HAZARDS, LANDSCAPE, AND PLACE:
STATEN ISLAND AND HURRICANE SANDY

A Dissertation in
Geography
by
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ABSTRACT

Hurricane Sandy, like most costly U.S. hurricane disasters, was fundamentally urban in character. Staten Island, New York, one of the five boroughs of New York City, received disproportionate damages in the storm, and recovery has been slow. The borough receives limited attention in academic and popular literature relative to the other four boroughs, despite a large population and a rich history dating to the colonial era. This study extends the idea that places are historically contingent and constantly evolving to place-based hazards research. It focuses on the historical development of places across Staten Island landscapes, on the ways in which those developments created and failed to mitigate coastal flood risk, and on the role of residents’ attachment to places in influencing their recovery from Sandy. It employs a mixed methods approach, relying on tools and concepts from the urban geography, urban sociology, historical geography, demography, and natural hazards literatures. The dissertation first explores the historical development of landscapes across Staten Island from the colonial era to the present day, noting the ways in which modern landscapes bear the traces of their historical antecedents. It next investigates the growth of flood risk over the course of the twentieth century in the island’s East Shore neighborhoods, pointing to prior storm events that foreshadowed Sandy. Post-Sandy policy initiatives are then examined in the light of these prior events. This study finds that many lessons have been learned from the failures of prior proposals, and that these lessons are reflected in the present-day proposals. The evolution of the study area’s demographic composition over the past 50 years is then examined within the broader context of other Sandy-affected areas to determine similarities and differences. Finally, the study examines the relationship between place attachment and recovery from Sandy, finding that one measure of place attachment, neighborhood satisfaction, is linked with recovery, but that another measure, duration of residence, is less clearly linked with recovery. Overall, this dissertation enhances the integration of place and history in geographic hazard risk research and reiterates the critical role that understandings of both place and history must play in establishing effective hazard mitigation, recovery, and resilience policies.
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Chapter 1

Introduction

Hurricane Sandy struck the New York City metropolitan area on October 29, 2012. At the time of its arrival, it had already become a post-tropical cyclone, but its effects on the region were much the same as those of a hurricane.¹ Wind gusts of nearly 80 miles per hour were recorded at John F. Kennedy International Airport in Queens, and sustained winds of up to 45 miles per hour were reported throughout the region (Gerhardt et al. 2012). Peak water levels on Staten Island during the height of the storm reached between 13 and 16 feet (US ACE 2015a). A storm of comparable severity had not struck the area in 20 years, and even that storm, a 1992 nor’easter, resulted in much lower peak flood heights (US ACE 2015a).

Given the unusual severity of the storm and the substantial length of time that had passed since a strong coastal storm had struck the area, it is perhaps unsurprising that Sandy was a disaster for the region. Because New York City is the largest city in the United States and because adjacent New Jersey is also highly developed, the economic damages were massive. A 2013 U.S. Department of Commerce report cites a New York State estimate of $41.9 billion in repair and reconstruction costs and New Jersey State estimates of $29.5 billion in repair and reconstruction costs and $950 million in lost tourism revenues. Sandy directly caused 48 deaths in New York State, 12 in New Jersey, and 12 in other states (CNN 2015).

¹ This study will follow the convention of referring to the storm as Hurricane Sandy or Sandy. Although it was technically no longer a hurricane at landfall, its effects were much the same as if it had still been a hurricane. Moreover, the often-used alternative nomenclature, “superstorm,” has no more scientific basis, and distracts from the fact that the effects of this storm mirrored those of a tropical storm or hurricane, and therefore can be compared to the effects of these types of storms. See Conklin (2013) for additional discussion of this point.
Sandy as Urban Hazard Event

As with other major hurricane disasters like Hurricanes Andrew and Katrina, a fundamental feature that set Hurricane Sandy apart from the majority of U.S. hurricanes was that it directly struck a highly urbanized landscape. The magnitude of potential damages from a natural hazard event increases as the population and associated assets exposed to that event increases (Barredo 2009; Nicholls 2004). For this reason, exposure is a pillar of several prominent definitions of hazard vulnerability (e.g. Frazier et al. 2014; Polsky et al. 2007) and hazard risk (IPCC 2014).

Urban contexts make particularly fruitful environments in which to study hazards and disasters because of the concentration of exposed people and assets within their borders. There has been a large body of social science scholarship on Hurricane Andrew (e.g. Dash et al. 2007; McDonnell et al. 1995; Peacock et al. 1997), which devastated the Miami metro area, and an even larger one on Hurricane Katrina (e.g. Brunsma et al. 2007; Richardson et al. 2008; Steinberg and Shields 2008), which devastated the New Orleans metro area. There is now also a growing body of literature on Sandy’s effects on New York and New Jersey (e.g. Bukvic et al. 2015; Leichenko et al. 2015; O’Neill and Van Abs 2016; Rosenzweig and Solecki 2016).

It is not, however, the magnitude of the exposed assets alone that separates a damaging storm from a major disaster. Hazard events have the potential to become disasters when they strike exposed assets in places where social and cultural attributes and processes have, over time, left affected places and their residents more susceptible to severe effects and/or insufficiently able to cope with those effects (Cutter 1996; IPCC 2014; Wisner et al. 2004; Yarnal 2007). A disaster, in other words, is a realization of vulnerabilities and risks in a specific place or set of

2 A further discussion of risk and vulnerability is given later in this chapter.
places at the time a hazard event occurs, and the severity of the effects of a hazard event vary in magnitude across the affected places. Again, urban places make ideal study sites for these dimensions of hazards because of their diverse populations, land uses, and histories.

This study addresses the historical antecedents of Hurricane Sandy and the role of place in determining hazard risks and hazard impacts, and in shaping recovery from those impacts. It examines the development of Staten Island and the creation of particular hazard risks in particular places over the course of the borough’s development as realized at the time Sandy struck in 2012, taking particular note of antecedent hazard events and the responses to those events. It compares the demographic profile of Staten Island to the demographic profile of several other jurisdictions, noting that there are differences, but mainly similarities, suggesting that demographic factors may not be a major driver of differential hazard risk. It then examines the role of residents’ attachment to those risk-exposed places in shaping recovery following the storm, finding more evidence for one dimension of attachment than others. These attachments are a manifestation of the ways in which individuals who shape a place become part of it, and thus represent another reason that understanding the historical dimensions of risk-prone places is so important.

**Vulnerability and Risk**

Much hazards vulnerability research of the past decade has defined vulnerability as a function of exposure (described above), sensitivity, and adaptive capacity. Sensitivity is the degree to which people and the things they value are likely to be harmed by a hazard event, and adaptive capacity is the ability to marshal resources to reduce hazard exposure and sensitivity prior to, during, and after a hazard event (IPCC 2007; Yarnal 2007). Although studies using this
definition are not necessarily restricted to a “slice in time,” popular implementations that focus primarily on socio-demographic indicators (e.g., Cutter et al. 2003; Frazier et al. 2014) are generally able to capture few if any historical dimensions of vulnerability.

More recent work, most notably in the most recent IPCC report (IPCC 2014) has shifted toward defining vulnerability as an independent property of people and places apart from their hazard exposure. This redefinition seeks to acknowledge that vulnerable people are sometimes vulnerable not only to hazards and climate change, but often to other economic and social stressors as well. Under this conception, the term risk has taken on a meaning closer to what the previous IPCC report (2007) described as vulnerability. It is “the potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values,” and is a function of hazard type and severity, exposure, and the revised definition of vulnerability (IPCC 2014 pp. 26, 1772). This distinction between risk and vulnerability has not caught on to as great a degree in the hazards literature as it has in the climate change literature, but risk, as defined above, is the term that will be used in the remainder of this dissertation for this concept.3 This definition of risk is highly amenable to a historical interpretation – both the exposure and the inherent vulnerability of a place are inextricably bound up in its history. The framework introduced by this study, hazard risk as a historically contingent process, described in greater detail below, is a natural outgrowth of this idea.

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3 The IPCC’s definitions of vulnerability and risk represent a broad international consensus among global change researchers. Because of the implications of this research for forward-looking mitigation and adaptation policies that will need to consider sea level rise and climate change, using the consensus terminology of that community here is important.
As previously noted, the place-specificity of natural hazards has been well documented for decades (Burton et al. 1993). Research by geographers and historians has acknowledged that hazards have a strong temporal dimension as well. One notable early effort to address a historical hazard event is David McCullough’s widely read *The Johnstown Flood* (1968) which is mostly a social history of a specific disaster, without much attention given to generalizing its lessons to present or future events. Most notably, Craig Colten’s work has examined the historical roots of present-day technological hazards in the American Midwest (Colten 1990; Colten 1991; Colten 1994) and the historical processes that shaped New Orleans and made the catastrophic impacts of Katrina possible (Colten 2002; Colten 2005). Scott Knowles’s book *The Disaster Experts: Mastering Risk in Modern America* (2011) is a history of disaster management focusing on the generation of knowledge about disasters and the failures and successes of its implementation in policy and planning contexts.

One strong thread linking several historical studies of hazards is a focus on Marx-influenced structural understandings of the production of vulnerability. Perhaps the most famous of these is Mike Davis’s *Ecology of Fear* (1998), which describes a Los Angeles in which wealthy elites, through a combination of malevolence and indifference, leave the poorest Angelenos in the locations that are most prone to hazard events. Another notable example is Ted Steinberg’s *Acts of God* (2006), which lays most of the blame for a whole host of historical disasters and present-day hazard risks at the foot of powerful political and economic interests. This study argues that this structural approach is insufficient to explain Hurricane Sandy’s impacts on Staten Island and that it is more generally unsatisfactory because it offers so little hope for mitigating the risk of future disaster events.
One important recent intervention into this literature that improves upon the
aforementioned efforts is detailed in three papers by Gregory Simon (2012, 2015), one with
Sarah Dooling (2013). The 2015 paper calls this “vulnerability-in-production.” These studies lay
out an approach to studying the historical generation of vulnerabilities in specific places,
focusing on the interplay between political and economic actors and ecological conditions, to
depict the 1991 Oakland Tunnel Fire in historical context. Drawing on insights from urban
political ecology, the authors develop a “material-political framework for assessing
vulnerabilities” which points to two “poles” of hazard vulnerability, the political and the
material, and the links between the two (Simon and Dooling 2013). Political vulnerabilities are
akin to O’Brien et al.’s (2007) “contextual” vulnerability, focusing on power dynamics,
inequalities, and often vulnerabilities that exist even in the absence of a natural hazard. Material
vulnerabilities, by contrast, are something closer to the “unsafe conditions” of Wisner et al.’s
(2004) widely cited Pressure and Release Model, and represent the actual immediate
susceptibility to harms of the population under consideration. Simon and Dooling consider these
forms of vulnerability to reinforce one another in many situations, although they acknowledge
that certain interventions into either portion of the cycle can reduce both types of vulnerability.
This study draws insights from the Simon and Dooling material-political framework about the
intersections of spatial and temporal factors across scales in creating hazard risk, but instead
focuses its framing explicitly on notions of place, one of the central concerns of geography.

Geographical notions of place have evolved over time. The regional geography of the
early-to-mid twentieth century was focused on place in the sense that it sought to differentiate
places from one another and identify their unique characteristics (Cresswell 2004, pp. 16-18).
Another line of work introduced what Cresswell (2004, p. 51) calls the “social constructionist”
conception of place, which focuses on the actors and processes that shape locations and understandings of those locations into particular configurations. A different conception of place – as distinct from space – originates with the humanistic geography of the 1970s, as exemplified by the works of Yi-Fu Tuan and Edward Relph (Cresswell 2004; Relph 1976; Tuan 1977; Tuan 1979). The humanistic geographers emphasized affective dimensions of place: feelings of home, emotional relationships, meanings. Cresswell (2004, p. 51) identifies this strain as being part of the phenomenological conception of place, which identifies place as inextricably bound up in the human condition. Other phenomenological views of place focus on the performance or practice of activities in space as of primary importance (Cresswell 2004; p. 33-39; Gregory 1984; Pred 1984; Seamon 1980; Thrift 1983). Other critical approaches, descended from Relph (1976), have suggested an “end of place” in a globalized world (Cresswell 2004; pp. 43-48), or a view of place that is more focused on flows than on fixed attributes rooted to particular locations (Cresswell 2004; Massey 1991). The precise definition of place remains unresolved to the present day, but there is little disagreement that the notion of place remains central to geographic inquiry.

Drawing from past work on place, this study introduces a framework characterizing hazard risk as a historically contingent process. Inspired by Allan Pred’s classic “Place as Historically Contingent Process: Structuration and the Time-Geography of Becoming Places” (1984), it suggests that place, appropriately conceptualized, can serve as a unifying theme for the ecological, social, spatial, and temporal dimensions of natural hazards research, which other approaches to hazards research have sometimes struggled to find.

The first premise of the framework is that natural hazards are fundamentally a place-based phenomenon. This has been widely posited in the geographical literature on hazards for
decades (e.g., Burton et al. 1993), but the specific argument merits stating explicitly. Most widely-cited definitions of natural hazards emphasize that these are natural phenomena that have the potential to cause harm to people or to things that they value (Burton et al. 1993; Kates 1971; Tobin and Montz 1997). Similarly, most contemporary definitions of place require some element of human activity or human sentiment to differentiate a place from a space (Cresswell 2004). Put another way, places are socially constructed spaces: they do not exist without people. Therefore, if hazards by definition threaten things that exist in space that people value, hazards can only affect places.

The second premise of this framework is that places do not exist in any permanent or fixed state. This was the crucial insight of Pred (1984; 1985), who in turn drew from structuration theory, developed by the sociologist Anthony Giddens. Giddens’s theory, inspired by phenomenological philosophy, viewed the notion that actors exist in, and activities take place in, time-space as fundamental to the understanding of social life (Gregory 1984). Both Pred and Giddens also partially drew inspiration from Hagerstrand’s “time geography,” which sought to model the behavior of individuals and groups in both time and space simultaneously. Pred argued that the logical extension of a time-space logic to the understanding of place suggested that places are constantly becoming, or, put another way, that there is no end-state of a place, and that the current state of a place is dependent on its past.

