, more importantly, it was theoretically interesting in that it was a notable example of how variations in the political economy throughout the United States leads to variations in how socially vulnerable populations are affected by organizational behavior.

While the changes in the social vulnerability variable exposed differences across different parts of the country, the non-importance of the distance variable proved interesting in the very local context. These analyses utilized distances of 1, 2, and 3 miles based on previous research that found differences in these distances to be significant (Mohai and Saha 2007). The distances may have been too close to the facility so that the variations were minimal. Since health risks, not accounting for other factors such as wind direction, are reduced the farther away from the hazard a population is located, the use of comparing social vulnerability of populations closer and farther away from a facility may have increased the significance of this variable. Additionally, previous research did not look specifically at food manufacturing facilities. The kinds of air emissions from different manufacturing plants may travel more or less than one another. It may be that at these smaller distances the differences are less important for food manufacturing facilities.

An additional variable at the community level that turned out to be significant was the number of similar plants located in the area. Grant et al. (2010), found that the amount of manufacturing plants in area was correlated with higher emissions. This research, considering the kind of manufacturing facility (i.e., food manufacturing), as well as using a nested model, found the opposite. Plant density, or the number of food manufacturing facilities within the given county, mattered in several different ways. First, more facilities in the area meant less emissions from individual facilities. This is not surprising for several reasons. Increased facilities in the area means increased competition for workers as well as increased competition for local community support. On the one hand, incentives to site within a community may be oriented towards a certain industry. For example, in the rural parts of Minnesota, communities have actively engaged in economic development through increasing the presence of the food manufacturing industry (Fennelly and Leitner 2002).

However, population ecology scholars have argued that density (i.e. the number of organizations within the same area) is an important variable to understand organizational birth, death, and most importantly legitimation (Hannan et al. 1995). The closer in proximity to other organizations, the less dependence the local community has on any one of those plants. If one plant closes, there are others to take its place. Additionally, higher plant density may make plant emissions easier to monitor and so may reduce the propensity for plants to produce high amounts of toxic air emissions in the area.

In addition to its direct effect, the findings from the plant density variable also suggested that when there are more facilities in a given area, the relationship between social vulnerability and toxic emissions was stronger (i.e., facilities that were located in areas more densely populated with other facilities were more likely to have higher emissions if the population's social vulnerability score was higher). In other words, social vulnerability matters more in these areas. In his environmental justice framework, Pellow (2004), theorized that environmental inequality not only included the relationship between hazards and certain groups of people, but it was also a complex interplay of relationships within local communities that reinforce power dynamics. For the most part, by 2010, workers in food manufacturing facilities tended to be largely low- income and minority, primarily Hispanic, and immigrants (Lo and Jacobsen 2011). Additionally, we know that the food manufacturing industry has largely brought these workers in from different places to work in their plants (Fennelly and Leitner 2002). This would mean a higher population of vulnerable groups of people (specifically vulnerable populations that depend directly on these facilities) when more food manufacturing facilities are located in the same area.

Findings from these analyses show us that community level variables have an important effect on emissions. However, unlike other research on environmental justice, this dissertation takes this analysis a step further. Communities do not exist in vacuums and facilities do not operate outside of their larger organizational context. In the next section, I focus my discussion on how organizational characteristics impact the relationship between the social vulnerability of local communities and the toxic emissions from food manufacturing plants.

Organizational Discussions

Grant, Jones, and Trautner (2004), found that plants run by absentee parent companies were not any more likely than plants that were not, to have higher log emissions. As in the case of plant density, this project also produced a different finding. Independent facilities, or facilities that were not subsidiaries or branches of a larger parent company were more likely to have higher and hazardous emissions. This makes sense for two reasons. Facilities that are owned by parent companies have increased visibility, in fact, around 30% of the facilities in this dataset were owned by companies in the Forbes 500 in 2010. This increased visibility could increase the way organizations are accountable to the public around emissions (Prechel and Istvan 2016) and could lead to lower emissions by the organizations where they are located.

Additionally, we can also assume that independent facilities have less resources with which to develop pollution abatement strategies. Furthermore, in more highly vulnerable communities, there is no specific incentive to control air emissions. This is supported by the second finding around the facility structure, that the relationship between the social vulnerability of a local population and a facility's emissions is stronger when a facility is independent. The independent structure means localized decision-making would be more responsive to the social power of the local community. Moreover, in cases where these local communities provide incentive packages for organizations to locate their facilities in specific areas (Leistritz and Sell 2001; Broadway 2000; Fennelly and Leitner 2002), facilities would have less reason to clean up their emissions in areas where the residents have limited political power. This can be exacerbated in communities that are most dependent on a particular industry. One addition for future analysis could be the percentage of a community's population employed by the food industry.

For organizations that have a parent company, I explored further the role of parent company size. For the most part, research has found that parent company size is negatively correlated with emissions, namely that larger parent companies have lower emissions rates (Ambec and Lanoie 2008; Prechel and Zheng 2012; Prechel and Istvan 2016). This dissertation, confirms these findings from the perspective of the individual facility: the larger the parent company, the lower the likelihood of more and hazardous emissions. Additionally, larger parent companies have higher odds that a populations' social vulnerability will be positively correlated with the odds of more and hazardous emissions.

For decades, population ecology scholars argued that organizational size and age is strongly correlated to structural inertia (Hannan and Freeman 1977; 1984). In other words, larger organizations are less likely to make significant changes. Furthermore, this would mean, especially if a facility is older, larger organizations would be less likely to make updates and upgrades to decrease the level of emissions, even if newer organizations are more environmentally friendly. However, this argument does not hold up in the continued findings on parent company size. Prechel and Morris (2010) argued that organizations find opportunities to act in certain ways based on the context in which they operate. In this case, larger state and regional context matters to organizational decision making and specifically in this case, their proximity to socially vulnerable populations also make a difference. In the absence of external incentives or consequences for an organization to reduce emissions, Prechel and Istvan (2016) found that penalties are not large enough for organizations to change their behaviors to avoid them. In short, decision making is influenced by opportunities. To put this in a different way, if location provides opportunities to focus less on maintaining environmental controls, namely areas where socially vulnerable populations are located, then larger organizations, that have more resources to control their production practices, would be less likely to commit to maintaining those environmental controls. This would be the case even as overall larger parent companies are correlated with fewer emissions. Additionally, while larger parent companies tend to be more visible, larger companies tend to mean more complicated organizational structures that would be more difficult to manage (Prechel and Istvan 2016). We can assume then, that with larger companies, a local facility may have much more localized control and would make decisions based on the communities in which they are located.

Organizational characteristics of the parent company provides an internal context under which facilities operate. This section suggests that the relationship between a facility and its community is contingent on its organizational structure and its size. These components affect internal decision-making as well as its interaction with the outside world. The next section focuses specifically on the role of the larger social, political, and economic context in which facilities and communities operate.

State and Region-wide Discussions

In recent years, there has been some research on the role of civil society, specifically nongovernmental organizations in reducing emissions. Specifically, researchers have noted that the existence of churches and non-profits means lower emissions rates (Grant, Jones, and Trautner 2004; Touche 2012; Grant and Vasi 2016). Although state agencies provide monitoring and enforcement, non-profit organizations can serve to bring mainstream awareness to a particular issue or serve as “watch dogs” for bad behavior. This project, however, found that more non-profit organizations and specifically more environmental organizations, were not correlated with lower emissions. In fact, I found that the relationship was very small and insignificant. There are both methodological and theoretical reasons for why this may have been the case.

From a methodological perspective, while I was measuring relationships between local communities and the facilities in the area, I measured the number of organizations within the state, which may have simply been too far removed to affect this relationship.

I might have found a different effect if I had looked at organizations within close proximity to the facility. Additionally, a second methodological issue is that the number of environmental organizations statewide may be considered with the state's overall environmental score and the measure itself could be redundant.

There are also theoretical reasons for finding a lack of relationship between the number of non-profit organizations, a community's social vulnerability, and a facility's toxic emissions. First, non-profit organizations, specifically environmental organization have a long history of, at best, not prioritizing and, at worst, ignoring issues of environmental justice[62] (Bullard 2008). This would mean that the mere existence of environmental organizations would not necessarily be correlated with any change in localized emissions of a facility or their relationship with their local vulnerable communities. Additionally, even if non-profit organizations are local, their goals may be directed at protection of open spaces or selected neighborhoods (Freudenberg and Steinsapir 1991; Dunlap and Mertig 2014). To illustrate in the city of Austin, a self-proclaimed green city, environmental organizations, such as Save Our Springs Alliance and others, have been instrumental in passing environmental protections, many of which apply only to the historically white, West Side of Austin. Meanwhile, zoning on the East Side, populated primarily by people of color and low-income residents, allowed for heavy polluting industries to be sited in residential neighborhoods. While grassroots

[62] See historical chapter of this dissertation.

environmental activists advocated for these vulnerable areas of Austin, they were less likely to have non-profit status or to be well resourced.

A second reason for the lack of relationship between non-profit organizations and toxic emissions can be found in the literature on the resource dependence of non-profits. Research from several disciplines suggest that the more organizations are dependent on corporations for funding support, the less likely they would be to actively and publicly go against them (Froelich 1999; Austin 2000; Lichtenstein, Drumwright, and Braig 2004). This dependence is additionally why communities would be more likely to support corporations regardless of their behavior (Lichtenstein, Drumwright, and Braig 2004). This situation is further exacerbated if the non-profit board is composed of business executives (Guo and Acar 2005). Further research is needed to examine how this relationship changes as non-profits diversify their funding and reduces their dependency on specific corporations would further this analysis.

While environmental organizations do not predict levels of emissions, a state's environmental record does. The findings from this dissertation is in line with earlier research (Prechel and Touche 2014; Prechel and Istvan 2016) and suggests that a state's commitment to environmental policies and actions has a direct impact on a facility's emissions. Furthermore, there is a weaker relationship between the social vulnerability of a local population and the emissions of a facility in states with stronger environmental records. This is a particularly important finding because it shows that a state's commitment to the environment, not only has a positive impact on environmental changes such as parks and open spaces, but also has a positive impact on protecting the most vulnerable from environmental ills such as toxic emissions. Furthermore, it illustrates that if a state has blanket environmental protections for the population, controlling for enforcement, organizations will have fewer opportunities to behave less environmentally friendly (Soule 2009; King and Pearce 2010). Although, there is less risk for an organization located in a vulnerable community to be penalized for poor environmental behavior (Zimmerman 1993), I would assert that in more environmentally friendly states this risk is still higher than in states that do not prioritize environmental issues when attempting to attract business investment.

The relationship between the emissions and the business climate is exactly as expected, namely that a stronger business tax climate increases the odds of a facility's higher and hazardous emissions. Although, this relationship was not significant, it does tell an important story. First, as one would expect, a state's business tax climate is negatively correlated with a state's environmental record. This would mean that those states that have tax systems which specifically benefit business would be less environmentally friendly and facilities would have less reason to pay attention to their environmental behavior. Additionally, as mentioned earlier in this chapter, to attract industry into certain areas, communities are more likely to limit environmental and tax regulations ((Leistritz and Sell 2001; Broadway 2000; Fennelly and Leitner 2002). These local communities would only be able to do this, if there is room within their state regulations to do so.

This section focused the discussion on how toxic emissions are affected by different levels of society. The organizational political economy of the environment framework (Prechel and Zheng 2012; Prechel and Istvan 2016) allows us to look at how these different levels have a direct impact on organizational behavior. But more importantly, it allows us to look at how they interact, and how variations in political-legal arrangements changes those outcomes. In the case of this dissertation, variations in community level, organizational level, and state/regional level characteristics impact how facilities relate to the socially vulnerable populations that are in proximity to them. The last section of this chapter serves to tie the dissertation together and discuss implications of this research.

Conclusions

This dissertation explored the relationship between social vulnerability and 2010 emissions from food manufacturing facilities and focused on political-economic factors that could have had an impact on that relationship. Considering the findings in the previous chapter and the discussion above, there are two significant takeaways from this study.

In response to the first research question, "*Are socially vulnerable populations at a disproportionate risk for being affected by emissions from food manufacturing industries?"*

- Social Vulnerability is one way of analyzing how population characteristics are related to toxic emissions. Overall, this research suggests that populations with higher levels of social vulnerability are more at risk for being affected by emissions from food manufacturing facilities.

In response to the second research question, *How do organizational and political-economic factors affect the relationship between a community's social vulnerability and the toxic emissions of local plants?"*

- Context matters. The organizational political economy of the environment has a direct impact not only on organizational behavior (i.e., amounts of emissions), but how organizational behavior relates to additional factors (e.g., social vulnerability, facility density, and environmental regulatory climate).

Social Vulnerability

In the environmental justice literature, there have been years of debates surrounding what matters more, race or class. Dozens of studies over several decades have engaged in this debate (Bullard 1983; Gould 1986; Gelobter 1992; Mohai and Bryant 1992; Anderton, Anderson, Oakes, and Fraser 1994; Brown 1995; Hamilton 1995; Ringquist 1997; Tiefenbacher 1998; Hird and Reese 1998; Downey 1998; Stretesky and Lynch 2002; Smith 2007; Mohai, Pellow, and Roberts 2009). This dissertation sought to step outside of that ongoing debate to recognize that not only are race and class intricately connected, but they are also connected to several other factors that make some individuals and communities more vulnerable than others. The ongoing *oppression olympics* of who has it worse than whom is an unproductive argument. Historical analyses note that paying close attention to who is the most vulnerable, shifts attention away from the *oppressor*, who is doing the harm and what structures and systems allow them to keep doing so and ignores the fact that large segments of whites, Native Americans and other populations are exposed to industrial toxic emissions (i.e, toxic pollution has become a social justice issue). As Perrow (1997: 66) argued, we need to shift the focus to “the most intensive and effective environmental destroyers…that externalize their pollution costs to society.”

To this end, I focused on addressing the vulnerability debate through finding interconnections. A social vulnerability score is not just a mathematical approach for putting similar components together, it is a political overture for saying that toxic industrial waste is a threat to everyone. From an economic perspective, there are significant data to support that racial minorities, the poor, and working class are the most vulnerable to environmental ills. Moreover, their communities are seen as strategic opportunities for bad organizational behavior and toxic emissions that impact everyone (e.g., adverse health outcomes that affect some parts of the population may have the potential to increase the overall health care costs for society as a whole). Findings from this dissertation illustrate the ways in which this plays out, in this case with higher and more hazardous emissions.

While the use of social vulnerability scores proved to be a helpful way of performing an environmental justice analysis, it was not without its limitations. First, while the components chosen to be a part of the score were theoretically driven additional components that would have also been supported by theory were not included because of data unavailability. This means that the social vulnerability score is not an all-inclusive score that covers all possible vulnerabilities of a population. Secondly, theory and past research findings are not always consistent regarding which direction vulnerability is related to other factors. For example, whether housing properties are owner occupied or renter occupied, could be positively or negatively related to social vulnerability. Homeowners can be more vulnerable to toxic emissions because they find moving more difficult than renters would. Conversely, renters may reside close to polluting facilities because leases are cheaper and commutes to work are shorter. Third, a social vulnerability score may obscure the weighted influences of each of its component variables. Some variables are more important than others as indicated by a comparison of their factor loadings.

Nevertheless, the social vulnerability construct/scale is an effective strategy. This dissertation focused on a broader context under which social vulnerability occurs. It simplified the analysis and provided a clear picture of how multiple political economic levels of society affect the relationship between toxic emissions and social vulnerability of particular populations. In the next section, I focus specifically on context.

Context Matters: Organizational Political Economy of the Environment

This dissertation, situated within the Organizational Political Economy of the environment framework (Prechel and Zheng 2012; Prechel and Istvan 2016), considers how organizations are embedded within political-legal arrangements and how their actions are in direct relation to the "dependencies, incentives, and opportunities" that they have to act in certain ways. I examined how organizational structure and the state and regional characteristics in which an organization is embedded not only directly impacted companies' emissions but impacted the relationship that companies had with their local community. Overall, the fewer opportunities organizations had to exploit their local populations, the less likely the emissions were to be higher or hazardous. This is illustrated by the fact that states with stronger environmental records were more likely than other states to have facilities that had less toxic emissions. Additionally, companies/plants that clustered in the same area also had fewer opportunities to emit higher toxic emissions, partly due to their increased dependencies on the location.

The method of multilevel modeling used in this dissertation served to focus the analysis on how certain variables were embedded or clustered in larger context. The use of the state and regional clusters, recognized that organizational behavior is not independent from the social structure, but is a direct result of the social structure.

Concluding Thoughts

In Jonathan Lear's *Radical Hope* (2008), he writes of the loss of the Crow (a Native American tribe) identity and life as they moved from a nomadic life to a life on a reservation. He says "no one dances the sun dance anymore because it is no longer possible to do so. Once planting a coup-stick loses meaning, so, too, does the Sun Dance. One might still teach people the relevant steps; people might learn how to go through the motions; and they can even call it the "Sun Dance" but the Sun Dance itself has gone out of existence."

Although risk analysis and risk assessments have been used to develop public policy, the concept remains tricky and sociological research has struggled with its ambiguity. In his 1984 presidential address for the American Sociological Association Annual Meeting, James Short called for sociologists to take seriously the social implications of risk analysis. Risk is defined as the likelihood or probability of some adverse effects of a hazard. Hazards are "historical and spatial processes of urban ecological change that have become increasingly unbounded in time and space" (Elliot and Frickel 2013; 525). They incorporate threats and collateral damage to people and what they value. Contemporary environmental hazards are increasingly connected to industrialization and the human pursuit of economic development. The risks associated with development have been consistently downplayed (Elliot and Frickel 2013). However, as industrial societies become more complex they become more concerned with these human created risks (Beck 2009) and how they should be assessed.

Additionally, Freudenburg (1993) argued that we must rethink the debates surrounding risk perceptions, paying closer attention to the institutions responsible for risk management. His recreancy perspective focused on the people, organizations, and institutions responsible for protecting the community and do not fulfill their responsibilities. He argued that the community's risk has less to do with the actual hazard, and more to do with the inability of those responsible to enforce regulations and mitigate potential hazards effectively.[63] Freudenberg called here for new research on:

"the kinds of institutional arrangements that are most and less likely to foster recreant behavior, and about the factors that can foster or frustrate the efforts of recreant officials and organizations to evade responsibility for their failings (927)."

The use of the food manufacturing industry in this analysis was particularly important. As one of the highest emitters of toxic pollution according to the Toxic

[63] Bullard et al. (2007) also discusses further steps that need to be taken to reduce the risk of toxic emissions on socially vulnerable communities. These include but are not limited to a full implementation of the original executive order signed by president Clinton (Executive Order 12898), increasing the EPA"s environmental justice initiatives, requiring safety buffers around polluting facilities, requiring risk assessments before providing a permit for a facility to operate.

Release Inventory, and one of the largest employers of low income and minority populations, it has a strong relationship to the social vulnerability of communities across the United States. In contemporary society we have become accustomed to all of the benefits that this industry provides including things like microwaveable foods and cleaned and packaged meat products. However, the increased environmental risk that comes with the continued development of this industry continues to be understudied.

For this dissertation, I conducted quantitative analyses that add to the scientific enterprise by calculating the risk of exposure to toxic emissions for socially vulnerable populations. This project began during a time of relative advances in environmental laws, particularly as they related to environmental justice in the United States. By the time I am concluding this process, the tide has shifted. The presidency of Donald Trump has ushered in a new era of environmental deregulation and we are yet to see the outcomes of his problematic and potentially disastrous environmental policies.

We can talk about environmental justice and the role of corporations in doing environmental harm, but what does it all mean? As we consider the consequences of even less government funding for enforcing environmental laws and collecting the important data needed for enforcing those laws, this dissertation is one tool to help think about how a population's vulnerability is impacted by political-legal arrangements. It is situated in a historical lineage of activism and resistance to environmental harm of people and places associated with continued capitalist production, and I hope that the research that comes after refines and continues the process.

"After this, Nothing Happened"

WORKS CITED

Acock, A. 2010. *A Gentle Introduction to Stata, Third Edition*. College Station, TX: Stata Press.

Albrecht, D.E. 1998. "The industrial transformation of farm communities: Implications for family structure and socioeconomic conditions." *Rural Sociology 63*(1): 51-64.

Albrecht, D.E. 1997. "The changing structure of US agriculture: Dualism out, industrialism in." *Rural Sociology 62*(4): 474-490.

Alexander, D.E. 1993. *Natural Disasters*. New York, NY: Springer Science & Business Media.

Ambec, S. and P. Lanoie. 2008. "Does it pay to be green? A systematic overview." *Academy of Management Perspectives* 22: 45-62.

Anderton, D. 1996. "Methodological issues in the spatiotemporal analysis of environmental equity." *Social Science Quarterly* 77(3): 508-515.

Anderton, D., A. Anderson, J. Oakes, and M. Fraser. 1994. "Environmental equity: The demographics of dumping." *Demography* 31(2): 229-248.