The third major premise is perhaps the most obvious – a potential hazard event occurs in a particular area of space at a specific time. Earthquakes occur along fault lines, hurricanes follow particular tracks determined by climatic and meteorological conditions, tsunami radiate out from a point of origin, and so on, and all of these phenomena have a fixed duration.
If a potential hazard event will ultimately affect particular places at particular times, and places are historically contingent, do not exist in a fixed state, and are constantly in the process of becoming, then the nature of hazard risk is also constantly evolving. As previously noted, this study is not the first to observe that hazards have spatial as well as temporal dimensions (e.g. Colten 2008; Simon 2014). Rather, this study’s formulation differs from other efforts by turning the focus of the analysis onto the continually shifting, historically contingent nature of contemporary hazard risk in particular places.

To accomplish this, the role of the formation of individual and community attachments to places over time must also be addressed. A major reason that place is important to social science research is its relationship to place attachment. This concept refers to the bonds that people form over time as they have experiences in places they live, work, or otherwise become familiar with in their day-to-day lives (Cope et al. 2013; Scannell and Gifford 2010). Place attachment is of interest not only for its own sake, but also because it has been found to be linked to a range of important social and psychological issues, including emotional states and stress (e.g., Fullilove 1996), crime and disorder (e.g., Brown et al. 2004), and, most importantly in the context of this study, disaster recovery (Cope et al. 2010; Cox and Perry 2011; Lee and Blanchard 2012; Mishra et al. 2010). The literature on place attachment is reviewed in greater detail in Chapter 5.

Place attachment is fundamentally a temporal process, and one that evolves as places evolve. For example, one common measure of place attachment – first used beginning in some of the earliest studies of the concept – is the length of time an individual has lived at their current residence (Goudy 1982; Kasarda and Janowitz 1974; Riger and Lavrakas 1981). This measure reflects the notion that people will, in general, become more attached to their residential environments the longer they live there. To the extent that hazard risk and/or recovery are related
to place attachment, then, this area of hazard research also must be sensitive to changes over time. Chapter 2 of this study, which provides a detailed account of the complex processes underlying Staten Island’s development, must then be seen as an account of the foundations of place attachment on the island and its neighborhoods, which in turn has implications for differential hazard risks across those neighborhoods.

Understanding an evolving hazard requires an understanding of the mechanisms by which places become subject to hazard risk and the role of hazard risk in residents’ perceptions of those places. First, and most critically, it requires an examination of how a particular place comes to exist in a particular time such that it is subject to a particular set of hazard risks. Particular attention must be paid to the actors and forces that shaped the place, and the ways in which those actions are reinforced over time and restrict the decisions available to future actors. This is one of the crucial insights of structuration theory (Carlstein 1981; Gregory 1984; Pred 1984; Pred 1985; Urry 1991). Many such actions are policy and planning decisions by local, state, and/or federal governments, but powerful economic actors and even private individuals can exert similar influence under certain circumstances. It is also important to note that these actors and forces often operate at multiple spatial scales.

Place attachment is a parallel force that also shapes places and restricts choices available in the future. Because policy and planning decisions play an important role in shaping the character of a place, and because the character of a place is one important determinant of people’s attachment to it (Lewicka 2011), these decisions influence attachments. The reverse is also true – place attachments influence the policy and planning choices communities make. Perhaps the most obvious examples are historic preservation movements, which may quite literally seek to preserve places as they are at a particular point in time. More relevant to this
study, though, are place attachments that have generated hazard risks. These range from an insistence upon staying and rebuilding in very vulnerable low-lying coastal areas after a major coastal flood, to the anti-Robert Moses sentiments that not only led to the abandonment of coastal highway development that would have included additional flood control measures, but also would have fundamentally altered the character of nearby neighborhoods in ways that residents found unpalatable. These processes also reinforce one another in parallel with the historically contingent development of risks described above: a successful preservation movement, for example, may precipitate the enactment of land use regulations that later become hard to overturn, even if events cause residents to weigh the tradeoffs between the status quo and hazard mitigation differently.

Recognizing both the importance of place and place attachment, and also the importance of generalizability of policy guidance across places, attention must be paid to both similarities and differences between places with similar hazard exposure. Although places may share similar attributes in a broad-brush sense, such as coastal locations with similar demographics, the processes that reinforce historical decisions and constrain the options of future decisionmakers ensure that places also have unique characteristics, especially with regard to hazard risk. Moreover, even where differentiation in measures like race, age, and income occur, measures of that differentiation may not be reliably predictive of hazard risk (Tate 2013) despite the common practice of measuring hazard risk and vulnerability this way (e.g. Cutter et al. 2003; Cutter and Finch 2008; Wood et al. 2010). Therefore, a lack of demographic variation across an area that has experienced differential outcomes from a hazard event like Sandy may suggest that demographic variation is not driving differential outcomes, as is found in Chapter 4 of this study.

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4 This is discussed in greater detail in Chapters 2 and 3.
but it is also important to note that the reverse is not true – this approach could not prove that demographic variations were driving differential outcomes even if they were.

For an analysis based on the concept of hazards-as-becoming to have practical utility, once the historically contingent nature of a place and its hazard risk at a particular moment in time is established, the ways in which that knowledge can be deployed to mitigate present and future hazard risk must be analyzed. Some solutions will be impractical or impossible in light of the previous components of the analysis. In some cases, past policy and planning decisions, coupled with residents’ attachments to their communities and neighborhoods, will constrain the choices available to policymakers and planners. In other cases, past policy proposals that were rejected due to cost, insufficient political will, or various other factors may actually prove to be a good basis for “new” policy after a disaster changes political circumstances. This component of the analysis must identify mitigation options that are realistic and then attempt to determine the best among them, rather than starting from the point of an ideal but impossible plan. It must also acknowledge that policy must evolve in tandem with evolving places and evolving risk, paying particular attention to the importance of place.

**Objectives, Structure, and Contributions**

The overall objective of the subsequent chapters is to analyze the place-specific characteristics of the New York City Borough of Staten Island and its East Shore neighborhoods over time, and the ways in which those characteristics have shaped and continue to shape residents’ experiences of Hurricane Sandy. The East Shore was among the areas hit hardest by Sandy, and its experiences are an important part of the overall story of the storm in New York
City. The area has not been the primary focus of much post-Sandy social science research so far, and with few exceptions (e.g. Nejat et al. 2016), what research there is has largely concentrated on home buyouts in a few small, badly damaged areas (Binder et al. 2015; Koslov 2016), which are only one small piece of a much larger story. The most basic contribution of this work is, then, to expand the body of knowledge on this area and its experience with Hurricane Sandy.

This dissertation also makes several other contributions, all of which stem from the concept of hazard risk as a historically contingent process, and each of which is tied to one or more of the specific research objectives identified in Table 1.1.

The first and most important of these contributions is a novel approach to unifying elements of the natural hazards, urban historical geography, environmental history, demography, and applied geography literatures through the lens of hazard risk as historically contingent process. Although there exists an excellent body of research by historical geographers and environmental historians on the historical dimensions of natural hazards in urban contexts (e.g., Colten 2005; Davis 1998; Simon 2014; Steinberg 2006), this literature rarely engages with mitigation policymaking or with academic research on that policymaking. George Santayana’s notion that “[t]hose who cannot remember the past are condemned to repeat it” (Santayana 1905) is so widely accepted that it has become a cliché, and yet historically, hazards policymaking has often refused to learn from past failures (Steinberg 2006). In an era where a changing climate is expected to increase hazard event frequency in some cities, increase hazard severity in most coastal cities, and increase hazard variability in general (IPCC 2014), hazard mitigation policies will become more important than ever (Rosenzweig and Solecki 2014). It is therefore imperative that mitigation policies learn from the mistakes of the past to reduce the impacts of future coastal
Table 1.1 Overview of Chapters 2-5

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Objective</th>
<th>Research Questions</th>
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| 2       | Analyze Staten Island as a set of historically contingent places to understand how it came to be as it was when Sandy struck | (1) How have physical and cultural landscape factors interacted on Staten Island to shape the borough as it exists today?  
(2) What are the key historical trends, events, and actors that shaped repeated landscape transformation on Staten Island?  
(3) To what extent are prior landscape features still evident in the landscape of today? |
| 3       | Assess post-Sandy flood mitigation plans for Staten Island’s East Shore in light of the historically contingent development of flood hazard | (1) What historical forces led to the extensive development of housing on the floodplain of the East Shore?  
(2) Do prior coastal flood events on the East Shore demonstrate similar impacts to those associated with Hurricane Sandy?  
(3) What policy responses were proposed to prior flood events, why were they insufficient to protect residents from Hurricane Sandy, and how did this contribute to Sandy’s impacts?  
(4) Do post-Sandy coastal flood mitigation policies address the factors that made prior policies insufficiently protective? |
| 4       | Examine population and housing change in the East Shore study area in the context of the broader Sandy-affected region to establish differences and similarities in local context | (1) How have several population and housing characteristics changed in the study area between the 1960 and 2010 Decennial Censuses?  
(2) How do these changes compare to changes in Staten Island, in New York City, and in coastal New York and New Jersey more broadly?  
(3) What do these changes say about differences between the East Shore and the other geographies, and what are the implications for hazard risk? |
| 5       | Examine relationships between place attachment and post-Sandy recovery in East Shore neighborhoods | (1) Is duration of residence at the same location associated with higher levels of self-reported recovery from Hurricane Sandy?  
(2) Is self-reported satisfaction with neighborhood associated with higher levels of self-reported recovery from Hurricane Sandy?  
(3) If these associations exist, are they robust to demographic and other controls? |
hazard events. This contribution is closely tied to Research Questions 2-4 of Chapter 3 in Table 1.1. It is also important, however, that research be attentive to differences between places across time before attempting to generalize from a case study. Recognizing this, Research Questions 1-3 of Chapter 4 assess differences between the study area and other Sandy-affected areas.

Another contribution of this research is to expand the critically important but relatively limited literature on the historical dimensions of hazard risk and vulnerability, and to reframe it under the rubric of hazard risks as historically contingent processes. The historical geographers and environmental historians mentioned above have done important work on historical dimensions of hazard risk, but specific conceptualizations of place are rarely considered explicitly in these studies, despite their importance for the implications of work of this type. Additionally, given the importance of place-specificity in this type of work, additional studies of other places are always needed, and this research provides another such study. This contribution of the dissertation is closely tied to all Chapter 2 Research Questions and to Research Questions 1-3 for Chapter 3 (described in Table 1.1). This study also, in broad terms, compares its study area to surrounding areas with similar hazard risks, as in the Research Questions for Chapter 4, which previous studies have rarely done but which better contextualizes the work.

A third contribution of this dissertation is to generate additional evidence about the link between place attachment and hazard recovery, which has been addressed by a few researchers in the community psychology literature but has rarely been discussed by hazards researchers, and to integrate that evidence into a place-centric, historically contingent notion of hazards. Urban geographers, urban sociologists, and other urban researchers have long been interested in place attachment and related concepts as part of broader efforts to understand why people live where they do, why some communities have stronger bonds than others, and a range of other issues
(Fried 1982; Kasarda and Janowitz 1974; Manzo 2005). Although place attachment is occasionally considered by hazards researchers as a factor influencing post-disaster recovery (Cutter et al. 2008; Vale and Campanella 2005a), it has more often been deployed in disaster contexts by community psychologists interested in the affective states of those affected by disasters (Cope et al. 2013; Cox and Perry 2011; Lee and Blanchard 2012), and even in that context, the existing literature is limited to a few disasters and a small number of places. This may be linked to the aforementioned tendency of hazards researchers to conceptualize hazards as cross-sectional, point-in-time phenomena, rather than as historically contingent, constantly evolving processes. Place attachment, like hazards, evolves over time, and although it must be measured at particular points in time, to conceive of it as a correlate of hazard risk or recovery implies a temporally evolving notion of hazards that, as previously noted, is often absent in the hazards literature.

This study adds to that body of literature in a place where it has not previously been studied, and also connects these questions to a specific theory of place more explicitly than previous studies have done. Specifically, place attachments are a product of the interaction between the historical development of places over time and the relationships people have with those places that strengthen over time. These attachments constrain mitigation and recovery policies and therefore have real consequences for hazards policy. This contribution is drawn from the three Research Questions associated with Chapter 5.

Lastly, this study contributes to the growing literature on the history of suburban landscapes, analyzing physical and environmental factors in tandem with cultural ones in a place that has seldom been studied by academics, despite its various compelling attributes, which are detailed in the next chapter. Although earlier social science and historical work has sometimes
addressed the suburbs, beginning in earnest with Kenneth Jackson’s *Crabgrass Frontier* in 1985, the suburbs have more recently become an increasingly important topic of interest. Notable contributions focus on a wide range of topics, including, but not limited to, suburban environmental history (Hayden 2003; Rome 2001), suburban housing and population diversity (Hanlon 2009; Hanlon et al. 2010), suburban decline (Short et al. 2007), industry in the suburbs (Walker and Lewis 2001), and a range of others. All Research Questions associated with Chapter 2 contribute to this literature.

Although this dissertation is unified by a common framework focusing on the historical contingency of hazards and places, each chapter is also intended to largely stand alone as a piece of scholarship (with the partial exception of Chapter 4, as is explained in that chapter). To that end, each chapter has its own independent literature review and documentation, and draws its own conclusions. Nonetheless, chapters do reference one another as appropriate throughout, and each refers back to the theoretical framework laid out in this chapter. Chapter 6 will draw out overall themes and conclusions from across the preceding chapters and will assess potential future research directions.
Chapter 2

Forgotten Landscapes in New York City’s Forgotten Borough: Staten Island Past and Present

A crucial insight of historical geography is its recognition of the fundamental interconnectedness of place and history. Places exist as they do at a given point in time contingent on a series of historical actions and events (Pred 1984). This observation has several important implications for understanding place. First, to describe a place is to describe it at a particular point in time. Cities and urbanizing places change in ways that are meaningful and detectable on a routine basis from year to year, month to month, and sometimes day to day. Second, to understand a place at a particular point in time requires understanding the ways in which historical forces and actions have interacted to shape it, and the ways in which past forces and actions were in turn contingent on earlier events, and so on, and also, to the extent feasible, the ways in which it is changing and will continue to change.

This chapter seeks to apply this understanding of historically contingent “becoming” places, inspired by structuration theory as outlined in the work of Giddens (1979, p. 201-210; 1989), Pred (1984; 1985), Gregory (1984; 1989), and others, to Staten Island, New York, as a precursor to adapting these ideas to the notion of hazard risk as a historically contingent process in later chapters. As I will demonstrate, although many parts of the Staten Island landscapes of today share the morphology of any number of American suburbs, this is only the most recent in a series of human transformations of the physical and cultural landscape dating back generations. This continuous and ongoing transformation represents a process of becoming places that is
unique to every place, even as multiple places are shaped by the same forces and may develop similar morphologies.

**Landscape and Place**

The most influential attempt to introduce structuration theory to geography was Allen Pred’s “Place as Historically Contingent Process,” which argued that the insights of structuration theory could serve as the basis for a new approach to regional geography. This is explicitly a theory of *place*. To quote Pred (1984, p. 282),

> Place is therefore a process whereby the reproduction of social and cultural forms, the formation of biographies, and the transformation of nature ceaselessly become one another at the same time that time-space specific activities and power relations ceaselessly become one another.

To Pred, landscape is one highly visible dimension of place, but it is neither more nor less important than the individuals (“biographies”) and contexts (“social and cultural forms”) from which it emerges, nor than its role in shaping new biographies and contexts that are continually emerging (Pred 1984, p. 287). This chapter will reject the notion that landscape and place are so easily disentangled. Specifically, landscape will be treated as inextricably bound up with place. Places are most often described and represented either explicitly or implicitly in terms of landscapes. Likewise, places exist in space on the Earth, and therefore are embedded in, coterminous with, or representative of a fraction of one or more landscapes. In other words, in practical terms, one cannot discuss landscape without discussing place, and one cannot discuss place without discussing landscape. The palimpsest of Staten Island that is interrogated here
clearly demonstrates that it is only by describing the convergence of histories, actors, and structural forces to alter landscapes that it is possible to fully understand urban places of today.

**Understanding Staten Island**

Staten Island, New York City’s smallest borough, has never had much of a role in the popular imagination. A 2001 *New Yorker* cover by illustrators Rick Meyerowitz and Maira Kalman called “New Yorkistan,” depicting New York City as a humorous collection of neighborhood stereotypes with names styled after Central Asian countries and regions, represents Staten Island as an undifferentiated, non-descript “Stan.” The cover does not even bother to depict the majority of the island, offering it only slightly more space than the sliver of Connecticut in the opposite corner.

Small wonder, then, that Staten Islanders and other New Yorkers have often used the term “forgotten borough” to describe the place. A 2005 blog post by etymologist Barry Popik traces an early usage of the moniker to a 1928 *New York Times* quotation from real estate developer W. Burke Harmon referring to a housing boom on the island as an indicator that “the forgotten borough […] has suddenly stepped into the limelight” (Popik 2005; Zuckerman 2012). Popik identified later uses by local politicians and business leaders from the 1950s onward that take on a more pessimistic tone, suggesting frustration with a perceived tendency of city leaders to ignore Staten Islanders’ needs. One prominent representation of this “out of sight, out of mind” attitude was the use of Fresh Kills, a filled wetland on the island’s West Shore, as the

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5 The cover was for the December 10, 2001 issue of the *New Yorker*. It drew inspiration from frequent post-9/11 news reports on Middle Eastern countries with which most Americans had little prior familiarity. An earlier sketch of the cover, available on Meyerowitz’s website, refers to parts of Staten Island as Giulianistan and Drudgikhs, referencing its conservative politics, which are discussed later in this chapter.
primary landfill for all of New York City from 1948 to 2001 (Slepian and Gardiner 2001). Fresh Kills Landfill covered over 2,000 acres,\(^6\) eventually accumulating 110 million tons of trash and rising as high as 225 feet at one location (Nagle 2010; NYC Department of Parks and Recreation 2006). The landfill’s smell was a putrid mix of leachate and venting methane and other gases that was mostly uncontrolled for most of the five decades the site was receiving trash (ATSDR 2000; Cho 2011; Steussy 2014). Staten Island residents hated the Fresh Kills Landfill, and it was a source of tension with the city government for virtually its entire existence, serving for residents as a symbol of the city’s indifference toward and even disdain for the borough (Kramer and Flanagan 2012 pp. 112-113; Slepian and Gardiner 2001).

The reputation of the island as forgotten or forgettable is unfortunate, given its substantial population and long, rich history. Were Staten Island an independent city,\(^7\) its 472,000 residents would make it approximately the thirty-sixth largest city in the U.S., larger than some other well-studied major cities such as Atlanta, Miami, and Oakland. Like other areas of New York City, it was first settled by the Dutch and then the English in the seventeenth century (Sachs 2010), making it older than most settlements in the United States. Like many of the other aforementioned cities, it shares some features in common with other major cities, but also has its own unique places and histories. Nonetheless, it is given relatively little attention in either the popular media or the academic literature.

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\(^6\) Only about 45 percent of the total acreage is covered by the actual landfill mounds (NYC Department of Parks and Recreation (2006)).

\(^7\) This is not a mere hypothetical, as the borough has threatened secession in the recent past (Sachs 2010).
As previously noted, this chapter traces the historical development of the island, focusing on the social, cultural, and economic forces that have shaped and reshaped Staten Island landscapes and the process of becoming places there. These transformations have profound implications for the development of the hazard risk realized during Hurricane Sandy discussed in
later chapters. I begin with a brief summary of the physical geography of the island, and then proceed to describe its development after European settlements. Rather than presenting an exhaustive catalog of the borough’s neighborhoods and their stories, I focus on place-specific accounts that are representative of the development of the island as a whole. Figure 2.1, referenced throughout, is a map indicating the locations of all neighborhoods and selected other features referenced in the chapter.

**The Pre-Colonial Landscape**

Staten Island’s present geomorphology formed relatively recently on the scale of geologic time. The highest point on the island, 405 feet at Todt Hill, consists of the terminal moraine of a Pleistocene glacier (Soren 1988). The East Shore primarily consists of glacial outwash, and much of the rest of the island is terminal moraine or ground moraine, with small amounts of outwash at the northwestern corner of the island and Holocene marsh deposits in small areas of the west shore (Soren 1988). Several streams cross the island’s surface, most of which originally terminated in wetlands that once covered much of the island’s East and West Shores.

At the time the first European explorers arrived on the island in the sixteenth century, it was inhabited by small numbers of American Indians of the Algonquin peoples, chiefly Raritan and Lenape (Steinemeyer 1950; Sachs 2010). Davis (1896) indicates four different possible names given to the island by the indigenous communities, including Motanucke, Monocknong, Aquehonga, and Eqhquaous, none of which are reflected in contemporary place names. At first European contact, much of the island was abundant with flora and fauna that has long since departed the island or even been driven to extinction during the nineteenth and twentieth
centuries. Steinmeyer (1950) describes animal life large and small, ranging from bear, wolves, and wildcats to deer and turkey. Oysters were abundant and were a major food source for the indigenous populations (Steinmeyer 1950; Kurlansky 2010). Accounts of the abundance of mollusks and fish on Staten Island’s shores persist into the turn of the twentieth century (Davis 1937, pp. 28-29). Oysters remained an important part of New York City’s economy into the early twentieth century, when pollution, a product of broader economic and landscape changes, began to make them difficult to grow and unsafe to eat (Kurlansky 2010).

The local flora were equally impressive to the European explorers. Henry Hudson’s crew, sailing at the turn of the seventeenth century, described a dense forest, “full of great and tall oaks” (Steinmeyer 1950; Barlow 1971). Although contemporary accounts of flora from the early colonial period are relatively scarce, descriptions from the nineteenth century document an island with large swaths still untouched by development, and therefore might be viewed as a reasonable proxy. Of these, the most notable is William T. Davis’s *Days Afield on Staten Island*, originally published in 1892 and reissued in 1937.

Davis describes a tremendous variety of plant and animal life he encountered on his walks around the island. The book’s second chapter, about springtime, mentions red maples, pussy willows, marsh marigolds, skunk cabbage, false hellebore, and benzoin (wild allspice) (Davis 1937 p. 15, 18). Along the contemporary East Shore (then considered part of the South Shore), he describes *Hudsonia*, beach-plums, beach grasses, bayberries, cedars, cattails and salt meadow grasses (pp. 36-38, 42). A later chapter on brooks and another on the West Shore’s salt marshes contain some information on vegetation, but in general these chapters are clear that these areas have been greatly perturbed by human activity (p. 68, 78-79), so these descriptions are less reliable as a depiction of pre-colonial flora. Leng and Davis (1930, pp. 27-42) provide an
extensive catalog of the flora present on the island in the early twentieth century, including over 100 tree species and dozens of shrubs, although these lists each include a substantial number of non-native species.

**The Colonial Period and the American Revolution (1639 to 1783)**

Initial European efforts to settle Staten Island were made by the Dutch, who named it Staaten Eylandt, after the Dutch parliament. The first three attempts to settle the island, each under the patroon system, failed (Steinmeyer 1950, pp. 8-11). The first of these was attempted in 1639, and the last in 1649. Each ended within a few years due to conflict with indigenous populations. The first permanent settlement of the island was undertaken by a small number of Dutch and French Protestant settlers in 1661 (Steinmeyer 1950 p. 10; Johnson 2010a). Details on these settlers are scant, but Leng and Davis (1930, p. 104) suggest that they were primarily engaged in “agricultural pursuits.” This place later came to be called Oude Dorp (Old Town) after the establishment of New (Nieuw) Dorp in the 1670s (Johnson 2010b). It is in the area of part of present-day South Beach.

Although the Dutch largely failed to colonize Staten Island, the Dutch colonial period did play an early role in shaping places that would come later by producing several place names still in use, in addition to the aforementioned Nieuw Dorp and Staaten Eylandt. Most notable among these are the two tidal straits that border the north and west of the island, the Kill Van Kull and the Arthur Kill. The former is derived from the Dutch *Kil Van Col*, roughly translated as “stream of the bay” (Davis 1896), while the latter is an Anglicization of the Dutch *achter kill* or “back channel” (Leng and Davis 1930). Similarly, Fresh Kills and Great Kills, two marshy areas of Staten Island, bear the Dutch name “kil” owing to the presence of streams.
In 1664, the English assumed control of Staten Island, renaming Oude Dorp to Dover.\(^8\) In 1670, the English Governor Francis Lovelace more formally purchased the land from the remaining American Indians, who agreed to relinquish any claim to it (Steinmeyer 1950; Sachs 2010). In about 1671, the English surveyed new lots south of Oude Dorp, which the locals termed Nieuw Dorp, as previously noted (Sachs 2010). The Anglicization of that name, New Dorp, remains the name of this area today. Land grants to settlers continued through the seventeenth century. Leng and Davis (1930, pp. 116-121) report that at various times these grants ranged from ten to eighty acres, and sometimes even larger, particularly to friends and relatives of the governor. This colonial partitioning of land represented one of the first significant changes that English culture brought to the landscape, one that played an important role in the eventual morphology of places later in the island’s history. The county was first named Richmond by the Provincial Assembly under Governor Thomas Dongan in November 1683, after the English town and dukedom (Leng and Davis, p. 128). Other early antecedents of a modern place names were established by 1687, when Dongan christened his 5,100-acre property the “Lordshippe of Cassiltowne,” (Leng and Davis; p. 128). Dongan’s name is the namesake of Dongan Hills (Richiuso 2010a), and part of his property is the contemporary neighborhood of Castleton Corners (Bendix 2010). Castleton, along with Southfield, Northfield, and Westfield, became one of the four large divisions of the island that persisted into the nineteenth century, with a fifth, Middletown, added in 1860 (Morris 1898; pp. 114-115). The use of three compass directions – South, North and West – as adjectives for “field” stitches a set of English rural place labels into these New York “towns” at the onset of British colonial rule (see also Bowden 1994).

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\(^8\) This attempt to rename the area ultimately did not take, and the name Old Town is still in use.
These divisions later served as political wards after consolidation with New York City (Morris 1900, pp. 454-455).

A number of other large land grants were made in this period, including a grant of 1,600 acres to Captain Christopher Billopp, whose namesake descendent played a prominent role in the Revolutionary War, and a grant to Ellis and Mary Duxbury of 340 acres, whose name appears in the place name Duxbury Point on at least one surviving eighteenth century map (Leng and Davis, p. 129; Lodge and Bew 1781). By 1708, the island was sufficiently deeded that “all [remaining] vacant and unappropriated land” was granted to Lancaster Symes, although a twentieth century court case brought by Symes’s descendants culminated in a ruling that virtually all land had already been titled at the time of the grant and that Symes’s heirs were not entitled to any additional land (Leng and Davis, pp. 129-131).

Although the English controlled the island’s government by the eighteenth century, there were still various cultural and ethnic minority populations present. Descendants of the early Dutch settlers remained. There was a prominent population of Huguenots and Walloons in the late seventeenth through eighteenth centuries. A present-day South Shore neighborhood, Huguenot, is named in recognition of this group, and streets such as Guyon Avenue, Bodine Street, and Mercereau Avenue are named after Huguenot settlers or their descendants (Weintrob 2014). The Moravian faith became increasingly popular on the island in the eighteenth century, and a large Moravian cemetery still stands near New Dorp (Holden 1964; Morris 1900, pp. 290-293). In the mid-to-late eighteenth century, island residents also held hundreds of black slaves, many working on farms, and slavery remained legal in New York until the 1820s (Holden 1964, p. 475; Steinmeyer 1950, p. 24; Weintrob 2014).
Several of Staten Island’s approximately 3,000 residents played prominent roles in the American Revolution (Steinmeyer 1950, p. 24). Many of the island’s most powerful business interests and political leaders were British loyalists, and the lack of local cooperation with the revolutionaries led George Washington to term Staten Islanders “enemies” on the eve of the Revolutionary War (Leng and Davis 1930, p. 170; Sachs 2010; Steinmeyer 1950, p. 25). Following a July 1776 landing of British troops there, the island remained a stronghold for the British throughout the war (Leng and Davis 1930; Steinmeyer 1950). Relatively little actual fighting took place on the island, but the British presence took a heavy toll on residents and their property and resources, particularly in the time between the surrender of Cornwallis in 1781 and Evacuation Day in late autumn 1783 when the British actually departed (Leng and Davis 1930). At the time of the British evacuation, the physical landscape of the island was left largely treeless and bereft of livestock, with many of its buildings damaged or destroyed (Sachs 2010; Steinmeyer 1950).