Antle, J. M. 1996. "Efficient food safety regulation in the food manufacturing sector." *American Journal of Agricultural Economics* 78(5): 1242-1247.

Antonio, R.J. 2009. "Climate change, the resource crunch, and the global growth imperative." Pp. 3-73 in *Nature, Knowledge and Negation*. Bingley, UK: Emerald Group Publishing Limited.

Austin, J.E., 2000. "Strategic collaboration between nonprofits and business." *Nonprofit and Voluntary Sector Quarterly* 29(suppl 1): 69-97.

Beck, E. 1979. The Love Canal Tragedy. *EPA Journal* https://archive.epa.gov /epa/aboutepa /love-canal-tragedy.html.

Beck, U. 2009. *World at Risk*. Malden, MA: Polity.

Been, V. 1994a. "Unpopular neighbors: are dumps and landfills sited equitably?" *Resources* 115: 16-19.

Been, V. 1994b. "Locally undesirable land uses in minority neighborhoods: Disproportionate siting or market dynamics." *The Yale Law Review* 103(6): 1383-1422.

Bell, M. 2004. *An Invitation to Environmental Sociology*. Thousand Oaks, CA: Pine Forge Press.

Berle, A. and G. Means. 1932. *The Modern Corporation and Private Property*. New York: Macmillan.

Bezdek, R. 1995. *Environmental Justice: Issues, Policies, and Solutions*. Washington D.C.: Island Press.

Blaikie, P., T. Cannon, I. Davis, and B. Wisner. 1994. *At Risk: Natural Hazards, People's Vulnerability and Disasters.* New York: Routledge.

Bluestone, B. and B. Harrison. 1988. "The growth of low-wage employment: 1963-86." *The American Economic Review 78*(2): 124-128.

Bonilla-Silva, E. 1997. "Rethinking racism: Toward a structural interpretation." *American Sociological Review* 62(3): 465-480.

Bookchin, M. 1962. *Our Synthetic Environment.* New York: Harper & Row.

Bouwes, N.W. and S.M. Hassur. 1997. *Toxics release inventory relative risk-based environmental indicators methodology.* Washington DC: Office of Pollution Prevention and Toxics, U.S. Environmental Protection Agency.

Boyer, P., C. Clarke Jr., J. Kett, N. Salisbury, H. Sitkoff, and N. Woloch. 2005. *The Enduring Vision: A history of the American People, Volume 2: From 1865*. Boston: Houghton Mifflin.

Brinkley, D. 2009. *The Wilderness Warrior: Theodore Roosevelt and the Crusade for America.* New York: Harper Collins Publishers.

Broadway, M. J. 2000. "Planning for change in small towns or trying to avoid the slaughterhouse blues." *Journal of Rural Studies* 16(1): 37-46.

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

Bryant, B. and P. Mohai, eds. 1992. *Race and the Incidence of Environmental Hazards: A Time for Discourse*. Boulder: Westview Press.

Bryk, A. and S. Raudenbush. 1992. *Hierarchical Linear Models*. Newbury Park, CA: Sage Publications.

Bullard, R. 1983. "Solid waste sites and the Black Houston community." *Sociological Inquiry* 53: 273–228.

Bullard, R. 1990. *Dumping in Dixie: Race, Class, and Environmental Quality*. Boulder, CO: Westview Press.

Bullard, R. 2005. *The Quest for Environmental Justice: Human Rights and the Politics of Pollution*. San Francisco, CA: Sierra Club Books.

Bullard, R. 2008. *Dumping in Dixie: Race, Class, and Environmental Quality, (2nd edition).* Boulder, CO: Westview Press.

Bullard, R., P. Mohai, R Saha, and B. Wright. 2007. *Toxic Wastes and Race at Twenty 1987 2007: A Report Prepared for the United Church of Christ Justice and Witness Ministries*. Cleveland, OH: United Church of Christ.

Buttel, F.H. 2000. "Ecological modernization as social theory." *Geoforum* 31(1): 57-65.

Buttel, F. H. 2004. "The treadmill of production: An appreciation, assessment, and agenda for research." *Organization & Environment* 17: 323-336.

Catton, W. and R. Dunlap. 1978. "Environmental sociology: A new paradigm?" *The American Sociologist* 13(1): 41-49.

Chandler, A.D. 1962. *Strategy and Structure: Chapters in the History of the American Enterprise*. Cambridge, MA: Massachusetts Institute of Technology.

Christoff, P. 1996. "Ecological modernisation, ecological modernities." *Environmental Politics* 5(3): 476-500.

Christy, W. 1960. "History of the Air Pollution Control Association." *Journal of the Air Pollution Control Association* 10(2): 126-174.

Cohen, G. 1991. "It's Too Easy Being Green: The Gains and Losses of Earth Day." *New Solutions: A Journal of Environmental and Occupational Health Policy* 1(2): 9-12.

Cole, L. and S. Foster. 2001. *From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement.* New York: New York University Press.

Collins, P.H. 2010. "The new politics of community." *American Sociological Review* 75(1): 7-30.

Collins, P.H. 2000. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment 2nd edition*. New York: Routledge.

Colten, C.E. 1988. “Historical questions in hazardous waste management.” *The Public Historian* 10(1): 7-20.

Connor, J.M. 1982. “Estimates of Manufacturers' Food and Beverage Shipments Among Major Marketing Channels, 1977.” Washington DC: ERS staff report-United States Dept. of Agriculture, Economic Research Service (USA).

Connor, J.M., R.T. Rogers, V. and Bhagavan. 1996. “Concentration change and countervailing power in the US food manufacturing industries.” *Review of Industrial Organization* 11(4): 473-492.

CQ Almanac. 1963. "Congress Enacts New Air Pollution Law.” *Congressional Quarterly* 19: 236-239. http://library.cqpress.com.lib-ezproxy.tamu.edu:2048/cqalmanac/cqal63-1316972.

CQ Almanac. 1964. "Food Marketing Study." *Congressional Quarterly* 20: 142-44. http://library.cqpress.com/cqalmanac/cqal64-1304007.

Cronon, W. 1992. *Natures Metropolis: Chicago and the Great West*. New York: W.W. Norton.

Cunningham, S.A., T. Kanzow, D. Rayner, M.O. Baringer, W.E. Johns, J. Marotzke, H.R. Longworth, E.M. Grant, J.J.M. Hirschi, L.M. Beal, and C.S. Meinen. 2007. “Temporal variability of the Atlantic meridional overturning circulation at 26.5 N.” *Science* 317(5840): 935-938.

Currie, J., L. Davis, M. Greenstone, and R. Walker. 2013. “Do Housing Prices Reflect Environmental Health Risk? Evidence From More Than 1600 Toxic Plant Openings and Closings.” *NBER Working Paper Series.*

Cutter, S., B. Boruff, and W. Shirley. 2003. “Social Vulnerability to Environmental Hazards.” *Social Science Quarterly* 84(2): 242-261.

Cutter, S.L., J.T. Mitchell, and M.S. Scott. 2000. “Revealing the vulnerability of people and places: a case study of Georgetown County, South Carolina.” *Annals of the Association of American Geographers 90*(4): 713-737.

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

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

Cutter, S. 2017. “The forgotten casualties redux: Women, children, and disaster risk.” *Global Environmental Change* 42: 117-121.

Cutter, S. 2016. “Resilience to what? Resilience for whom?” *The Geographical Journal* 182 (2): 110-113.

Danbom, D.B. 1979. *The Resisted Revolution: Urban America and the Industrialization of Agriculture, 1900-1930*. Iowa City, IA: Iowa University Press.

Diprete, T. and J. Forristal. 1994. “Multilevel Models: Methods and Substance.” *Annual Review of Sociology* 20: 331-357.

Downey, L. 2005. “The unintended significance of race: Environmental racial inequality in Detroit.” *Social Forces* 83(3): 971-1007.

Downey, L. 2007. “US metropolitan-area variation in environmental inequality outcomes. *Urban Studies* 44(5-6): 953-977.

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

Dunlap, R.E. and A.G. Mertig. 2014. *American environmentalism: The US environmental movement, 1970-1990.* New York: Taylor & Francis.

Egan, M. 2010. “What did environmental justice look like in 1970?” *Environmental Justice* 3(2): 41.

Ehrlich, P. and A. Ehrlich. 1996. *Betrayal of Science and Reason: How Anti-Environmental Rhetoric Threatens our Future.* Washington D.C.: Island Press.

Elliott, J.R. and S. Frickel. 2013. “The historical nature of cities: A study of urbanization and hazardous waste accumulation.” *American Sociological Review 78*(4): 521-543.

Ember, Lois. 1995. “EPA Administrators Deem Agency’s First 25 Years Bumpy but Succesful.” *Chemical & Engineering News Archive 73*(44): 18-23.

Environmental Protection Agency. 1992. *Environmental Equity: Reducing Risks to All Communities.* Washington D.C.

Faber, D.J. ed. 1998. *The Struggle for Ecological Democracy: Environmental Justice Movements in the United States*. New York: Guilford Press.

Fennelly, K., and H. Leitner. 2002. *How the food processing industry is diversifying rural Minnesota* (No. 59). East Lansing, MI: Julian Samora Research Institute, Michigan State University.

Fernandez, R. M. 2008. “Race, spatial mismatch, and job accessibility: Evidence from a plant relocation.” *Social Science Research 37*(3): 953-975.

Fligstein, N. 2000. “The spread of the multidivisional form among large firms, 1919–1979.” Pp. 55-78 in *Economics Meets Sociology in Strategic Management.* Bingley, UK: Emerald Group Publishing Limited.

Freudenburg, W. 2005. “Privileged access, privileged accounts: toward a socially structured theory of resources and discourses.” *Social Forces* 84(1): 89-114.

Freudenburg, W. 1993. “Risk and recreancy: weber, the division of labor, and the rationality of risk perceptions.” *Social Forces* 71(4): 909-932.

Freudenberg, N. and C. Steinsapir. 1991. “Not in our backyards: The grassroots environmental movement.” *Society & Natural Resources* 4(3): 235-245.

Friedman, M. 1993.“The ‘plucking model’ of business fluctuations revisited.” *Economic Inquiry* 31(2): 171-177.

Froelich, K.A. 1999. “Diversification of revenue strategies: Evolving resource dependence in nonprofit organizations.” *Nonprofit and voluntary sector quarterly* 28(3): 246-268.

Fryer, P. J. and C. Versteeg. 2008. “Processing technology innovation in the food industry.” *Innovation: Management, Policy & Practice* 10(1): 74-90.

Gasser, J. and E. Snitofsky. 1990. *Vulnerability Analyses Plan for Wastewater Emergencies*. Emmitsburg, MD: National Emergency Training Center.