Rural Staten Island: Farms and Towns (1783 to 1866)

Staten Island’s population grew steadily from the end of the revolution to the mid-nineteenth century, from a population of under 4,000 in 1790 to over 25,000 by 1860 (Sachs 2010). Much of the population during this era was concentrated in the northeastern quadrant of the island, although the longstanding settlement at New Dorp remained (Johnson 2010a), as did small settlements built around ferries to New Jersey on the opposite side of the island at Tottenville (Johnson 2010c) and Old Blazing Star (later Rossville) (Shepherd 2010a).
The highly detailed 1845 *Map of New York Bay and Harbor* (seen partially in Figure 2.2), published by the U.S. Coast Survey, nonetheless makes clear that even at this date the island was sparsely populated, depicting only just over a dozen named areas. The overwhelming majority of the island is depicted as marsh (about 15 to 20 percent of land area), or either farms of widely varying sizes or woodlands (about equally dividing the remainder). These places include the North Shore towns (e.g. Tompkinsville, New Brighton, Port Richmond), several West Shore settlements primarily associated with New Jersey ferries (e.g. Chelsea, Rossville), the forts at the Narrows, and a few towns in the island’s interior (e.g. Richmond, Springville). A map from 16 years earlier shows only Richmond, Tompkinsville, and the forts at the Narrows as named settlements, perhaps an indication of just how small some of the island’s other settlements were during this period (Burr 1829).
Figure 2.3: Staten Island Landscape Paintings

(a) Chambers (c. 1840s) (Brooklyn Museum)

(b) Cropsey (1868) (Amon Carter Museum of Art)
Accordingly, nineteenth century landscape paintings of Staten Island convey a rural ideal (Figure 2.3). “Staten Island and the Narrows,” a work by Thomas Chambers, probably from the 1840s, shows a small group of detached houses set in green fields with forest in the background from a vantage point on the water near the Narrows. The Staten Island painter Jasper Cropsey, a notable member of the Hudson River School, painted several Staten Island landscapes, notably “The Narrows from Staten Island” (1868), which shows much the same area as the Chambers painting but from the opposite direction. There is pasture in the foreground and farms further down the hill, a small town and lighthouse set against the shore to the left, and several large houses set amongst the trees further in the background to the right, with the forts at the Narrows off in the distance. This painting represents several of the predominant features of the nineteenth century landscape: farms and pastures, growing towns, and large estates of wealthy landowners. Much of the growth in the nineteenth century occurred in the towns of the North Shore like the one depicted in the Cropsey painting, but even there, the landscape was far less populated in the mid-nineteenth century than it would be by the turn of the twentieth century. St. George, the eventual densely populated hub of county government, had yet to be named.

Two notable examples of North Shore areas that began to develop into denser population centers in the first half of the nineteenth century were Tompkinsville and Port Richmond. The former, named for Daniel Tompkins, was established in 1815 by its namesake while he was serving as Governor of New York. The portions of the street grid established in Tompkins’ day remain partially intact to the present, although some of the streets, which were originally named after Tompkins’s children, no longer bear their original names.9 This is a quite direct example of a single individual’s role in shaping the character of a place. The 1845 U.S. Coast Survey

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9 Others, such as Griffin St., Minthorne St. and Hannah St, have retained those names.
displays another prominent feature of the neighborhood in this era – the landing from which Tompkins established the first Staten Island steam ferry to Manhattan in 1817 (Shepherd 2010b). One of the successors of this ferry became the property of Cornelius Vanderbilt, a Staten Island native and the patriarch of the wealthy Vanderbilt family, in 1838 (Stiles 2009).

A perusal of the 1860 Census for this area shows a number of very wealthy families, including Jacob B. Wood, a customs house broker with a $20,000 estate and $3,000 in personal property, and Louis P. Bayard, another customs house broker with a $5,000 estate and $2,500 in personal property. Other sizable properties include the $3,000 estate of James Harcourt, a physician, and the $5,000 estate of John R. Smith, whose occupation is listed only as “clerk.” The largest of these estates is worth about $500,000 in today’s dollars on a pure consumer price index inflation measure, but given that this value is very high for the era, alternative inflation measures may be more appropriate in this context. Using purchasing power parity measures of inflation, which are calculated relative to contemporary labor earnings or income distributions, an alternative valuation of a $20,000 estate might be in the range of $3.7 million to $8 million in today’s dollars (Williamson 2016). This evidence suggests that the Tompkinsville of the mid-nineteenth century was mainly developed for and inhabited by well-off New Yorkers.

Port Richmond, a North Shore settlement inhabited continuously since the early eighteenth century, increased substantially in prominence between the end of the Revolutionary War and the mid-nineteenth century, eventually incorporating as an independent village. Its initial small settlement centered on a Dutch Reformed church and later a ferry to contemporary Bayonne, New Jersey (Johnson 2010d; Davis 1896). By the mid-nineteenth century, it, along with adjacent Factoryville (later West New Brighton), was the island’s main industrial hub. Notably, the area was home to the Jewett White Lead Company (est. 1842), J.A. Dean and Co.’s
Linseed Oil Mill (est. in the 1840s) and the Barrett Nephews Company cloth-dyeing plant (est. 1850) (Johnson 2010d; Papas and Weintrob 2009). It was ultimately incorporated in 1866 (Morris 1900, p. 446). This toxic industrial landscape is entirely absent from the idyllic environments portrayed in the landscape paintings described earlier in this section, and it stood in stark contrast to the wealthy residential neighborhoods to the east and to the small oystering community to the immediate west.

Another oystering community known as Sandy Ground, on the Arthur Kill, was founded in the mid-nineteenth century as the first free black settlement on Staten Island (Gottlieb 2015; Lee 2008). Built around a piece of property first purchased in 1828 shortly after slavery was declared illegal in New York State, it grew to a size sufficient to support an African Methodist Episcopal Zion Church, which still stands, from the 1850s onward (Gottlieb 2015).

Other long-extant settlements remained in place at this time. The 1866 Colton & Co. Map (Figure 2.4) includes many place names still in use today, and depicts settlements of varying densities throughout much of the island. Conversely, this map also shows large swaths of the island virtually untouched by development, although mostly depicted as empty space, so it is unclear what exactly was there. This is unsurprising given the number of estates and farms remaining at this time, probably numbering in the hundreds based on later maps (e.g. Beers 1874). Another notable feature of this map is that the Staten Island Rail Road (today’s Staten Island Railway) has already been opened. The railroad would prove a driving force in shaping the next stage of development on the island.
Industrial, Commercial, and Recreational Landscapes (1867 to 1929)

In the mid-nineteenth century, Staten Island had begun to shed its rural character. Several settlements had grown to the point that they had incorporated as independent municipalities,
most notably including Port Richmond, New Brighton, and Edgewater\(^\text{10}\) (Morris 1900). As previously noted, the first line of the Staten Island Railroad was up and running in the 1860s, slicing diagonally across the island from southwest to northeast. The railroad’s path was mostly anchored by stations located near existing settlements, which in turn expanded once it opened. Tottenville, the town at the southern extreme of the island and the southern terminus of the railway, had been established as an oystering community and the home of a ferry to Perth Amboy, New Jersey in the 1700s, albeit under another name – Bentley Manor (Tottenville Historical Society, n.d.). Clifton (then Vanderbilt’s Landing and part of the aforementioned Edgewater), the original northern terminus of the railway, was likewise built around a ferry, this one to Manhattan (Richiuso 2010b; Steinmeyer 1950).

In 1866, settlements outside of these extreme southwestern and North Shore portions of the island were sufficiently sparse that it was possible for cartographers to individually label hundreds of householders on much of the island (Colton & Co. 1866)\(^\text{11}\). At the time of their construction, railroad stations such as Gifford’s and Garretson’s were located in communities known only by the names of local roads that were in turn named after prominent locals (Morris 1900), again suggesting the importance of individuals in the becoming of places. Later, these stations were renamed to the contemporary Great Kills and Dongan Hills, respectively, as they developed a more defined neighborhood character over a period of decades.

Three major forces shaped the development of neighborhoods during this period of population growth on the island. The first, which continued from an earlier time, was the presence of major government institutions and other large institutions. Staten Island had always

\(^{10}\) Edgewater was comprised of Stapleton, Clifton, and part of Tompkinsville. In contemporary Staten Island, the place name only lives on by way of a street and a small number of buildings.

\(^{11}\) The densest parts of the island at Stapleton, Tompkinsville, New Brighton, etc. are not labeled in this fashion – the island’s total population at this time was around 30,000.
had major institutions – a federal government quarantine station on the North Shore, and Forts Tompkins and Richmond at the island’s easternmost tip, for example – but their number and influence on the landscape increased during the late nineteenth and early twentieth centuries. The second was the growth of industry. Although Port Richmond and Linoleumville, discussed previously, had begun to industrialize in the pre-Civil War era, the island’s industries grew in number and importance during this more-recent period, and expanded in spatial extent as well. The third was the establishment of a recreation and tourism industry, primarily focused on the coastal East Shore, in today’s South Beach, Midland Beach, New Dorp Beach, and Oakwood Beach. The growth of Staten Island as a tourist destination had no precedent in prior decades, but it had a major influence on the growth of these neighborhoods.

**Institutions**

Three examples of institutional influences on neighborhood development that arose in this era were Mount Loretto Orphanage in Pleasant Plains on the South Shore and Miller Field in New Dorp on the East Shore. Mount Loretto was founded by Father John Christopher Drumgoole in 1871, moving to its long-lasting location in Pleasant Plains in 1883 (Catholic Charities of Staten Island, n.d.). Drumgoole, a Catholic priest, devoted his life to the plight of homeless and orphaned children, and opened Mount Loretto on a former farm to provide for the care and vocational training of these children, many of whom came from the crowded tenements of Manhattan. Thus, a single person founded an institution that came to define a local landscape for a time, and that institution, Mount Loretto, continued to operate as an orphanage and later foster home for over a century. As a result, a large swath of land south of the Pleasant Plains and Richmond Valley stations of the Staten Island Railway remains only sparsely developed to the
present day – an outcome highly unlikely to have occurred without the presence of Mount Loretto.

Miller Field was a very different sort of institution, but similarly had a significant influence on the development of a segment of coastal Staten Island. Built by the Army in the period 1919-1921 on land previously owned by the Vanderbilt family (Bromley and Bromley 1917), it was one of the earliest coastal air defense stations in the United States (Greenwood and Torres-Reyes 1977). Important early aviation testing and training of the 1920s occurred at the facility (Greenwood and Torres-Reyes 1977). Over the years, Miller Field gradually declined in importance, as the runways were never paved or upgraded to modern standards, and it was eventually shuttered in 1969 (National Park Service n.d.). It was then acquired by a different institution, the National Park Service, in the 1970s, preserving it as open space in an otherwise heavily developed area.

Industry

Industry on Staten Island also continued to grow over the course of the late nineteenth and early twentieth centuries. Nowhere was this more evident than the North Shore, already home to manufacturing in Linoleumville and Port Richmond by the mid-nineteenth century. The largest of all industrial developments of this era occurred in Howland Hook and Old Place at the island’s extreme northwest corner. The area consisted largely of unimproved swamp well into the 1870s (Beers 1874), possibly due to the poor drainage and abundance of mosquitoes (Johnson 2010e). The largest landowner in the area in the 1870s, the estate of George Bowman, formerly president of the village of New Brighton, sold his property to the Baltimore and Ohio Railroad
(B & O) sometime before 1887 (Beers 1887), in a transaction that signaled the landscape transformation to come in the area.

One major driver of change was the extension of rail transportation across the North Shore. The North Shore Branch of the Staten Island Railway opened in 1886, carrying passengers as far as Mariner’s Harbor\(^{12}\) and, later, farther to Arlington. In this era, Staten Island Rapid Transit had entered into an agreement with the Baltimore & Ohio Railroad. The B&O, desiring access to New York Harbor for its freight, built the North Shore Branch to handle both passenger and freight traffic, which played a key role in the development of St. George, described later in this chapter (Bommer 2004). The connection to New Jersey and the continental rail network via the Arthur Kill Bridge made the North Shore more appealing to additional industries beyond those already there. Thus economic institutions shaped infrastructure development which in turn enabled the development of other economic institutions.

Another major change was the result of that increased attractiveness to industry: the development of Port Ivory, a large Procter and Gamble factory at the extreme northeast of the island. Procter and Gamble, based in Cincinnati, Ohio, became interested in expanding its operations into other parts of the country in the early twentieth century. Between 1905 and 1907, they constructed a large facility called Port Ivory, after the company’s most popular product, Ivory Soap (Sachs 1988, p. 72). The soap was, in turn, made in part from tallow from the slaughterhouses in other parts of the New York metro area, another example of Staten Island as a receiving site for wastes generated elsewhere (Staten Island Advance 2011). The facility was expanded to produce powder soap in 1912, and again to produce Crisco shortening from cottonseed oil in 1926. At its peak prior to the Great Depression, it employed roughly 1,500

\(^{12}\) Mariner’s Harbor, on the shores of the Kill Van Kull, is so named because it was once home to several sea captains (Fioravante 2004).
workers on a 129-acre site, making it one of the largest employers on the island (Sachs 1988, p. 72). The industrial character of the area remains intact even to the present, although the Port Ivory factory closed over two decades ago after many years of decline and was acquired by the Port Authority of New York and New Jersey. It also left a toxic legacy on the landscape in the form of three contaminated sites that have required and continue to require substantial costly remediation by the Port Authority of New York and New Jersey and that have discouraged redevelopment of the site. The sources of this contamination reflect the scale of the site and the scope of products manufactured there, and range from aromatic hydrocarbons like benzene and toluene, to caustics, to spent acids, and to the soaps themselves (NYSDEC 2016). The heavy industrial history of Port Ivory and Howland Hook, and the resultant contamination is likely one reason that residential development has never occurred there. This has had the beneficial consequence of not facilitating additional population growth in a low-lying area along the water.

**Recreation and Tourism**

For a period in the late nineteenth and early twentieth centuries, Staten Island’s East Shore was also a hub for tourism from other parts of the island and from other parts of New York City. In the 1874 Beers map, coastal development on the East Shore is essentially absent save a few houses in Arrochar and a few in New Dorp Beach. Much of what is today considered South Beach and Midland Beach is depicted entirely as marsh or swamp. One notable exception is the 160-acre estate of George W. Vanderbilt II, grandson of Vanderbilt patriarch Cornelius Vanderbilt, which included a horse track and stables and a hotel at the waterfront, a portent of the future direction of development in the area.
By the turn of the twentieth century, the area had become nearly unrecognizable. Maps of Staten Island by E. Robinson & Co. from 1898 and 1907 no longer show any indication that any of the East Shore is considered a marsh. In 1898, numerous named beaches are visible on the map: Poppy Joe Island, Midland, Barnes, and New Dorp. Each of these beaches had tourist hotels, and the more developed beaches at New Dorp and Midland had other recreational facilities including bath houses and carnival rides (Robinson 1898). By 1907, South Beach, abetted by the 1880s opening of the South Beach Branch of the Staten Island Railway, had grown to be even larger than the others, with an amusement park, casino, and extensive boardwalk (Robinson 1907). Moreover, several permanent housing developments had been constructed at contemporary Arrochar and New Dorp Beach that have remained to the present day.\(^\text{13}\)

In 1917, near the peak of the recreation and tourism industry on Staten Island, virtually every part of the coastline of the East Shore had some recreational development, save for small areas around where New Creek empties into the ocean, which is typically considered part of Midland Beach today, and at the estate of George Vanderbilt, which would shortly thereafter become the aforementioned Miller Field (Bromley and Bromley 1917). These sites ranged from the hotels, boardwalks, and amusements of prior years, to seaside seasonal bungalow camps, to camping and picnic grounds with more limited facilities. More importantly to the long-term character of these places, additional permanent settlements had appeared set just inland from the beaches, between the beaches and the main line of the Staten Island Rail Road, bearing names such Woodland Terrace, North Beach Park, Linden Park, Ocean Breeze, and Oakwood Beach. Of these, only Oakwood Beach persists as a modern place name; the others have been

\(^{13}\) At the time, these developments were considered to be in South Beach and Oceanville, respectively, and the housing was seasonal rather than year-round.
incorporated into South Beach, Midland Beach, New Dorp Beach, and Arrochar, although a few businesses and residents still use the name Ocean Breeze. These developments appear to have been built on the footprints of earlier farms or estates, leaving the impression of earlier land uses imprinted on the morphology of later ones.

A perusal of the 1920 Decennial Census provides some insight into who lived in these new housing developments. A single block on Windom Avenue in Arrochar includes second-generation Irish, and first- and second-generation Italians and Germans, with heads of households working primarily in blue-collar occupations: butcher, dock hand, mason, baker, and sculptor. Private homes on nearby Seaside Boulevard belong to wealthier people: a second-generation English broker and a second-generation German wholesale manager. A nearby boarding house attracted mostly third or later generation American tenants working in a range of fields: two teachers, a civil engineer, a translator, a minerals merchant, a construction worker, an electrical supply salesman, and so on. In general, one gets the impression that this area is home to mostly blue-collar workers and families of modest means, with a few wealthier property owners scattered throughout. The former, the upwardly mobile working family, is the group that would come to dominate these East Shore neighborhoods for much of the twentieth century.

**Landscapes Converge: St. George**

The development of St. George in the late nineteenth and early twentieth centuries in some ways incorporates all three types of landscapes. Prior to the late nineteenth century, contemporary St. George largely consisted of the estates of wealthy families and was considered to be divided between the adjacent jurisdictions of Tompkinsville and New Brighton. Erastus Wiman, a Canadian-born businessman and entrepreneur, spearheaded two major developments
in the area that helped shape the neighborhood’s character as distinct from neighboring areas. A possibly apocryphal story often told in histories of Staten Island is that George Law, a businessman who owned much of the waterfront property Wiman needed for these ventures, held out on selling the property until Wiman agreed to name the neighborhood after him (Leng and Davis 1930; Holden 1964).

The first of these ventures was undertaken in conjunction with the second. Wiman and his backers gained control over and expanded the Staten Island Railway, including the aforementioned North Shore and South Beach Branches and the freight rail connection to New Jersey, in cooperation with the B&O Railroad. He also consolidated the ferry terminal and the terminus of the railway lines at St. George, making it the most important transportation hub on the island (Brown 1994; Morris 1900; Shepherd and Wright 2010). This made Staten Island the home of a major institutional presence in the consolidated terminal, and brought industry to the area in the form of shipping warehouses, highly apparent in the abundance of piers evident in the Robinson maps (Robinson 1898; 1907). It also anticipated consolidation with New York City in 1898, which reoriented island government toward Manhattan, culminating in construction of the Borough Hall in 1906 (Sachs 2010; Shepherd and Wright 2010), which became the official center of borough government, cementing a major governmental institution on the landscape.

For a time, St. George was also a locus of recreational activity on the North Shore. Wiman bought a Manhattan-based baseball team and brought their home field to the neighborhood, although the venture did not succeed and the team was sold after only two seasons of play (Kirsch 2010). He also owned the Staten Island Amusement Company, which for a short time offered pageants and a large fountain in the neighborhood (Shepherd and Wright 2010). Ultimately Wiman’s personal business ventures largely failed and he was accused of fraud by his
former employers, and he lived out the last decade of his life in much reduced economic circumstances (Brown 1994). Nonetheless his legacy lives on in St. George, which became, and remains, a dense neighborhood and the governmental center of the island. In this sense, St. George perhaps best represents the confluence of biography, social/cultural context, and landscapes in shaping emerging places.

The Fifth Borough (1930 to the present)

The Great Depression hit Staten Island hard, as it did the rest of New York City. Economic growth and development on the island halted. A planned tunnel connecting the borough to the city subway system was abandoned during the Depression, leaving only ferry connections to the rest of the city until the opening of the Verrazano Narrows Bridge in 1964 (Holden 1964; Sachs 2010). Times were sufficiently desperate that a massive migration of mackerel into New York Bay in 1932 “virtually depopulated the interior of the island” as hungry people flocked to the ocean to capitalize on a free protein source (Steinberg 2014, p. 235). Boardwalks at South Beach and Midland Beach, already beginning to decline due to fires and polluted water, fell into disuse and disrepair as the Depression left many people unable to afford spending on tourism and recreation (NYC Department of Parks and Recreation, n.d.). New York City acquired the property in 1935, and the federal Works Progress Administration tore down most of the deteriorating buildings and upgraded the boardwalk, dedicating it in 1939 as the Franklin D. Roosevelt Boardwalk and Beach.

Like many U.S. cities, Staten Island’s economy began to recover via the participation of the manufacturing and government sectors in the war effort once the U.S. became increasingly involved in World War II from late 1941 onward. Staten Island was home to two shipyards and a
dry dock company during the war, the largest of which, the Bethlehem Steel shipyard, employed as many as 10,000 people (Holden 1964, p. 164). Other industries active during the war included scrap reclamation, dental supplies, and small parts machining (Holden 1964, pp. 164-165).

As the Depression waned and World War II drew to a close, Staten Island, like much of the rest of the United States, boomed. A growing economy, low unemployment, and homeownership benefits for returning GIs increased demand for suburban-style single-family detached housing, and Staten Island benefited greatly (Holden 1964; Sachs 2010). According to U.S. Census Bureau figures, the population of the borough grew by over 20,000 between the 1950 and 1960 censuses and by nearly 75,000 between the 1960 and 1970 censuses, the latter the single largest ten-year period of growth in the island’s history. These developments filled in virtually all of the open space on the island that had not already been developed or preserved as parks, and the last operating farm was sold off in the 1970s (Sachs 2010).

Housing growth on the island was not driven solely by economic and demographic forces. The opening of the Staten Island Expressway and the Verrazano Narrows Bridge in 1964 dramatically reshaped the local landscape. In prior decades, most of the development on the island had focused on coastal areas with close ties to New York City and major cities in New Jersey. The coming of the bridge and the expressway shifted development and the economic center of gravity of the island to the interior, generating rapid growth in neighborhoods that had previously been sparsely developed. Table 2.1 shows Staten Island’s population growth in ten year increments since 1900.
Table 2.1: Staten Island Population Growth since 1900

<table>
<thead>
<tr>
<th>Census Year</th>
<th>Staten Island Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>67,021</td>
</tr>
<tr>
<td>1910</td>
<td>85,969</td>
</tr>
<tr>
<td>1920</td>
<td>116,531</td>
</tr>
<tr>
<td>1930</td>
<td>158,346</td>
</tr>
<tr>
<td>1940</td>
<td>174,441</td>
</tr>
<tr>
<td>1950</td>
<td>191,555</td>
</tr>
<tr>
<td>1960</td>
<td>221,991</td>
</tr>
<tr>
<td>1970</td>
<td>295,443</td>
</tr>
<tr>
<td>1980</td>
<td>352,121</td>
</tr>
<tr>
<td>1990</td>
<td>378,977</td>
</tr>
<tr>
<td>2000</td>
<td>443,728</td>
</tr>
<tr>
<td>2010</td>
<td>463,450</td>
</tr>
</tbody>
</table>

Source: Minnesota Population Center (2016)

The borough’s growth may also have been in part a side effect of white flight from Brooklyn and Queens in an era when these boroughs were becoming more diverse as housing restrictions declined in the wake of new laws.

Morphologically, the housing built in this period was generally single-family owner-occupied units. Many were detached homes, but duplexes were also common. Most were colonial, ranch, or Cape Cod-style houses, like those being built on Long Island in neighborhoods like Garden City, Levittown, and Massapequa (see Figure 2.5 for examples). These architectural styles, which reflect broader cultural trends of the era, still predominate in many areas of Staten Island today.
Figure 2.5: Examples of Twentieth-Century Staten Island Architectural Styles

Despite its growing population of New York City natives and its direct overland transportation link to the rest of the city via the Verrazano Narrows Bridge, the relationship between Staten Islanders and the rest of the city remains a complicated one. Staten Island is culturally distinct from the rest of New York City. The only dense, conventionally “urban” developments similar to those found in many parts of the other boroughs are in a few small pockets in the extreme northeast of the island closest to the ferry to Manhattan. As of 2014, it has the smallest population of any borough by a factor of three, and is smaller than Brooklyn, the largest borough, by more than a factor of five. It is less racially diverse than the other boroughs, with nearly 65 percent of the population describing itself as non-Hispanic white (down from 78 percent in the 2000 census). There are far more registered Republicans as a percentage of registered voters on Staten Island than in any other borough (although not a majority), and
Republicans often win local elections (Beveridge 2004; Kramer and Flanigan 2012). Kramer and Flanigan (2012, pp. 12-19) attribute this to several things: the position of Staten Island as a suburban-style community whose Democrat-controlled city government is perceived as disinterested in local concerns; the island’s large blue-collar population of Italian- and German-Americans with “Reagan Democrat”-type political ideologies; and the disproportionate employment of island residents in typically conservative professions such as law enforcement and emergency response.

Given this, and the aforementioned tendency of residents of the other boroughs to “forget” Staten Island, it is perhaps unsurprising that residents have mixed feelings about their relationship to New York City. This issue came to a head in the 1980s, when a serious political campaign to secede from New York City came to prominence. The secession movement was prompted by several things, most notably: long-simmering resentments over Fresh Kills Landfill and other New Yorkers’ attitudes about the island, a perceived poor provision of city services, and a court decision leading the city to abolish the Board of Estimate, an institution which had benefitted Staten Island greatly in budgeting and land use issues (Kramer and Flanigan 2012, pp. 119-133). Islanders actually voted 65% to 35% to secede in a 1993 referendum, but the State Assembly refused to allow the secession to go forward without the approval of the city (Kramer and Flanigan 2012, pp. 130-131). Talk of secession has died down in subsequent years, but this history is indicative of the strained relationship and unequal power dynamics that persist between the island and its neighbors to the north and northeast. It also demonstrates the implications for place of the tendency of powerful actors to reinforce the status quo when they are able to do so.
Conclusions

This chapter sought to analyze Staten Island as a set of constantly evolving, historically contingent places, with particular emphasis in the ways in which those places are expressed as landscapes. It demonstrated that such an analysis reveals the ways in which individual actions; political, social, and cultural forces; and landscapes mutually reinforce and/or transform one another in ways that another analytical approach might not. Moreover, it reveals the extent to which the Staten Island of today is the product of, and bears distinctive physical and cultural traces of, the Staten Island of the past, a point which is particularly important in the context of understanding the island’s experience with Hurricane Sandy, as will be detailed in Chapter 3.

The Staten Island of today, the suburb within the city, the “conservative bastion” that had developed by the time Hurricane Sandy struck in 2012, was the product of an accelerating transformation that took place during the nineteenth and twentieth centuries. In the nineteenth century, new places emerged as the farms and hamlets of the colonial era were reshaped by trains, industry, and burgeoning residential developments. Economic and cultural links to the rest of New York City, although always present, grew increasingly strong over the course of the nineteenth century, abetted by the aforementioned changes, and Richmond County became a borough of the consolidated city in 1898, changing its political and sociocultural context. By the early decades of the twentieth century, the East Shore, the focus of the next chapter, with its seasonal bungalows, camps, and boardwalks, became a popular retreat for tens of thousands of residents of the other boroughs, facilitated by changes in transportation infrastructure and technology. Other parts of the island, meanwhile, were developing as early suburbs of New York City or as industrial hubs, while still others remained predominantly rural. Decades later, the 1964 opening of Verrazano-Narrows Bridge to Brooklyn, lamented by islanders as the event that
fundamentally altered the character of the island, brought with it a “deluge” (Dominowski 2011) or “flood” (Barron 2014) of changes as development boomed. But the bridge did not create these changes – it merely accelerated changes in places that were already underway. The resulting configuration of residential and commercial development, built upon previous alterations to the landscape, became the basis for a different sort of deluge: the flood hazard risks realized repeatedly in the island’s coastal communities throughout the twentieth century, culminating in disaster with Hurricane Sandy in 2012. This aspect of Staten Island’s development is explored in the next chapter.
Chapter 3

Landscapes of Risk on Staten Island’s East Shore

Staten Island’s East Shore neighborhoods, described briefly in the previous chapter, experienced some of the worst of Hurricane Sandy’s impacts. These neighborhoods also have a long history of storm-related flooding. From the building of the boardwalks and bungalow colonies of the early twentieth century onward, a deluge of development in these areas pressed ahead relatively unabated, despite regularly occurring coastal flood events that might have been expected to hold back the tide of urban or suburban growth. Through the early 1970s, there were one or more major floods in the East Shore neighborhoods every decade. By contrast, between Tropical Storm Doria in 1971 and Hurricane Sandy in 2012, there was only one major coastal flood in the area, the one caused by a December 1992 Nor’easter. This much longer return interval may have led to complacency on the part of government, residents, and/or developers, shaping a landscape that was more vulnerable to a disaster like Sandy than it otherwise might have been.

In the wake of Sandy, local, state, and federal government agencies have set forth a series of policies and policy proposals that are intended to reduce the likelihood of a future coastal storm disaster of similar magnitude. The need for these types of policies had been noted in the wake of previous floods experienced in this area (Staten Island Advance 1932a; 1960), and yet responses were insufficient to prevent subsequent incidents.