Gelobter, M. 1992. “Toward a model of “environmental discrimination.” Pp. 64-79 in *Race and the Incidence of Environmental Hazards.* Boulder, CO: Westview Press.

Giddens, A. 2009. *The Politics of Climate Change*. Cambridge, UK: Polity Press.

Gitlin, T. 1980. *The Whole World is Watching*. Berkeley: University of California Press.

Givens, J.E. and A.K. Jorgenson. 2011. “The Effects of Affluence, Economic Development, and Environmental Degradation on Environmental Concern: A Multilevel Analysis.” *Organization and Environment* 24(1): 74-91.

Gonzalez, G.A. 2001. *Corporate Power and the Environment: The Political Economy of US Environmental Policy*. Lanham, MD: Rowman & Littlefield Publishers.

Gore, A. 1997. Environmental Diplomacy: The Environment and U.S. Foreign Policy. Letter to the U.S. State Department. https://www.wilsoncenter.org/sites/default/files/report3c.pdf.

Gottlieb, R. 2005. *Forcing the Spring: The Transformation of the American Environmental Movement. Revised and Updated Edition.* Washington D.C.: Island Press.

Gottlieb, R. 2002. *Environmental Technology Resources Handbook*. Boca Raton, Florida: CRC Press.

Gottlieb, R. 1993. "Reconstructing environmentalism: Complex movements, diverse roots." *Environmental History Review* 17(4): 1-19.

Gould, J. 1986. *Quality of Life in American Neighborhoods: Levels of Affluence, Toxic Waste, and Cancer Mortality in Residential Zip Code Areas*. Boulder, CO: Westview Press.

Gould, K. A., D. N. Pellow, and A. Schnaiberg. 2004. "Interrogating the treadmill of production: everything you wanted to know about the treadmill but were afraid to ask." *Organization and Environment* 17(3): 296-316.

Gould, K., A. Schnaiberg, and A.S. Weinberg. 1996. *Local Environmental Struggles: Citizen Activism in the Treadmill of Production*. Cambridge, UK: Cambridge University Press.

Grant, D., A. Bergesen, and A. Jones. 2002. "Organizational size and pollution: the case of the U.S. chemical industry." *American Sociological Review* 67(3): 389-407.

Grant, D. and A. Jones. 2003. "Are subsidiaries more prone to pollute? New evidence from the EPA's Toxics Release Inventory." *Social Science Quarterly* 84(1): 162-173.

Grant, D., M. Trautner, L. Downey, and L. Thiebaud. 2010. "Bringing the polluters back in: environmental inequality and the organization of chemical production." *American Sociological Review* 75: 479-504.

Grant, D., M. Trautner, A. Jones. 2004. "Do facilities with distant headquarters pollute more? How civic engagement conditions the environmental performance of absentee managed plants." *Social Forces* 83(1): 189-214.

Grant, D. and I. Vasi. 2016. "Civil society in an age of environmental accountability: how local environmental nongovernmental organizations reduce US power plants' carbon dioxide emissions." *Sociological Forum* 32(1): 94-115.

Gruen, F.H. 1968. "Trends in food manufacturing in the united states." *Australian Journal of Agricultural Economics* 12(1): 24-31.

Guo, C. and M. Acar. 2005. "Understanding collaboration among nonprofit organizations: Combining resource dependency, institutional, and network perspectives." *Nonprofit and Voluntary Sector Quarterly* 34(3): 340-361.

Hamilton, J.T. 1995. "Testing for environmental racism: prejudice, profits, political power?" *Journal Policy Analysis and Management* 14: 107-132.

Hannan, M.T., G.R. Carroll, E.A. Dundon, and J.C. Torres. 1995. "Organizational evolution in a multinational context: Entries of automobile manufacturers in Belgium, Britain, France, Germany, and Italy." *American Sociological Review* 60(4): 509-528.

Hannan, M. and J. Freeman. 1984. "Structural inertia and organizational change." *American Sociological Review* 49(2): 149-164.

Hannan, M. and J. Freeman. 1977. "The population ecology of organizations." *American Journal of Sociology* 82(5): 929-964.

Harper, J.A. 2008. "The Marcellus Shale–An Old 'New' Gas Reservoir in Pennsylvania." *Pennsylvania Geology* 38(1): 2-13.

Haydu, J. 1998. "Making use of the past: Time periods as cases to compare and as sequences of problem solving." *American Journal of Sociology* 104 (2): 339-371.

Highfield, W.E., W.G. Peacock, and S. Van Zandt. 2014. "Mitigation planning why hazard exposure, structural vulnerability, and social vulnerability matter." *Journal of Planning Education and Research* 34(3): 287-300.

Hird, J.A. and M. Reese. 1998. "The distribution of environmental quality: An empirical analysis." *Social Science Quarterly* 79(4): 693-716.

Hodgson, M. and S. Cutter. 2001. "Mapping and the Spatial Analysis of Hazardscapes." Pp. 37-45 in *American Hazardscapes: The Regionalization of Hazards and Disasters,* edited by S. Cutter. Washington DC: Joseph Henry Press.

Hooks, G. and C. Smith. 2004. "The treadmill of destruction: national sacrifices areas and Native Americans." *American Sociological Review* 69(4): 558-575.

Huber, J. 2000. "Towards industrial ecology: sustainable development as a concept of ecological modernization." *Journal of Environmental Policy and Planning* 2: 269-286.

Jewell, J. 2007. *Race, Social Reform, and the Making of a Middle Class. The American Missionary Association and Black Atlanta, 1870-1900.* Lanham, MD*:* Rowman and Littlefield.

Jones, C.O. 1978. *Clean Air: The Policies and Politics of Pollution Control*. Pittsburgh, PA: University of Pittsburgh Press.

Johnson, L.B. 1965. "Statement by the President in Response to Science Advisory Committee Report on Pollution of Air, Soil, and Waters.," November 6, 1965. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. http://www.presidency. ucsb.edu/ws/?pid=
27355

Jorgenson, A. K., & B. Clark. 2012. "Are the economy and the environment decoupling? A comparative international study, 1960–2005." *American Journal of Sociology* 118(1): 1-44.

Kadushin, C., M. Lindholm, D. Ryan, A. Brodsky, and L. Saxe. 2005. "Why it is so difficult to form effective community coalitions." *City & Community* 4(3): 255-275.

Kaufman, H. F.1959. "Toward an interactional conception of community." *Social Forces* 38(1): 8-17.

King, B. G. and N. A. Pearce. 2010. "The contentiousness of markets: politics, social movements, and institutional change in markets." *Annual Review of Sociology* 36: 249-267.

Kline, B. 2011. *A Brief History of the U.S. Environmental Movement, Fourth Edition.* Plymouth, UK*:* Rowman and Littlefield Publishers.

Komaki, J., K.D. Barwick, and L.R. Scott. 1978. "A behavioral approach to occupational safety: pinpointing and reinforcing safe performance in a food manufacturing plant." *Journal of applied Psychology 63*(4): 434.

Krause, F., J. Koomey, and W. Bach. 1992. *Energy Policy in the Greenhouse*. New York: Wiley and Sons.

Krieg, E. J. 1995. "A socio-historical interpretation of toxic waste sites." *American Journal of Economics and Sociology* 54(1): 1-14.

Landy, M.K., M.J. Roberts, and S.R. Thomas. 1994. *The Environmental Protection Agency: From Nixon to Clinton.* New York: Oxford University Press.

Lavelle, M. and M. Coyle. 1992. "Unequal protection: The racial divide in environmental law." *National Law Journal* 15(3): S1-S12.

Lear, J. 2008. *Radical Hope: Ethics in the Face of Cultural Devastation.* Cambridge, MA.: Harvard University Press.

Leonard, C., 2014. *The Meat Racket: The Secret Takeover of America's Food Business*. New York: Simon and Schuster.

Lichtenstein, D.R., M.E. Drumwright, and B.M. Braig. 2004. "The effect of corporate social responsibility on customer donations to corporate-supported nonprofits." *Journal of marketing* 68(4): 16-32.

Leistritz, F. L and R. Sell. 2001. "Socioeconomic impacts of agricultural processing plants." *Community Development Society* 32: 130-159.

Lo, J. and A. Jacobson. 2011. "Human rights from field to fork: improving labor conditions for food-sector workers by organizing across boundaries." *Race/Ethnicity: Multidisciplinary Global Contexts* 5(1): 61-82.

Mahoney, J. 2000. "Path dependence in historical sociology." *Theory and Society* 29: 507-548.

Marx, K. and Engels, F., 2009. *The Economic and Philosophic Manuscripts of 1844 and the Communist Manifesto*. New York: Prometheus Books.

Melosi, M.V. 1980. *Pollution and Reform in American Cities: 1870-1930*. Austin, TX.: University of Texas Press.

Milanez, B., and T. Buhrs. 2007. "Marrying strands of ecological modernisation: A proposed framework." *Environmental Politics* 16(4): 565-583.

Mohai, P., P. Lantz, J. Morenoff, J.S. House, and R.P. Mero. 2009. "Racial and socioeconomic disparities in residential proximity to polluting industrial facilities: evidence from the Americans' Changing Lives Study." *American Journal of Public Health* 99(S3): S649-S656.

Mohai, P. and R. Saha. 2015. "Which came first, people or pollution? A review of theory and evidence from longitudinal environmental justice studies." *Environmental Research Letters* 10(12).

Mohai, P. and R. Saha. 2007. "Racial inequality in the distribution of hazardous waste: A national level reassessment." *Social Problems* 54(3): 343-370.

Mohai, P., D. Pellow, and J.T. Roberts. 2009. "Environmental justice." *Annual Review of Environment and Resources* 34: 405-430.

Mol, A. P. J. 1995. *The Refinement of Production: Ecological Modernization Theory and the Chemical Industry*. Utrecht: Van Arkel.

Mol, A. P. J., and D. A. Sonnenfeld. 2000. *Ecological Modernisation Around the World: Perspectives and Critical Debates.* London: Frank Cass.

Morello-Frosch, R., M. Pastor, and J. Sadd, 2001. "Environmental justice and Southern California's "riskscape" the distribution of air toxics exposures and health risks among diverse communities." *Urban Affairs Review 36*(4): 551-578.

Mumford, L., 1968. *The Urban Prospect: Essays*. New York: Harcourt, Brace & World.

Mumford, L., 1956. "The Natural History of Urbanization." Pp. 382-398 In *Man's Role in Changing the Face of the Earth*. Chicago, IL: University of Chicago Press.