Prior work by historical geographers and environmental historians has documented this pattern of failure to mitigate existing flood risks and continuing to develop in flood risk zones in other places over a span of centuries (Colten 2005; Colten and Sumpter 2009; Steinberg 2006). Colten (2005) describes New Orleans as an “unnatural metropolis” – a place that was flood-
prone at the time of initial European settlement in the eighteenth century and that repeatedly magnified its flood risk over time. It did so both by increasingly relying on federal infrastructure projects to handle the bulk of its hazard mitigation efforts, and by allowing development on parcels with ever-higher flood risk with each passing decade. Steinberg (2006) draws from multiple hazard events affecting different locations across the U.S. over a period of two centuries, but the segments discussing hurricane risk in South Florida prior to Hurricane Andrew are particularly relevant to a historically informed discussion of Sandy’s effects. Steinberg describes the development of the Miami Beach area as a cooperative effort between real estate developers and state and local government, one that explicitly sought to downplay hurricane risk even in the face of several major storm events (Steinberg 2006, pp. 47-68). He then also argues that the devastation wrought by Andrew was encouraged by several federal and local policies, including: beach nourishment, which made beachfront development more attractive; the transition of federal disaster aid away from loans and toward grants, which federalized risk; and weakened local building standards that failed to fully consider hurricane mitigation (pp. 79-96).

This chapter, drawing inspiration from these earlier works, from the material-political framework of Simon and Dooling (2013), and from Allen Pred’s work on structuration theory and place (1984, 1985), as described in Chapter 1, explores the confluence of events that led to Sandy’s disastrous impacts on Staten Island’s East Shore through the lens of hazard risks as historically contingent process. The chapter traces the concurrent histories of development of the East Shore and of coastal flood events in the area, examining policy responses and their failure to adequately mitigate local vulnerability. It then draws from this history to assess policies and policy proposals responding to Sandy to assess the degree to which the lessons of the past are reflected in them and the likelihood that they will prove sufficient to diminish future hazard risk.
This is an important extension of prior works in this research area, which often read like cautionary tales, doing little to draw direct connections between historical hazard mitigation efforts and present-day post-disaster mitigation and resilience proposals.

Hazard Risks as Historically Contingent Process

To restate information presented in Chapter 1, there are three major premises underlying the hazards as historically contingent process framework introduced in this dissertation. First, hazards are a place-based phenomenon – they affect locations in space that are inhabited by people or things that people value, i.e., places. This is well established in the geographic literature going back decades (Burton et al. 1993; Tobin and Montz 1997). Second, places do not exist in a permanent or fixed state, but rather are always in a process of becoming. This notion, inspired by Pred (1984; 1985) and Giddens (e.g., Gregory 1984) suggests that places are historically contingent – a product of the interaction between structural forces, individual actions, and changing landscapes, constantly shifting as those influences shift, and in turn also recursively affecting those influences. Third, natural hazard events occur in particular places at particular times – they are discrete events. Combining these premises results in the notion that hazard risks are themselves historically contingent. They materialize in particular places as a result of individual actions and structural forces altering landscapes, and the disasters that occur as a result of these risks in turn reshape places, institutions, and individuals. Moreover, the same is true of hazard planning and policy: it is the product of institutions and actors in particular places, and following a disaster or a close call, it can shift in response.
**The East Shore**

The East Shore is briefly described in the previous chapter’s discussion of bungalow communities there in the early twentieth century, but a more in-depth description of the area is necessary before delving into its history with coastal flooding. Figure 3.1 depicts the region that is considered the East Shore for the purposes of this study. Because New York City does not have official neighborhood delineations, there are no formal boundaries for the East Shore or its constituent neighborhoods, but generally they are considered to be, from north to south: Arrochar, South Beach, Midland Beach, New Dorp Beach, and Oakwood Beach. Parts of New Dorp and Oakwood that are not typically considered part of the “Beach” portion of those communities are sometimes still considered to be part of the East Shore, which is a convention adopted in this study. Some of these neighborhoods were not named until the late nineteenth or
early twentieth centuries, and they were typically considered part of the South Shore, which extends to island’s southernmost tip, until sometime in the mid-twentieth century.¹⁴

In the centuries prior to substantial hydrological modifications of the area, it was predominantly marshy, with the area around contemporary Midland Beach heavily influenced by New Creek, the largest body of running water in the East Shore area, which extends more than a mile inland, and its tributaries (Soren 1988, pp. 10-11). Historical and contemporary United States Geological Survey topographic maps demonstrate that almost all of the study area is within 20 feet of local mean sea level, and most of it is within 10 feet of local mean sea level (USGS 1898; USGS 2013). Given the low elevation and the proximity to the water, exposure to coastal floods was inevitable once development of the area began. The historical and demographic characteristics of that development are described in tandem with the history of flood events and flood mitigation measures in subsequent sections of this chapter.

**Early Warning Signs**

The East Shore was largely undeveloped until the late nineteenth century. Although a small settlement was constructed at New Dorp in the late seventeenth century, very few people lived in the area for over 200 years after this initial European settlement. The 1874 F.W. Beers Atlas of Staten Island depicts primarily individual homes on parcels ranging in size from under 10 acres to upwards of 100 acres throughout the area, and much of it is depicted as empty marshland (Figure 3.2). About 50 of these parcels appear to have buildings on them. Census data

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¹⁴ Further adding to confusion in historical use of these terms, East Shore sometimes referred to the northeastern coast of the island between Tompkinsville and Clifton (e.g., Holden 1964). The use of South Shore to encompass everything from Tottenville to Fort Wadworth persists in some contexts (e.g. US ACE 2015a; 2015b), but this study follows the convention typically used in New York City documents (e.g. New York City Office of the Mayor 2013).
for small areal units is not available for this period, but based on a U.S. Census Bureau estimate of average household size for 1880 of 5.04 (Pear 1987), about 252 people would have been living in the area. Even assuming a slightly higher average household size number, such as the 5.66 for 1870 reported by Salcedo et al. (2012), yields an estimate of 283 residents. As noted in the previous chapter, the one harbinger of the future direction of development in the area present on the 1874 Beers map was William H. Vanderbilt’s estate, which included a horse racing track, stables, and a hotel.

This began to change in the late nineteenth century. In 1860, the main line of the Staten Island Railroad opened, traveling along a northeast-southwest axis roughly two miles inland from the shoreline. This rendered the island far easier to navigate in an era before bridges or automobiles, and was intended to spur development along the rail corridor (Sparberg 2010;
Steinmeyer 1950). Along with this development came more attention to the island generally, including interest in furthering the recreational development of the East Shore that had begun with Vanderbilt’s horse racing track.

By 1898, the boardwalk at South Beach was already well-developed, with a casino, dancing pavilion, theater, and numerous hotels apparent on an 1898 map (Robinson 1898). Midland Beach, opened in 1897 (Sherry 2014), also had several hotels, two bathing pavilions, and a Ferris wheel and carousel available at this time. A small number of hotels appear on this map at New Dorp Beach, and several other beaches are named but with no buildings or amenities visible. These resorts catered to a range of clientele, with accommodations ranging from “Victorian hotels” to bungalows or even tent camping (Matteo 2013; Sherry 2014), and may have originally been intended to replicate the successes of Coney Island earlier in the nineteenth century (Salmon 2012).

Already at this time, residents and business owners in the East Shore neighborhoods had begun to see the extent of their exposure to coastal storms. William T. Davis, Staten Island naturalist, wrote in his 1892 memoir of a September 1889 storm in which “few of [South Beach’s] ‘hotels’ [sic] escaped without damage” (Davis 1937). Davis also notes that within a week, “workmen appeared in numbers” to repair the damage, setting a precedent that would hold for each subsequent storm for over a century that even an event as disruptive as a disaster sometimes proves inadequate to shift policy, planning, and/or development. Another storm 14 years later reportedly leveled one of the South Beach hotels, and caused widespread damage to coastal areas of the island (Richmond County Advance 1903).
The Boom Years: 1900 to 1930

The peak of the East Shore recreation economy occurred between 1900 and the 1920s. Fine-scale census data is not available for all parts of the study area prior to 1930, but investigation of the historical maps confidently summarizes population growth during this time. Figure 3.3 depicts the study area in 1898, 1906, and 1920, in three contemporary maps (Colton, Figure 3.3: East Shore Maps 1898-1920)
The growth in the extent of the grid during this period clearly demonstrates the rapid pace of change. These developments are bounded by previously existing farm or estate parcels, in a landscape rewriting process akin to those described in the previous chapter, and encroach increasingly into land previously depicted as marsh. This is an example of how a structural force (economic development pressure) can alter the physical landscape such that newly emerging places emerge with heightened levels of hazard risk.

Likewise, the details of the maps of this period provide a wealth of information about the changing land uses on the East Shore and thus about the nature of the growing hazard risks developing in the area. E. Robinson & Co. published their second detailed atlas of Staten Island in 1907. Here the coastal developments have expanded at Midland Beach and New Dorp Beach relative to nine years prior, but are still relatively modest in scale on most of the East Shore. There are hotels at the beaches at South Beach, Midland Beach, and New Dorp Beach, and some land has been divided into tracts for development at South Beach and New Dorp Beach, but most of these parcels do not actually contain structures. A 500-bed waterfront hospital for poor children, run by the St. John’s Guild, a charitable affiliate of the Episcopalian Trinity Church of Manhattan, had been established in the previous decade at New Dorp Beach (New York Times 1899) and is visible on the map. The campus was large, and a photo from several decades later shows several buildings, some as tall as four stories (Dalton 2015).

By 1917, things had changed considerably along most of the East Shore. Two resources from that year provide rich detail of East Shore developments: the Sanborn Fire Insurance Maps of the areas around South Beach, Midland Beach, and New Dorp Beach,15 and the G.W. and

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15 These maps were not created for Oakwood Beach or the southernmost portion of today’s Midland Beach.
W.S. Bromley *Atlas of the City of New York* covering the entire island. By 1917 extensive development had occurred at New Dorp Beach. Many of the homes that stand today had already been constructed on the blocks occupying space within two blocks of the shore and within four blocks south of what was then still George W. Vanderbilt’s estate, but would become the U.S. Army’s Miller Field in 1919. At this time some of the bungalows were built almost all the way to the shore line, although these would later be demolished, as described later in this chapter. A bathing house, beach hotel, bowling alley, and dance hall were also present in the area. The St. John’s Guild Children’s Hospital remained, and had grown in size.

Beachfront property north of what would become Miller Field had been almost completely developed by 1917 to varying degrees of density. The densest developments were at and adjacent to the resort portions of Midland Beach and South Beach described above, but numerous other “camps” – more basic bungalow and campsite facilities – were found at places like Woodland Beach, Poppy Joe Island Beach, McCourt Bros.’ Camp, and Camp Warren. Extensive permanent housing had been constructed just inland from the Midland Beach resort area and from the northernmost part of the South Beach resort. The bungalow community at Ocean Breeze, on the border of today’s South Beach and Midland Beach, had also been constructed. A “bungalow” in those years referred to a seasonal structure, a label that traces back to European colonial residences in Southeast Asia and to when those administrators returned home to Europe and established weekend or summer houses outside the city (King 1984). In the western parts of the North American continent, a California Bungalow became the de facto suburban middle-class built form of the streetcar suburb era of the early twentieth century (Holdsworth 1977; Winter 1980). Staten Island’s bungalows, unlike the California Bungalow or the more robust two-level vacation duplexes that typify many areas of the Atlantic coast from
New Jersey to the Carolinas, were sparse and comparatively fragile wooden structures (Figure 3.4). At this time, most of the bungalows on Staten Island’s East Shore would have been seasonally occupied (Kilgannon 2010; New York City Office of the Mayor 2013), but gradually, nearly all that were not destroyed were eventually converted for year-round use, and some persist to the present day.¹⁶

¹⁶ This is evident in the real estate ads examined to generate Figure 3.5, below. From the 1930s onward there are both ads for “winterized” bungalows and ads for summer or seasonal bungalows. By the 1960s, ads for summer bungalows are essentially non-existent and ads for bungalows or cottages no longer mention winterization or use the term “all-season.”
The East Shore remained a popular tourist attraction throughout the 1910s and 1920s. A July 5, 1925 *New York Times* story reported that about 100,000 people spent the Independence Day holiday at Staten Island’s beach resorts (*New York Times* 1925). Nonetheless, signs of the difficulties the beach resorts were beginning to face also began to mount during this period. Happyland Park, one of the major attractions at South Beach, was completely destroyed, along with 40 adjacent bungalows, in a May 1919 fire (*New York Times* 1919). Midland Beach experienced fires in 1924, 1926, and 1929 (*New York Times* 1924, 1926, 1929). The 1924 fire, possibly intentionally set (*New York Times* 1924), destroyed the entire resort and several adjacent bungalows, ultimately costing about a million dollars (uninflated), and the 1929 fire destroyed about a quarter of the reconstructed resort, costing over $250,000.

Storms continued to be a problem for the area and caused considerable damage during these years, as well. A February 1927 nor’easter generated flooding “almost one mile” inland (*New York Times* 1927a). Approximately 1,500 people had to evacuate during the storm, about 200 of them in boats, and an indeterminate number of homes, likely several dozen, were rendered uninhabitable, with bungalows swept from their foundations, and flood damage from waters as high as ten feet (*New York Times* 1927a, 1927b). Tide gates, structures that prevent floodwaters from flowing upstream, had been constructed and are referenced in newspaper accounts of the storm (*New York Times* 1927a). These were likely privately owned, such as the one on New Creek owned by James Graham, a beachfront property owner and namesake of the defunct Graham Beach resort within the boundaries of present-day Midland Beach, as referenced in a 1932 *Staten Island Advance* article (1932a). These structures proved completely insufficient, and no other mitigation measures appear to have been in place at this time.
Decline, Reconstruction, and Mitigation: 1931 to 1959

Beginning with the 1930 Decennial Census, the availability of census data tabulated to small area geographies improves, and it becomes possible to more accurately define the East Shore’s population. Table 3.1 presents basic census population and housing counts for the 1930 through 2010 Decennial Censuses. At the time of the 1930 Census, the population of the East Shore area was around 15,000 (Minnesota Population Center 2011). Few of the most densely populated areas (on an enumeration district basis) are the tracts closest to the shore, with denser populations closer to the Staten Island Rail Road.