Murray, R. and T. Blessing. 1994. *Greatness in the White House: Rating the Presidents from George Washington through Ronald Reagan*. University Park, PA: Pennsylvania State University Press.

Omi, M. and H. Winant. 1993. "On the theoretical status of the concept of race." Pp. 3-10 in *Race, Identity and Representation in Education.* UK: Routledge.

Palmer, D., B.M. Barber, X. Zhou, and Y Soysal. 1995. "The friendly and predatory acquisition of large US corporations in the 1960s: The other contested terrain." *American Sociological Review* 60(4): 469-499.

Papageorgiou, T., P.G. Michaelides, and J.G. Milios. 2011. "Technology and economic fluctuations in the U.S. food sector (1958-2006): An empirical approach from a political economy perspective." *International Journal of Social Economics* 38(2): 140-164.

Papers of John F. Kennedy. Presidential Papers. President's Office Files. Departments and Agencies. President's Science Advisory Committee (PSAC): Pesticides report, 15 May 1963.

Parenteau, P. 2004. "Anything industry wants: environmental policy under Bush" *Vermont Journal of Environmental Law* 6: 363- 405.

Park, L. S. H., and D. Pellow. 2011. *Slums of Aspen: Immigrants Versus the Environment in America's Eden.* New York: NYU Press.

Pastor, M., J. Sadd, J. and J. Hipp. 2001. "Which came first? Toxic facilities, minority move-in, and environmental justice." *Journal of Urban Affairs* 23(1): 1-21.

Pastor, M., J. Sadd, and R. Morello-Frosch. 2004. "Waiting to Inhale: The Demographics of Toxic Air Release Establishments in 21st Century California." *Social Science Quarterly* 85(2): 420-440.

Payne, D.G. and R.S. Newman. 2005. "United Church of Christ Commission for Racial Justice." Pp. 259-264 in *The Palgrave Environmental Reader*. New York: Palgrave Macmillan US.

Peacock, W. G., N. Dash, and Y. Zhang. 2007. "Sheltering and housing recovery following disaster." Pp. 258-274 in *Handbook of Disaster Research.* New York, NY: Springer.

Peacock, W. G. and C. Girard.1997. "Ethnic and racial inequalities in hurricane damage and insurance settlements." Pp. 171-190 in *Hurricane Andrew: Ethnicity, Gender and the Sociology of Disasters.* New York, NY: Routledge.

Peacock, W. G. and A.K. Ragsdale. 1997. "Social systems, ecological networks and disasters: Toward a socio-political ecology of disasters." Pp. 20-35 in *Hurricane Andrew: Ethnicity, Gender, and the Sociology of Disasters*. New York: Routledge

Pellow, D. N. 1998. "Bodies on the line: Environmental inequalities. Hazardous work in the U.S. recycling industry." *Race, Gender & Class* 6(1): 124-151.

Pellow, D.N. 2001. "Environmental Justice and the Political Process: Movements, Corporations, and the State." *Sociological Quarterly* 42: 47-67.

Pellow, D.N. 2004. "The politics of illegal dumping: An environmental justice framework." *Qualitative Sociology* 27(4): 511-525.

Perrow, C. 1986. *Complex Organizations.* New York: McGrawHill.

Perrow, C.1984. *Normal Accidents: Living with High Risk Systems*. New York: Basic Press.

Pfeffer, J., 1972. "Size and composition of corporate boards of directors: The organization and its environment." *Administrative Science Quarterly* 17(2): 218-228.

Pierson, P. 2000. "Increasing returns, path dependence, and the study of politics." *American Political Science Review* 94(2): 251-267.

Pierson, P. 2005. "Big, Slow-Moving, and… Invisible; Macrosocial Processes in the Study of Comparative Politics." Pp. 177-207 in *Comparative Historical Analysis in the Social Sciences.* J. Mahoney and D. Rueschemeyer. New York: Cambridge University Press.

Platt, R. 1991. "Lifelines: an emergency management priority for the United States in the 1990s." *Disasters* 15: 172-76.

Prechel, H. and J. Boies.1998. "Capital dependence, financial risk, and change from the multidivisional to the multilayered subsidiary form." *Sociological Forum* 13(2): 321-362.

Prechel, H. and A. Istvan. 2016. "Disproportionality of corporations' environmental pollution in the electrical energy industry." *Sociological Perspectives* 59(3): 505-527.

Prechel, H. and T. Morris. 2010. "The effects of organizational and political embeddedness on financial malfeasance in the largest U.S. corporations: dependence, incentives and opportunities." *American Sociological Review* 75(3): 331-354.

Prechel, H. and G. Touche. 2013. "The Effects of Organizational Characteristics and State Environmental Policies on Sulfur-Dioxide Pollution in U.S. Electrical Energy Corporations*." Social Science Quarterly* 95(1): 76-96.

Prechel, H. and L. Zheng. 2012. "Corporate characteristics, political embeddedness and environmental pollution by large U.S. corporations." *Social Forces* 90(3): 947-970.

Prechel, H. 2000. *Big Business and the State: Historical Transitions and Corporate Transformation, 1880s-1990s*. Albany, NY: SUNY Press.

Prechel, H. 1990. "Steel and the state: Industry politics, and business policy formation, 1940 1989." *American Sociological Review* 55(5): 648-668.

Prechel, H. 1997. "Corporate transformation to the multilayered subsidiary form: changing economic conditions and state business policy." *Sociological Forum* 12(3): 405-439.

Prechel, H. 2003. "Historical contingency theory, policy paradigm shifts, and corporate malfeasance at the turn of the 21st century." *Research in Political Sociology* 12(31): 1-34.

Prechel, H. 2012. "Corporate power and U.S. economic and environmental policy, 1978-2008." *Cambridge Journal of Regions, Economy and Society* 45(3): 357-375.

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.

Putnam, R. 2001. *Bowling alone: The Collapse and Revival of American Community*. New York: Simon and Schuster.

Ragin, C.C., 2000. *Fuzzy-set social science*. Chicago: University of Chicago Press.

Reiss Jr, A. J. 1959. "Rural-urban and status differences in interpersonal contacts." *American Journal of Sociology* 65(2): 182-195.

Report on the Use of Pesticides. 1963. *Chemical & Engineering News Archive* 41(21): 102-115.

Ringquist, E. 1997. "Equity and the distribution of environmental risk: The case of TRI establishments." *Social Science Quarterly* 78(4): 811-829.

Roberts, Wayne. 2011. "Processing methods may move nutrition to food movement center stage" http://wayneroberts.ca/archives/774.

Rogge, M.E., 1998. "Toxic Risk, Community Resilience, and Social Justice in Chattanooga, Tennessee." Pp. 105-121 in *Sustainable community development: Studies in economic, environmental, and cultural revitalization*. Boca Raton, FL: CRC Press.

Rothschild, E. 1976. "Food politics." *Foreign Affairs* 54(2): 285-307.

Rudel, T.K., J.T. Roberts, and J Carmin. 2011. "Political Economy and the Environment." *Annual Review of Sociology* 37: 221-238.

Schnaiberg, A. 1980. *The Environment, from Surplus to Scarcity*. New York: Oxford University Press.

Schnaiberg, A. and K. A. Gould. 1994. *Environment and Society: The Enduring Conflict*. New York: St. Martin's Press.

Scott, M., S.L. Cutter, C. Menzel, M. Ji, and D. Wagner. 1997. "Spatial accuracy of the EPA's environmental hazards databases and their use in environmental equity analyses." *Applied Geographic Studies* 1(1): 45-61.

Shabecoff, P. 1993. *A Fierce Green Fire*. Washington DC: Island Press.

Sherer, P.D. and K. Lee. 2002. “Institutional change in large law firms: A resource dependency and institutional perspective.” *Academy of Management Journal 45*(1): 102-119.

Sewell, W. 1992. “A theory of structure: Duality, agency, and transformation.”*American Journal of Sociology 98*(1): 1-29.

Shiva, V. 2008. *Soil not oil: environmental justice in a time of climate crisis*. Brooklyn, NY: South End Press.

Short, J. 1984. “The social fabric at risk: toward the social transformation of risk analysis.” *American Sociological Review* 49(6): 711-725.

Sicotte, D. and S. Swanson. 2007. “Whose risk in Philadelphia? Proximity to unequally hazardous industrial facilities.” *Social Science Quarterly* 88(2): 515-534.

Sinclair, U. 2014. *The Jungle. 1991(1906)*. UK: Dover Publications.

Smith, C. 2007. “Economic Deprivation and Environmental Inequality in Post-Industrial Detroit: A Comparison of Landfill and Superfund Site Locations.” *Organization & Environment* 20(1): 25-43.

Solomon, J. and J. Eilperin. 2007. “Bush’s EPA is pursuing fewer polluters.” *The Washington Post*. September 30, 2007.

Soule, S. 2009. *Contention and Corporate Social Responsibility*. New York: Cambridge University Press.

Spaargaren, G., A. P. J. Mol, and F. H. Buttel. 2000. *Environment and Global Modernity*. London: Sage.

Steinmetz, G. 2005. “The Epistemological Unconscious of U.S. Sociology and the Transition to Post-Fordism: The Case of Historical Sociology.” Pp. 109-157 in *Remaking Modernity: Politics, History, and Sociology*. J. Adams, E. S. Clemens, and A.S. Orloff eds. Durham, NC: Duke University Press.

Stretesky, P.B. and J. Gabriel. 2005. “Self-policing and the environment: predicting self-disclosure of Clean Air Act violations under the US Environmental Protection Agency's audit policy.” *Society and Natural Resources* 18(10): 871-887.

Stretesky, P. and M. Lynch. 2002. "Environmental Hazards and School Segregation in Hillsborough County, Florida, 1987-1999." *Sociological Quarterly* 43(4): 553-573.

Stockwell, J.R., J.W. Sorensen, J. Eckert, and E.M. Carreras. 1993. "The US EPA geographic information system for mapping environmental releases of toxic chemical release inventory (TRI) chemicals." *Risk Analysis 13*(2): 155-164.

Szasz, A. and M. Meuser. 1997. "Environmental Inequalities: Literature Review and Proposals for New Directions in Research and Theory." *Current Sociology* 45(3): 99-120.

Thomas, J.K., F.M. Howell, G. Wang, D.E. Albrecht. 1996. "Visualizing trends in the structure of US agriculture, 1982 to 1992." *Rural Sociology 61*(2): 349-374.

Tiefenbacher, J., D.C. Konopka, and F.M. Shelley. 1997. Airborne toxic emission hazards in Texas: measuring the vulnerability of place." *Applied Geographic Studies* 1(4): 271-286.

Tiefenbacher, J. 1998. "La Frontera Quimica: Toxic Emissions and Spills along the U.S.- Mexican Border." *Journal of Borderland Studies* 13: 57-77.

Tilman, D., K. Cassman, P. Matson, R. Naylor, and S. Polasky. 2002. "Agricultural sustainability and intensive production practices." *Nature* 418(6898): 671-677.

Time Magazine. 1979. *Carter's Bold Mission*. Accessed http://time.com /vault/year/1979/.

Timmer, C.P. 2010. "Reflections on food crises past." *Food policy* 35(1): 1-11.

Toffel, M.W. and J.D. Marshall. 2004. "Improving environmental performance assessment: a comparative analysis of weighting methods used to evaluate chemical release inventories." *Journal of Industrial Ecology* 8(1-2): 143-172.

Toke D. 2011. "Ecological modernisation, social movements and renewable energy." *Environmental Politics* 20(2): 60-77.

Tolbert, C. M., M.D. Irwin, T Lyson, and A.R. Nucci. 2002. "Civic community in small-town america: how civic welfare is influenced by local capitalism and civic engagement." *Rural Sociology* 67(1): 90-113.

Tolbert, C. M., T. Lyson, and M.D. Irwin. 1998. "Local capitalism, civic engagement, and socioeconomic well-being." *Social Forces* 77(2): 401-427.

Touché, G. 2012. *The Effects of Corporate and Community Characteristics on Environmental Pollution in U.S. Electrical Generating Facilities: A Multilevel Examination.* College Station, TX: Texas A&M University PhD Dissertation.

Treiman, D. 2010. *Quantitative Data Analysis: Doing Social Research to Test Ideas*. San Francisco, CA.: John Wiley and Sons.

Van Zandt, S., W. Peacock, D.W. Henry, H. Grover, W.E. Highfield, and S.D. Brody. 2012. “Mapping social vulnerability to enhance housing and neighborhood resilience.” *Housing Policy Debate* 22(1): 29-55.

Warren, R.L. 1972. “The Great Change in American Communities.” Pp. 53-94 in *The Community in America.* Chicago, Il.: Rand McNal

Warren, R.L. 1972. “The Community as a Social System.” Pp. 135-166 in *The Community in America.* Chicago, Il: Rand McNal

Watts, M.J. and H.G. Bohle. 1993. “The space of vulnerability: the causal structure of hunger and famine.” *Progress in Human Geography* 17(1): 43-67.

Webber, M. M. 1964. *The Urban Place and the Nonplace Urban Realm.* Philadelphia, PA: University of Pennsylvania Press.

Weber, M. 2009. *From Max Weber: Essays in Sociology*. New York: Routledge.

Widmaier, W.W., M. Blyth, and L. Seabrooke. 2007. “Exogenous shocks or endogenous constructions? The meanings of wars and crises.” *International Studies Quarterly* 51(4):747-759.

Wilkinson, K. 1999. “Introduction” and Chapter 1: “Community: An Interactional Approach.” Pp.1-36 in *The Community in Rural America.* Middleton, WI: Social Ecology Press.

Wilson, W. J. 1996. *When Work Disappears: The New World of the Urban Poor*. New York, NY: Alfred Knopf.

Wilson, W.J. 1987. *The Truly Disadvantaged*. Chicago. IL: University of Chicago.

Wisner, B. 2016. “Vulnerability as a concept, model, metric and tool.” *Oxford Research Encyclopedias, Natural Hazards Science* (http:// naturalhazardscience.oxfordre.com/view /10.1093/acrefore/ 9780199389407.001.0001/acrefore-9780199389407-e-25?rskey=3 oozF8&result=20) Accessed 13 June 2017

Yandle, T. and D. Burton. “Re-examining environmental justice: A statistical snalysis of historical hazardous waste landfill siting patterns in metropolitan Texas.” *Social Science Quarterly* 77(3): 477-492.

York, R., E.A. Rosa, T. Dietz. 2010. “Ecological modernization theory: Theoretical and empirical challenges.” Pp. 77-90 in *The International Handbook of Environmental Sociology*. UK: Edward Elgar Publishing

York, R., E. A. Rosa, and T. Dietz. 2003. “STIRPAT, IPAT and imPACT: analytic tools for unpacking the driving forces of environmental impacts.” *Ecological Economics* 46(3): 351 365.

York, R. and E. A. Rosa. 2003. “Key challenges to ecological modernization theory.” *Organization & Environment* 16(3): 273-288.

Young, S. 2000. *The Emergence of Ecological Modernisation: Integrating the Environment and the Economy.* London: Routledge.

Zahran, S., S.D. Brody, W.G. Peacock, A. Vedlitz, and H. Grover. 2008. “Social vulnerability and the natural and built environment: a model of flood casualties in Texas.” *Disasters* 32(4): 537-560.

Zald, M.N. and M. Lounsbury. 2010. “The wizards of Oz: Towards an institutional approach to elites, expertise and command posts.” *Organization Studies* 31(7): 963-996.

Zimmerman, R. 1993. “Social equity and environmental risk.” *Risk Analysis* 13(6): 649-66

APPENDIX A: PARENT COMPANY AND FACILITIES IN 2010 TRI DATA SET

Table 13: Parent Company and Facilities in 2010 TRI Data Set

Parent Company	Number of Facilities
Dairy Farmers Of America	1
Aarhuskarlshamn Aak	1
Ab Mauri Food Inc.	1
Abbott Laboratories	2
Adams Group Inc.	1
Adron Inc.	1
Afa Foods	1
Ag Processing Inc.	4
Agri Star Meat & Poultry Llc	1
Agri-King Inc.	1
Agri-Mark Inc.	4
Agribeef Co	1
Agropur Inc.	1
Ajinomoto Heartland Inc.	1
Al Gilbert Co	2
Albion Group	0
Allens Inc.	1
Alpenrose Dairy	1
America'S Catch Inc.	1
American Crystal Sugar Co	1
American Dehydrated Foods Inc.	2
American Foods Group Llc	1
American Proteins Inc.	5
American Sugar Refining Inc.	1
Anderson Dairy	1
Anderson Erickson Dairy	1
Anheuser-Busch Inbev	1
Archer Daniels Midland	22
Associated British Foods N.A. Corp	1
Associated Milk Producers Inc.	4
Aventine Renewable Energy Inc.	1
Aviagen Feed Processing Unit	1
B&G Foods Inc.	2
Balchem Corp	2
Basic American Foods	2
Bay State Milling Co	1

Table 13 (Cont.)

Parent Company	Number of Facilities
Beef Products Inc.	4
Behrends Feed & Fertilizer Lp	1
Berner Cheese Corp	1
Best-Ever Dairy Products	1
Biazzo Dairy Products Inc.	1
Big Gain Inc.	1
Biorigin	1
Birds Eye Foods Inc.	1
Birmingham Hide & Tallow Co Inc.	1
Blommer Chocolate Co	1
Blue Bell Creameries Lp	1
Blue Diamond Growers	1
Bluegrass Dairy & Food Llc	1
Boar'S Head Provisions Co Inc.	2
Bob Evans Farms Inc.	1
Bonduelle Usa Inc.	1
Bongards' Creameries	2
Borden Inc.	3
Bp Products N.A. Inc.	1
Brewster Cheese Inc.	1
Brooks Food Group Inc.	1
Buffet Partners Lp Dba Dynamic Foods	1
Bunge Ltd	6
Butterball Llc	3
Byrne Dairy	1
Cagle's Inc.	1
California Dairies Inc.	5
California Natural Products	1
Campbell Soup Co	4
Cargill Inc.	21
Carolina Pride Foods Inc.	1
Cgb Enterprises Inc.	1
Ch Guenther & Son Inc.	3
Chelsea Milling Co	1
Chemstar Products Co	2
Chs Inc.	1
Citrosuco North America Inc.	1
Citrus World Inc.	1

Table 13 (Cont.)

Parent Company	**Number of Facilities**
Claxton Poultry Farms	1
Clover Stornetta Farms Inc.	1
Colgate-Palmolive Co	2
Columbus Foods	1
Conagra Foods Inc.	18
Confish Inc.	1
Conopco Inc.	1
Cooper Hatchery Inc.	1
Cti Foods Llc	1
Ctp	1
Cutrale Citrus Juices Usa Inc.	1
D L Lee & Sons	1
Dairiconcepts Lp	3
Dairy Farmers Of America Inc.	10
Dannon Co	1
Darling International Inc.	2
Davisco Foods International Inc.	3
Daybrook Fisheries Inc.	1
Dean Dairy Holdings Llc	3
Dean Foods Co	41
Del Monte Corp	1
Del Monte Foods Co	5
Delano Growers Grape Products	1
Delta Oil Mill	1
Devro International Plc	1
Dfa	0
Dfs Inc.	1
Diamond V Mills Inc.	1
Dole Food Co Inc.	3
Dpf Holdings Inc..; C/O Dole Packaged F	1
Dr Pepper Snapple Group	2
Dreyer'S Grand Ice Cream	2
Dupont	0
E I Du Pont De Nemours & Co	6
E&J Gallo - San Joaquin V	1
Eagle Family Foods	1
Eastern Minerals Inc.	1
Ed&F Man Liquid Product Corp	1

Table 13 (Cont.)

Parent Company	Number of Facilities
Elite Spice Inc.	1
Empire Kosher Poultry Inc.	1
Evolution Fresh Inc.	1
F & A Dairy Products Inc.	1
Farmdale Creamery Inc.	1
Farmer'S Pride Inc.	1
Farmers Feed & Supply Co	1
Farmers Rice Cooperative	1
Farmers Union Industries Llc	1
Farmland Dairies Llc	1
Farmland Foods Inc.	3
Feed Energy Co	1
Felda Iffco Sdn Bhd	1
Ferrara Candy Co	1
Fieldale Farms Corp	3
Fieldbrook Foods Corp	1
First District Assoc	1
Fmc Corp	1
Foremost Farms Usa Cooperative	1
Foster Farms	12
Foster Turkey Products Ftp-1	1
Fpl Food Llc	1
Fresh Mark Inc.	2
Freshwater Farms Products Llc	1
Friesland Campina	1
Fuji Specialties Inc.	1
Gallo Cattle Co	1
General Mills Inc.	8
George'S Inc.	7
Georges Family Farms Llc	1
Gerber Products Co	1
Gerber'S Poultry Inc.	1
Givaudan Us Inc.	1
Glanbia Plc	1
Goldsboro Milling Co	1
Gossner Foods Inc..	1
Gourmet Express	1
Great American Appetizers	1

Table 13 (Cont.)