Table 3.1: Census Population and Housing Counts, 1930 to 2010

<table>
<thead>
<tr>
<th>Census Year</th>
<th>Total Population</th>
<th>Total Housing Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>15,071</td>
<td>—</td>
</tr>
<tr>
<td>1940</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>1950</td>
<td>25,601</td>
<td>9,673</td>
</tr>
<tr>
<td>1960</td>
<td>36,416</td>
<td>12,581</td>
</tr>
<tr>
<td>1970</td>
<td>49,680</td>
<td>16,100</td>
</tr>
<tr>
<td>1980</td>
<td>52,919</td>
<td>18,572</td>
</tr>
<tr>
<td>1990</td>
<td>53,120</td>
<td>20,636</td>
</tr>
<tr>
<td>2000</td>
<td>59,494</td>
<td>23,180</td>
</tr>
<tr>
<td>2010</td>
<td>64,087</td>
<td>25,025</td>
</tr>
</tbody>
</table>


Notes: Census tract boundaries vary from year to year. Boundaries used to generate this table are based on an aggregation of East Shore tracts, the outer boundaries of which are closely but not perfectly aligned for all years, particularly earlier in the series.

Enumeration district-level data, which can be aggregated to boundaries of later tracts, are available for 1930, but only tract level data is available for 1940, and 1940 tracts are too large to be useful in this analysis. Housing unit data also is not available prior to 1950.

Many variables have not been adequately digitized for small areas in this census, so other population attributes are harder to summarize. One other potential metric of interest that is available, proportion of population born abroad, ranges from 16 percent to 43 percent in the enumeration districts making up the area, with the highest and lowest concentrations around
Arrochar. Another data series of demographic interest that begins in this era is presented in Figure 3.5.

![Graph showing real estate ads from 1922 to 2012 for Arrochar, Midland Beach, New Dorp, Oakwood, or South Beach](image)

**Figure 3.5: Staten Island Advance Real Estate Ads: 1922 to 2012**

This is a newly collected systematic sample of classified ads for housing units for sale taken from the *Staten Island Advance* six days per year, in five year increments, between 1922 and 2012. Details can be found in the footnote to the figure. Note that housing ads are fairly level through the early years of the graph, likely owing to the economic forces associated with the Depression and World War II.

By the 1930s, the East Shore beaches were clearly in decline. As noted elsewhere in this chapter and the previous one, this likely reflects a combination of structural factors: the economic decline associated with the Great Depression, deteriorating conditions at these beaches, and competition from others. A June 1931 *New York Times* article reports crowds of

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Ads for all housing units for sale in Arrochar, Midland Beach, New Dorp, Oakwood, or South Beach collected for January 2, January 15, May 1, May 15, June 1, and June 15 issues of the *Staten Island Advance* for every fifth year ending in two or seven. Obtained from archives in the St. George Branch of the New York Public Library. January 1927 and mid-May 2012 ads are missing from the archives. The drop-off in ads in 2012 is hypothesized to be a result of the decline of print journalism coupled with the tail end of the recession that began in late 2007-early 2008.
75,000 to 80,000 at Staten Island beaches on a busy weekend, which represents a drop of more than 20 percent relative to similar reports from a few years previous cited above (New York Times 1931a). Meanwhile, flood risks persisted: a large storm in March of 1931 generated a “tide that averaged three feet above normal” (Staten Island Advance 1931), flooding bungalow communities across the East Shore and causing over $250,000 in damages (New York Times 1931b). A second major nor’easter struck in November of the following year, causing floodwaters two feet deep throughout the East and South Shores (Staten Island Advance 1932b).

The 1932 storm, in addition to causing further evacuations and property damages, also removed a massive amount of sand from the island’s East and South Shores via flooding and erosion – up to five feet in parts of Oakwood Beach, which experienced the most severe sand loss (Staten Island Advance 1932c). This incident prompted possibly the first public debate about appropriate flood control measures for the East Shore, one that was still unresolved at the time Hurricane Sandy struck nearly 80 years later, and that is still ongoing in Sandy’s aftermath. The flood control debate is depicted in a November 12, 1932 Staten Island Advance headline declaring “Sea Wall Is Too Expensive! Land Must Be Filled In to Protect It from Tide Flood” (Staten Island Advance 1932a).

Indeed, no sea wall was built, but a publicly funded beach fill project, rather than the larger-scale private marsh filling plan proposed in the Advance article, was carried out for part of the East Shore. Two years earlier, a bill passed by the state legislature had ceded to New York City coastal land and funds intended to be used to redevelop the dilapidated boardwalk and restore the beaches from Arrochar to Miller Field near New Dorp Beach. In 1935, shortly before the expiration of these funds, the city broke ground on a project with additional resources from the federal Works Progress Administration (WPA) (New York Times 1935). A 1936 Times
article describing delays in the project notes strong local support for the project, pointing to
declines in beach use due to “the competition of newer and more lavish resorts in the
metropolitan area,” presumably those constructed at the impetus of city planner Robert Moses on
Long Island (New York Times 1936). As part of this project, which was completed in 1937 and
christened the Franklin D. Roosevelt Boardwalk and Beach, the United States Army Corps of
Engineers (US ACEa) applied a million cubic yards of fill to 7,500 feet of South Beach (US
ACE 2015a). In this instance, structural forces in the form of the state land appropriation and
WPA funds shifted local policymaking in a way that reduced flood risk.

These efforts did not, however, eliminate that risk. A September 1944 hurricane\textsuperscript{17} did not
cause the same degree of damage of the early 1930s storms, but photos in a Staten Island
Advance article from the day after the storm convey the familiar scene of a Midland Beach home
inundated by flood waters with its residents standing outside in water to their knees (Staten
Island Advance 1944). Extratropical storms in November 1950 and October 1955 again caused
widespread damages throughout the East Shore (Staten Island Advance 1950; 1955).

There was also substantial population growth in the area at this time. At the 1950
Decennial Census, the population of the tracts comprising the East Shore study area had grown
to 25,601, more than a 60 percent increase from 1930. Because of the much more thorough
digitization of the 1950 Decennial Census data, it is possible to say more about the demographic
composition of the area at this time than for 1930. There are 9,673 dwelling units in the study
area. Percentage of population comprised of foreign-born whites ranges from eight percent to 25
percent, compared to 6.7 percent for the U.S. as a whole in 1950, possibly indicating a relatively

\textsuperscript{17} Hurricanes were not officially given names in the United States prior to 1950 (Landsea and Dorst 2014), and the
Saffir-Simpson scale currently used to categorize hurricanes by wind speed was not developed until 1971 (Williams
2005).
high influence of immigrant cultures in this area. Median years of schooling ranges from eight to 12 in the tracts comprising the study area, compared to 9.3 for the U.S. population overall (U.S. Census Bureau 1952).

A Critical Juncture for Mitigation

Components of public works projects implemented during the 1950s and 1960s that had a primary purpose other than flood risk mitigation nonetheless reduced flood risk, reflecting another way in which structural forces that shape places also shape hazard risks. City planner Robert Moses and Staten Island Borough President Edward Baker proposed a plan in 1953 to further rehabilitate the East Shore beaches, which Moses and other local officials felt the FDR Boardwalk project had failed to completely accomplish (New York Times 1953, 1955a). The proposal included a provision to condemn 415 dwellings, calling them “cheap, dilapidated seasonal bungalows and other seasonal shanties” (New York Times 1953). Although the goal of this policy was nominally the development and provision of beach amenities, by clearing these residences and associated commercial structures, people and assets were relocated out of a zone at very high risk of floods, even as the place as it had existed was erased.

Another component of this project was beach fill at South and Midland Beaches, which was completed in 1955 using state and local funds. Justifications for this project vary across sources. It was proposed as part of the aforementioned effort to rehabilitate the East Shore beaches, but other stated justifications include erosion reduction and “prevent[ion of] flooding that [had] plagued residents for years” (New York Times 1955a, 1955b). The project may have, in part, had its intended effect: Hurricane Connie, which struck in August 1955, caused far less damage than storms of similar strength in previous years. Staten Island Borough President Albert
Maniscalco attributed this in part to the recent beach fill project, as well as to the borough’s efforts in reinforcing a temporary flood control structure at Oakwood Beach (Staten Island Advance 1955).

Similarly, Hurricane Donna, which struck in September 1960, led to widespread closures of schools and businesses, but on most parts of the East and South Shores, damage was limited to phone and power outages. One major exception, and one that would remain a recurring problem in future storms, was the high degree of damage at Oakwood Beach, which did not benefit from the 1950s-era beach improvements farther north. There, floodwaters generated by Donna wiped out a 150-foot section of a makeshift dike at the southwestern border of the neighborhood and overtopped a depression in the embankment protecting Kissam Avenue in the easternmost part of the neighborhood (Staten Island Advance 1960, p. 1). A tide gate in the area also failed during the storm (Kihss 1960). This resulted in flooding of as much as six to seven feet in some areas (Staten Island Advance 1960 p. 1). Thirty-seven families, “almost a third of the beach’s year-round population” at the time, evacuated (Staten Island Advance 1960 p. 1). The Advance quotes a member of the Oakwood Flood Committee as telling a Borough official that repairing the broken temporary dike would be insufficient, that the neighborhood “want[ed] protection at any cost” (Staten Island Advance 1960; p. 3).

Less than two years after Donna, during the Ash Wednesday Storm of 1962, the story at Oakwood Beach repeated itself: the tide gate failed, the makeshift dike failed, and the community once again found itself under water (Staten Island Advance 1962a). Borough President Maniscalco complained to New York City Mayor Robert Wagner Jr. that the borough lacked the resources to fully restore the tide gate or to create a more permanent retaining wall to replace the makeshift dike (Staten Island Advance 1962b). Unfortunately, these pleas fell on deaf
ears, and these issues would persist for decades to come, as discussed below. This suggests that pressure from local residents (individuals) and even local government (structural forces) were insufficient to inspire shifts in policy at scales that would in turn reduce hazard risk in these places.

The other East Shore area that sustained massive damage during the Ash Wednesday Storm was the Cedar Grove Beach Club. The last of the aforementioned seasonal bungalow communities still intact in 1962, the storm was an added blow to a community already locked in a legal battle to maintain its existence after the earlier eminent domain acquisitions and demolitions of neighboring communities. Originally, the land was acquired for a proposed expressway, but local opposition and competing priorities led to its cancellation, and by 1962, the proposed condemnation was intended to incorporate the land into nearby Great Kills Park (Dwoskin 2010). Because of the condemnation threat, residents expressed skepticism that they would bother to rebuild after the storm (Wiesner 1962). Ultimately, however, they reached a lease agreement with the city that kept the community intact until 2010, and many of the damaged bungalows were rebuilt.

At the 1960 Decennial Census, the population of the tracts comprising the East Shore study area had grown to 36,416, an increase of over 40 percent from ten years earlier. Housing units had increased to 12,581, an increase of about 30 percent. In the tracts closest to the shore, only 60 to 80 percent of the housing is described as “year-round” in 1960, meaning the remainder are the sorts of seasonal bungalows Moses was seeking to demolish in his redevelopment project. In the adjacent tracts inland, this number is above 95 percent in all cases. The percent of the population born abroad had narrowed considerably in range from 1950, to between nine and 19 percent. It is no longer possible to calculate median years of education due
to changes in the variable construction, but percent of population 25 or older whose maximum educational attainment was a high school diploma ranged from 18 percent to 34 percent, whereas the range for those holding college degrees or more was 0.5 percent to nine percent. Figure 3.5 also demonstrates that this timeframe was the peak of the Staten Island housing market, at least as represented by ads in the *Staten Island Advance*.

In the early 1960s, as preparations were being made for the opening of the Verrazano-Narrows Bridge, Robert Moses had proposed a new major arterial road that would have run along Staten Island’s East and South Shores, from the new bridge at the island’s eastern tip to Tottenville at its southern tip, incorporating part of the existing Seaside Boulevard in expanded form (Dellatte 2012). Moses correctly anticipated that the island’s population would boom following the opening of the bridge, and sought additional roads to alleviate congestion. Concurrently, US ACE released a comprehensive study of New York City coastal flooding in 1964 in response to Hurricanes Connie and Donna, arguing for an extensive system of dunes, levees, and beach fill along much of the East Shore, to be carried out concurrently with the development of the South Shore Parkway (Schuerman 2013). By the end of the 1960s, Moses had lost his stranglehold on the New York City planning process, and the City Planning Commission’s 1970 proposals for Staten Island recommended against the development of the parkway (Dellatte 2012; New York Times 1970). Likewise, the US ACE projects were never funded, possibly because of the proposal’s reliance on the assumption that the parkway would be built, and the flood control proposal was shelved for nearly a decade. This is an example of the interconnectedness of the forces that shape the evolution of both places and hazard risks.

The opening of the Verrazano Narrows Bridge did, as Moses predicted, facilitate a sizable wave of new migration to the borough. The 1970 Decennial Census reported a population
of 49,680 in the tracts of the East Shore study area, an increase of 36 percent from just a decade before. The number of housing units had only increased by 28 percent, to 16,100. This is reflected in the housing advertisement data in Figure 4.5, where the number of ads in the *Staten Island Advance* actually drops in the 1960s, likely due to the very tight housing market.

The US ACE flood mitigation proposal was reconsidered in the wake of Tropical Storm Doria, which struck in August 1971 and was the most damaging coastal storm in a generation. A *Staten Island Advance* headline the day after the storm struck proclaimed “You’re right – it was worst ever” (Fischetti and DeMaria 1971). The *Advance* reported on residents calling its offices seeking help with issues the city had yet to address, including extensive flooding of homes in South Beach, Midland Beach, and New Dorp Beach (Staten Island Advance 1971). Residents vented their frustrations about city officials, and some declared an intent to sell their homes and move out of New York City altogether.

In the wake of Doria, the US ACE beach erosion and flood control proposal was revived and expanded. The earlier proposal had focused on Oakwood Beach, Great Kills, and New Dorp Beach, at and beyond the southernmost extent of the study area. The 1973 *Draft Environmental Impact Statement* proposes various mitigation infrastructure along the entirety of the South and East Shores, from Tottenville to Fort Wadsworth (US ACE 1973). The proposed measures include a levee perpendicular to the beach protecting the Oakwood Beach Sewage Treatment Plant, shoreline dune and beach fill between Oakwood Beach and New Dorp Beach, and a levee from north of Miller Field to the Verrazano-Narrows Bridge. These structures would have extended protection for flood events of up to 15 feet above mean sea level within the study area (US ACE 1973). As before, the project ultimately was never funded or built, demonstrating that
even the backing of an influential federal government agency was not sufficient to overcome status quo inertia and change local disaster policy in a way that would substantially reduce risk.