Parent Company	Number of Facilities
Great Lakes Cheese Co Inc.	2
Gusto Packing Co Inc.	1
H P Hood Llc	2
Hain Pure Protein	1
Hanover Foods Corp	1
Hans Rothenbuhler & Son Inc.	1
Harim Usa Ltd	4
Harrison Poultry Inc.	2
Hartsville Oil Mill	1
Hartz Mountain Corp	1
Hearthside Food Solutions Llc	2
Heartland Catfish	1
Heb Grocery Co Lp	2
Heinz	2
Hero	1
Hershey Foods Corp	1
Hi Plains Feed Llc	1
Hi-Pro Feeds Inc..	3
Hiland Dairy Foods Co	1
Hillshire Brands Co	2
Hilmar Cheese Co	2
Hj Baker & Bro Inc.	1
Honan Holding'S Usa Inc.	1
Hormel Foods Corp	12
House Of Raeford	5
Hp Hood Llc	5
Hubbard Feeds Inc.	2
Idaho Milk Products Inc.	1
Inc.obrasa Industries Ltd	1
Indiana Packers Corp	1
Ingredion Inc.	5
Iowa Turkey Growers Cooperative	1
J R Simplot Co	6
J. M. Smucker Co	1
Jasper Products	1
Jasper Wyman & Son	1
Jbs Usa Llc	5
Jfc Inc.	1

Table 13 (Cont.)

Parent Company	Number of Facilities
Jg Boswell Co	3
Jm Huber Corp	1
Joseph Adams Corp	1
Kalsec Inc.	1
Kaneka Nutrients Lp	1
Keebler Co	1
Kellogg Co	4
Kemin Industries Inc.	1
Ken'S Foods Inc.	2
Kent Corp	2
Kerry Inc.	3
Keynes Brothers Inc.	1
Keystone Foods Llc	7
King & PrInc.e Seafood Corp	1
Knightsbridge Biofuels Llc	1
Knouse Foods Coop Inc.	6
Koch Foods	7
Koninklijke Dsm Nv	2
Kraft Foods Group Inc.	6
Kyowa Hakko Bio	1
La La Usa	1
Lactalis American Co Inc.	1
Lallemand Inc.	2
Lamb-Weston/Rdo Frozen	1
Land O Lakes Inc.	50
Land-O-Sun Dairies Llc	1
Lauridsen Group Inc.	2
Leprino Foods Co	1
Lesaffre International	2
Loders Croklaan Usa Llc	1
Lopez Foods Inc.	1
Losurdo Foods Inc.	1
Louis Dreyfus Corp Inc.	2
Mangus International Group	1
Marquez Brothers International Inc.	1
Mars Inc.	4
Marshall Durbin Food Corp	4
Marshall Minerals Inc.	1

Table 13 (Cont.)

Parent Company	Number of Facilities
Maxwell Farms	1
Mccain Foods Usa Inc.	4
Mcshares Inc.	2
Md & Va Milk Producers Cooperative Inc.	2
Mead Johnson & Co Llc	2
Mennel Milling Co	1
Michael Foods Inc.	4
Michigan Milk Producers Assoc	1
Michigan Sugar Co	3
Michigan Turkey Producers	1
Mid-South Milling Co Inc.	1
Milk Specialties Global	1
Minn-Dak Farmers Cooperative	1
Minnesota Soybean Processors	1
Mom Brands	1
Mondelez International Inc.	3
Morton Salt Inc.	2
Mountaire Farms Inc.	5
Munson Lakes Nutrition Llc	1
Murphy Brown Llc	9
Murry'S Inc.	1
Muscatine Foods Corp	3
Nash Johnson & Sons Farms Inc.	3
National Beef Packing Co Llc	1
National Dairy Holdings	2
National Grape Cooperative Assoc	1
Naturex Sa	1
Nbty Inc.	1
Nestle	13
New World Pasta	1
Nippon Suisan Usa	1
Nitta Gelatin Inc.	1
Northwest Dairy Assoc	10
Novus Arkansas Llc	1
O-At-Ka Milk Products Cooperat Ive Inc.	1
Ocean Gold Inc.	1
Ocean Spray Cranberries Inc.	1
Odom'S Tennessee Pride Sausage Inc.	1

Table 13 (Cont.)

Parent Company	Number of Facilities
Ok Industries Inc.	3
Omega Protein Inc.	4
Osi Group	1
Osi Industries Llc	1
Owensboro Grain Holding Co Inc.	1
Pasco Processing Llc	1
Patterson Vegetable Co Llc	1
Peco Farms Inc.	0
Peco Foods Inc.	2
Pendleton Flour Mills Llc	1
Penford Corp	1
Pepsico Inc.	8
Perdue Farms Inc.	21
Perkins & Marie Callenders' Inc.	1
Perrigo Nutritionals	1
Pfizer Inc.	1
Phibro Animal Health Corp	2
Pictsweet Llc	5
Pilgrims Pride Corp	29
Pinnacle Foods Group Llc	2
Plains Dairy Llc	1
Planter Cotton Oil Mill	1
Prairie Farms Dairy Inc.	8
Premium Standard Farms Llc	3
Prestage Farms Inc. Texhoma Feed Mill	1
Prinova Solutions	1
Producers Cooperative Oil Mill	1
Protein Products Inc.	1
Publix Super Markets Inc.	3
Pyco Industries Inc.	2
Quali-Tech Inc.	1
Raisio Group - Benecol Div	1
Ralcorp Holdings Inc.	4
Ranch-Way Inc.	1
Rembrandt Enterprises Inc.	2
Riceland Foods Inc.	1
Ridley Inc.	4
Ridley Inc..	2

Table 13 (Cont.)

Parent Company	Number of Facilities
Roberts Dairy Co	1
Robinson Dairy Llc	1
Rockview Dairies Inc.	1
Roger Wood Foods	1
Roquette Freres	1
Rose Acre Farms Inc.	1
Rose Packing Co Inc.	1
Rumiano Cheese Co	1
Safeway Inc.	3
Sam Kane Beef Processors Inc.	1
Sanderson Farms Inc.	1
Sanimax Usa Inc.	1
Saputo Inc.	3
Sara Lee Corp	1
Sartori Co	1
Schreiber Foods Inc.	3
Schwan'S Global Supply Chain Inc.	3
Seaboard Corp	1
Sem Minerals Lp	1
Seneca Foods Corp	1
Sensient Technologies Corp	1
Sethness Products Co	1
Shamrock Food Co	1
Shaws Southern Belle Frozen Foods Inc.	1
Simmons Farm Raised Catfish I Nc	1
Simmons Foods Inc.	4
Smith Dairy Products Co	2
Smith Frozen Foods Inc.	1
Smithfield Packing Co Inc.	1
Snake River Sugar Co	3
Snokist Growers - Cannery Div	1
South Dakota Soybean Processors	1
Southeastern Mills Inc.	2
Southeastern Minerals Inc.	1
Southern Hens Inc.	1
Southern Minnesota Beet Sugar Cooperat..	2
Southern States Coop Inc.	5
Southfresh Aquaculture Llc	1

Table 13 (Cont.)

Parent Company	Number of Facilities
Southwest Cheese Llc	1
St Albans Cooperative Creamery Inc.	1
Star Of The West Milling Co	1
State Of North Dakota	1
Steuben Foods Inc.	1
Stewart'S	1
Stremicks Heritage Foods	2
Sugar Cane Growers Cooperative Of Flor..	1
Sugar Creek Packing Co	1
Suiza Dairy Holdings Llc	1
Sunny Meadows Dairy & Food	1
Sunopta Inc.	2
Super Store Industries	2
Superior Dairy	1
Superior Fish Products Inc.	1
Swift & Co	1
Swiss Valley Farms Cooperative	1
Tampa Bay Fisheries Inc.	1
Tate & Lyle	5
Tennessee Farmers Cooperative	1
The Clemens Family Corp	1
The Coca-Cola Co	1
The Dannon Co Inc.	1
The Hartz Mountain Corp	1
The Hillshire Brands Co	2
The Kroger Co	14
The Mennel Milling Co	4
The Orignal Honeybaked Ham Co Of Ga Inc.	1
The Quaker Oats Co	1
The Smithfield Foods Inc.	6
Tillamook County Creamery Assoc	2
Townsend Farms Inc. Bonlee (9215)	3
Toyota Industries N.A.	1
Transpackers Services Corp	1
Tree House Foods Inc.	1
Trident Seafoods Corp	1
Triumph Foods Llc	1
Trouw Nutrition Usa Llc	1

Table 13 (Cont.)

Parent Company	**Number of Facilities**
Turner Holdings Llc	1
Tuscan/Lehigh Dairies Inc.	1
Twin Counties Dairy Llc	1
Twin Rivers Technologies Us Inc.	1
Two Farms Inc.	1
Tyson Foods	67
Ultra Dairy Llc	1
Unilever	1
United Dairy Farmers Inc.	1
United Dairymen Of Arizona	1
Upstate Niagara Cooperative Inc.	2
Us Sugar Corp	2
Usa Yeast Co	1
Valley Fine Foods	1
Valley Proteins Inc.	5
Valley Queen Cheese Factory Inc.	1
Virginia Poultry Growers Cooperative Inc.	2
Vitasoy International Holdings Ltd	1
Wacker Chemical Corp	1
Wakefern Food Corp	1
Wapsie Valley Creamery Inc.	1
Watkins Associated Industries	1
Wawa Inc.	1
Wayne Farms Llc	10
Wells Enterprises Inc..	2
Wenger'S Feed Mill Inc.	7
West Liberty Foods Llc	2
Western Sugar Cooperative	2
Weston Foods	1
Wilkins-Rogers Inc.	2
Willmar Poultry Farms Inc.	1
Windsor Foods	1
Wyoming Sugar	1
Xl Four Star Beef Holdings (Idaho) Inc.	1
Zausner Foods Corp	1
Zeeland Farm Services Inc.	1
Zinpro Corp	1
Total Facilities	**1,031**

APPENDIX B

MAPS OF TRI FOOD MANUFACTURING FACILITIES IN THE U.S. BY EPA

REGION (2010)

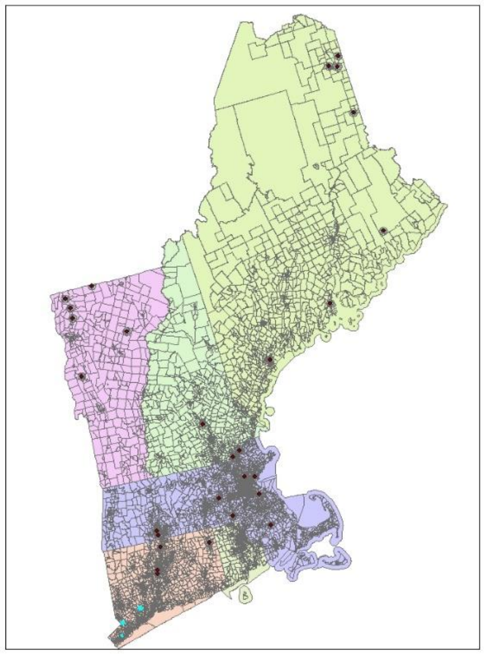


Figure 4: Region 1

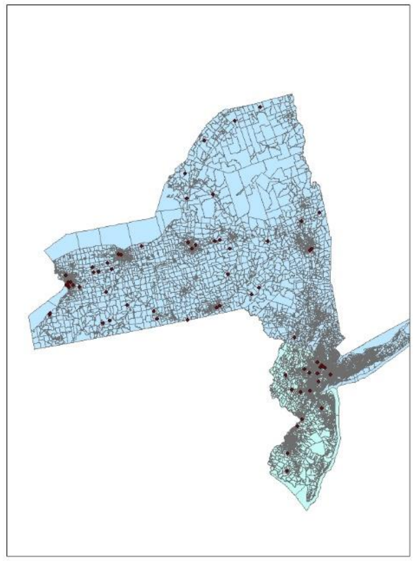


Figure 5: Region 2

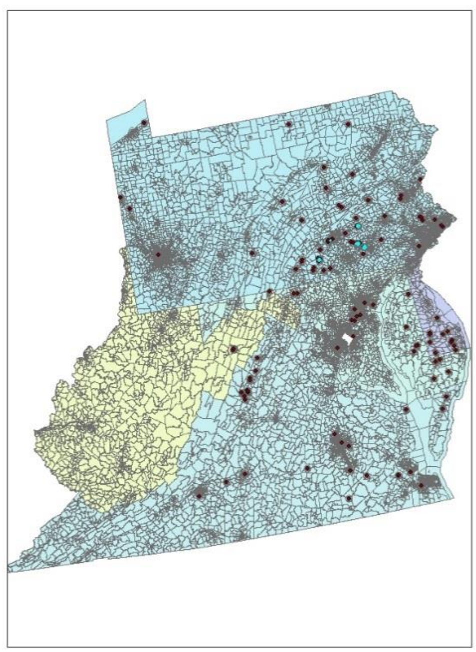


Figure 6: Region 3

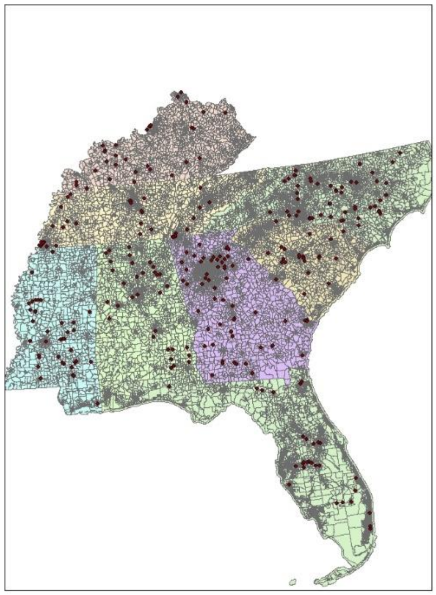


Figure 7: Region 4

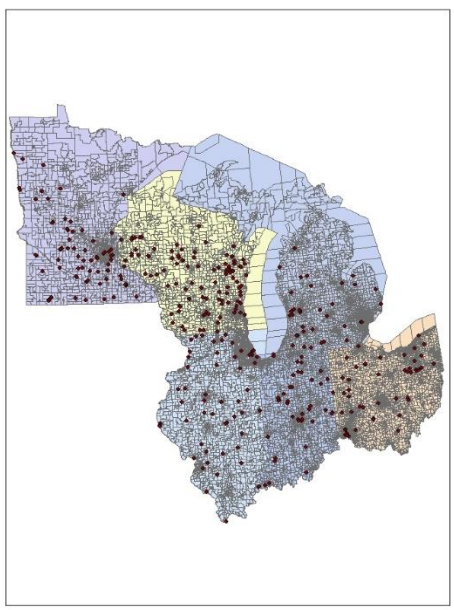


Figure 8: Region 5

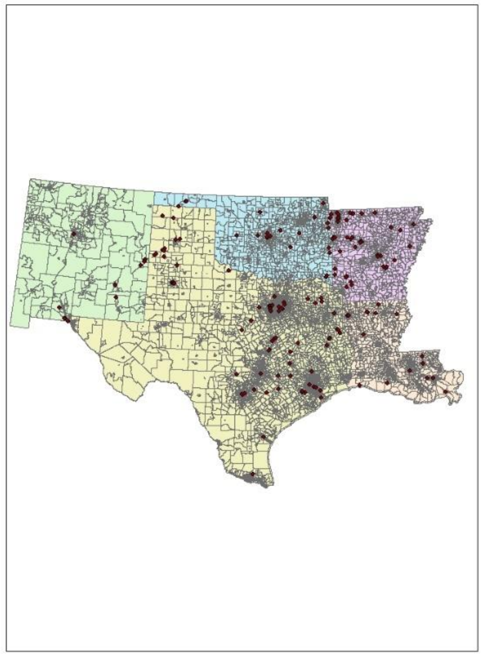


Figure 9: Region 6

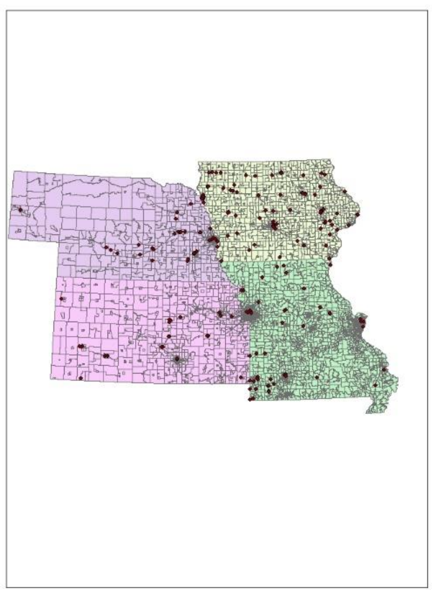


Figure 10: Region 7

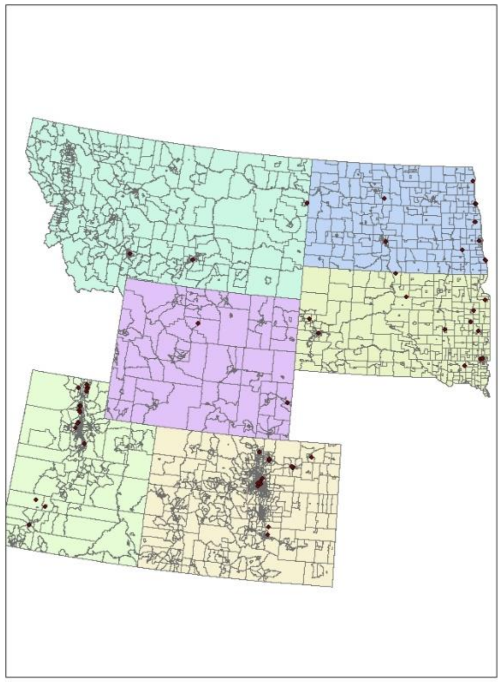


Figure 11: Region 8

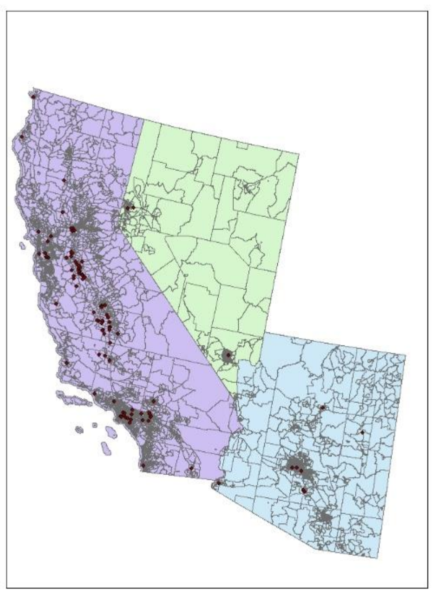


Figure 12: Region 9

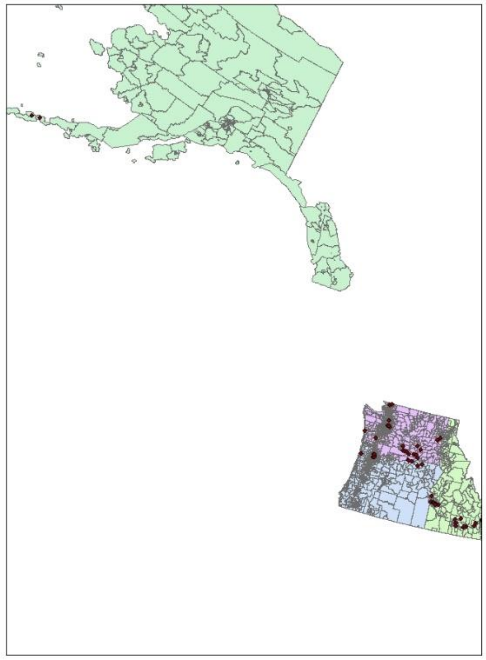


Figure 13: Region 10

APPENDIX C: STEPS FOR MERGING DATA AND UTILIZING THE AREAL APPORTIONMENT METHOD

1. Block group shape files and data were downloaded from https://www.census.gov/geo/maps-data/data/tiger-line.html and inputted into ARCGIS.
2. State shapefiles and demographic data were merged using ARC GIS (Regional Maps were created to make the data more manageable).
3. Using the geographic calculator in ARCGIS, the total area of each block group was calculated.
4. Emissions data was downloaded from the Environmental Protection Agency's Toxic Release Inventory and Risk-Screening Environmental Indicators (RSEI) websites and were added to ARCMap.
5. Using the ARCGIS geoprocessing buffer tool, 1, 2 and 3 mile buffers were calculated around each TRI facility.
6. Using the ARCGIS geoprocessing intersect tool, demographic data were merged with the emissions and risk data and buffers.
7. Using the geographic calculator in ARCGIS, the area of each block group that fell in one of the three buffers was calculated. The field calculator determined the percentage of the total area of every block group that was in each buffer zone.
8. All data was transferred into STATA.

9. In Stata, all weighted characteristics were grouped and aggregated by facility. If the same area was within the buffer area of more than one facility, the weighted population characteristics for that area were calculated with each facility.