The 1992 Nor’easter and Hurricane Sandy

After Tropical Storm Doria, the East Shore went through a long “drought” of major coastal flooding. A series of storms in November 1977 caused substantial inundation in the area, but the flooding was the result of repeated heavy rains, not high tides or storm surge, and is therefore outside the scope of this chapter (Kifner 1977, Kleiman 1977, Williams 1977). During this 20-year period, the population at risk from coastal floods continued to grow as places evolved and grew denser. By the 1990 Decennial Census, the population of the census tracts comprising the study area had grown to 53,120 individuals living in 20,636 housing units, a slower growth rate possibly indicating the reduced amount of vacant land available for new development by this point in time, also evident in Figure 3.5. Proportion of population born abroad remained fairly low, ranging from five percent to 17 percent. The proportion of the population whose highest educational attainment is a high school diploma ranged from 32 to 44 percent in the tracts comprising the study area, while the proportion of the population with a college degree had increased, ranging from seven percent to 22 percent.

The next major storm, a nor’easter, struck in December 1992. The effects of this storm closely paralleled those of Hurricane Sandy 20 years later. Residents throughout the East Shore experienced significant flooding, with evacuations from South Beach in the north to Oakwood Beach in the south (McPolin 1992). A New York Times report from the week after the storm suggests that about 1,000 homes and businesses were damaged on Staten Island, with the worst damage on the East Shore (New York Times 1992). Photos and stories in the Staten Island
Advance point to near-complete devastation in the Oakwood Beach neighborhood, where floodwaters reached the second story of some homes (D’Angelo 1992). Even in the face of this event, which was nearly as severe as Sandy, an Advance columnist summed up the viewpoint of some Oakwood Beach residents in a piece entitled “Unwelcome water is a fact of life here” – implicitly suggesting that relocation was not an alternative (Bruno 1992). It took Sandy, 20 years later, before this attitude, rooted in attachment to place and community, began to change in some of the highest-risk neighborhoods.

Again after the 1992 nor’easter, discussions began about additional mitigation measures to protect the East Shore communities, particularly at Oakwood Beach, where the damage was especially severe. Although a US ACE plan for Oakwood was developed relatively quickly, there were repeated delays in implementation, and work on the project did not begin until 1999. Moreover, because these places continued to evolve during these delays, a developer actually constructed new housing in one of the areas that was to become a new levee, putting additional people in harm’s way while also reducing the Corps’ ability to protect the area (O’Grady 1998). By 2000, the $2.6 million project was complete. It included building a 700-ft long, 7-ft tall levee, constructing a tide gate, and raising of a few roads in the area (Engels 2000). A contemporary news report mentions an ongoing study of more comprehensive flood protection for the East Shore area (Engels 2000), but that study does not appear to have been completed. The same article notes that the measures were intended to have “a 10-year life span.” No additional measures had been taken before Sandy’s landfall 12 years later.
Hurricane Sandy

Prior to Hurricane Sandy, the population of Staten Island and of the East Shore had continued to grow, although the pace slowed as development filled in and subdivided most of the available parcels. The tracts comprising the study area had reached a population of 64,087 by the 2010 Decennial Census, representing a 21 percent increase since the 1990 Decennial Census, a much larger population at risk. There were 25,025 housing units in 2010, also representing a 21 percent increase from 1990. This is a somewhat higher growth rate than the preceding 20-year period, but a much lower growth rate than the postwar period.

As described in the introduction to this dissertation, Sandy was an immense, powerful extratropical cyclone at the time it struck New York City. Despite the long history of flood events affecting the area, it was the first major storm to cause significant coastal flood-related damages on Staten Island in 20 years, and sufficient time had passed that the local collective knowledge of the flood risk had diminished considerably. Colten and Sumpter (2009) suggest that a similar loss of “social memory” happened in New Orleans between Hurricane Betsy in 1965 and Hurricane Katrina in 2005, and that this was an important contributor to the severity of Katrina’s effects on the city. Moreover, a mandatory evacuation had been declared for Tropical Storm Irene the previous year, but was largely experienced as a false alarm, causing only minor flooding and power outages (Porpora 2012). This is another parallel to Katrina, where experience with false alarms reduced the likelihood of evacuation for New Orleans residents as Katrina approached (Brunkard et al. 2008).

Staten Island’s East Shore, along with several low-lying coastal communities of Brooklyn and Queens, sustained the worst damage in New York City. According to a map accompanying a Staten Island Advance article commemorating the first anniversary of the storm, 18 of the 24
Staten Islanders killed by Sandy were residents of the East Shore (Yates 2013). East Shore residents thus account for 40 percent of all fatalities citywide (Brown 2013). The city government’s NYC Build it Back program, described in greater detail below, has received over 3,500 requests for assistance with repairing storm-related damage in the East Shore neighborhoods to date, accounting for over three-quarters of Staten Island’s Built it Back requests and over 15 percent of all requests citywide, a number far disproportionate to the borough’s and the neighborhoods’ populations (New York City Build It Back 2016).

**Assessing Policy Responses to Hurricane Sandy in Historical Context**

The devastation wrought by Hurricane Sandy has offered an opportunity for the East Shore neighborhoods to redefine themselves in ways that mitigate or propagate future flood risks. A broad range of policy responses have been implemented post-Sandy by actors at the federal, state, and local levels (see, e.g., Federal Emergency Management Agency 2015; New York City Office of Recovery 2016). This analysis will focus on a few of the policies likely to have the most significant impacts and that directly affect the East Shore of Staten Island and will assess the likelihood that they will change the trajectory of these places with regard to hazard risks.

In contrast to FEMA’s much-criticized response to Hurricane Katrina in New Orleans, an audit by the Department of Homeland Security Office of the Inspector General found that FEMA performed well in its response to New York City, delivering aid effectively despite significant challenges (Kelly 2013). FEMA’s contributions to disaster recovery number in the billions of dollars, including National Flood Insurance Program payouts, loans and repair costs for
individual homeowners and businesses, aid to local government for damaged infrastructure, and hazard mitigation measures.

A major flood mitigation program administered directly by a federal agency for the East Shore neighborhoods is being led by US ACE. A recently released draft proposal suggests $578 million in hard infrastructure to reduce flood risk between Fort Wadsworth and Oakwood Beach (US ACE 2015a). If adopted, this would represent the most ambitious coastal flood mitigation project ever attempted on Staten Island. The project would reconstruct and extend an existing levee at Oakwood Beach, add an additional flood wall at Oakwood Beach, and install a buried seawall/armored levee from Oakwood Beach to the border of Arrochar/South Beach and Fort Wadsworth. Costs are to be paid 65 percent with federal funds and 35 percent with state/local funds. Upkeep costs are expected to be about half a million dollars annually.

This proposal incorporates many long-discussed, never-implemented measures originally developed in response to prior flood events. The East Shore seawall deemed too expensive by Sewer Superintendent Charles P. Cole in 1932 (Staten Island Advance 1932a) became a serious proposal in the wake of major storms in the 1960s and 1970s (US ACE 1973), but for a variety of reasons described above, these proposals never came to fruition. The current proposal shares a great deal in common with the 1973 plan. The major differences are the extension of levee/sea wall structure to the area from Miller Field to Oakwood Beach, and a slight upward adjustment in the proposed height of the flood control infrastructure from 15 feet to 15.6 feet above mean sea level (US ACE 1973, 2015a).

This suggests the extent to which the policy climate evolves in tandem with places and hazard risks, and viewing this proposal in light of the history of earlier proposals suggests that there is cause for cautious optimism. Whereas the 1973 proposal suggested that one benefit of
the flood control project would be the ability to further develop these areas, the 2015 EIS explicitly states that “[c]ontinued development within the Project area may exacerbate flooding levels” and notes approvingly the city’s efforts to acquire land for wetland preservation and stormwater retention in flood risk zones (US ACE 2015a, p. 1). Moreover, this plan does not rely on the questionable assumption that beach fill and dune construction alone would be sufficient for protection of much of New Dorp Beach and Oakwood Beach. Thus, focusing on this optimistic evidence, perhaps the trajectory of these places with regard to flood risk will change moving forward.

The plan is not without its downsides, though. First, previous proposals for similar projects were never built, despite coming on the heels of major flood disasters, so it is possible that the project is never completed or that a lower-cost but less-protective alternative is built instead. One observation of structuration theory (and much other social science) is that many forces work to reinforce existing patterns of activity, and therefore disrupting engrained ways of doing things can prove particularly difficult. Second, the hazards literature is clear that government provision of flood control infrastructure can cause individuals, households, and government officials to perceive their risks as lower than they are and act accordingly (Burby 2001; Ludy and Kondolf 2012; Montz and Tobin 2008; Steinberg 2006), which may offset some of the gains associated with the project. Last, even if the project is built and works exactly as designed, US ACE predicts that 461 existing structures will still be flooded in a 100-year flood event, so the project is not a panacea for flooding in the area (US ACE 2015b).

New York State implemented two major resilience and recovery programs in Staten Island with relevance to coastal flood hazard mitigation. The first, the Buyout and Acquisition Program, was administered through the Governor’s Office of Storm Recovery that acquired
hundreds of very high flood-risk properties in Oakwood Beach, Ocean Breeze, and Graham Beach\textsuperscript{18} (New York State Governor’s Office 2013). All acquired properties within the 100-year floodplain have a deed restriction preventing future development, with most of the land being reverted to wetlands that will have flood mitigation qualities (New York City Build It Back 2016b). This is an important step, as it represents the first concerted effort on the East Shore to limit development in the highest risk portions of the floodplain strictly for flood mitigation. The demolition of bungalow communities in the 1950s and 1960s and of Cedar Grove Beach Club in 2011, described above, had similar effects, but flood mitigation was not the primary objective of those actions. Like those demolitions, this move represents a decision by powerful government actors to fundamentally alter the character of places in ways that ultimately reduce hazard risks. Although the program has been very successful overall, not all homeowners have agreed to the buyout, and there have been significant complaints about the management of the process (O’Grady 2014; Sherry 2014).

The state also funds the New York Rising Community Reconstruction program, which has proposed several major mitigation projects on the East and South Shores (New York Rising Community Reconstruction Program 2014). These range in scope from minor landscape alterations like temporary dune-building measures meant as stopgaps pending the development of the aforementioned US ACE flood control project, to larger modifications like expansion of existing green stormwater infrastructure programs such as constructed wetlands and retention areas, to business and residential rebuilding and resilience initiatives. The effects of most of these programs are likely to be small but positive – the reconstructed dunes will become redundant upon completion of the larger flood control project, the stormwater infrastructure

\textsuperscript{18} The latter two are named for former seasonal bungalow colonies and sometimes considered part of Midland Beach.
improvements will contribute modestly to lower flood risk, and much of the residential and commercial money will be administered through the city, as described below. One potential cause for concern in this program is the proposed East Shore Waterfront Vision Plan, which will, among other things, “study economic development opportunities” associated with the seawall (New York Rising Community Reconstruction Program 2014; p. 89). As is well-documented in other works, post-disaster recovery programs have often been disproportionately influenced by powerful economic actors to suit their own agendas, often in ways that are not optimal for assisting hazard recovery and mitigating future risk (Gotham 2013; Steinberg 2006).

The city has had several resilience and recovery funding mechanisms, mostly funded by $4.2 billion in funds from the U.S. Department of Housing and Urban Development’s Community Development Block Grant Disaster Recovery program (New York City Office of Recovery 2016). One is the aforementioned Build It Back Program, the primary post-Sandy housing recovery program for the city, which provides funds for residents whose homes were damaged by Sandy and whose losses were not covered by the National Flood Insurance Program. The most notable feature of this program is that houses that received damage requiring repairs worth more than 50 percent of their pre-storm value were required to be elevated to one to two feet above the FEMA base flood elevation to meet new building standards, which can be more than a full story for the homes with highest flood risk (New York City Office of Recovery 2016). This provision includes some additional homes that required complete rebuilds under the program. The city has also acquired homes via the Build it Back program to be redeveloped for uses that are more appropriate to their flood exposure. This represents a subtler but nonetheless important reconfiguration of the built environment that reduces overall risk.
Overall, this analysis suggests that perhaps post-Sandy policy proposals for Staten Island’s East Shore have taken account for many of the failings of earlier policy responses to coastal flood events in the area. Structural mitigation measures are proposed for the entire contiguous flood-exposed zone, rather than piecemeal as in prior years. Strategic retreat from the most vulnerable locations, seemingly never before considered a viable policy option, has been implemented in several areas through a buyout program. Building codes have been strengthened, and a substantial fraction of recovery aid is contingent upon the recipient taking mitigation actions. Perhaps most importantly, a wide array of strategies is being pursued, rather than narrow reliance on a small number of major projects.

There are still caveats to this optimistic conclusion, however. First, these various plans must actually be carried through to completion, and some are quite expensive and will take many years to complete. Flood mitigation plans of this scale have repeatedly failed to obtain the necessary funding or to be fully implemented in the past, both on Staten Island, as described extensively in this chapter, and elsewhere. Moreover, most of these plans fail to account completely for sea level rise. For example, the portions of Build it Back that require raising homes only raise them one to two feet above the FEMA base flood elevation, but sea level rise of 18 to 39 inches is projected by the 2080s in New York City (Horton et al. 2014). Likewise, the proposed US ACE flood control infrastructure for the East Shore is set at 15.6 feet above mean sea level, but Sandy’s maximum flood levels ranged from 13 to 16 feet along the East Shore (US ACE 2015a). Sandy was an event of extremely rare severity under current climate conditions, but even the much less severe 1992 nor’easter reached 10.6 feet above mean sea level (US ACE 2015a), and given the possibility of sea level rise of more than three feet, setting 15.6 feet as the barrier height may not prove sufficient over the medium-to-long term.
Just as importantly, many of the recovery dollars are being spent on structural mitigation based on large-scale flood control infrastructure projects. Although these approaches may be easier to sell to the public because they mostly do not require individual or household behavioral changes and provide tangible, visible results, structural mitigation alone is generally not able to fully mitigate flood risk (Mileti 1999; Wisner et al. 2003). Household- and individual-level behavior changes are much harder to induce and to maintain (Mileti 1999; Wisner et al. 2003), and perhaps even more so in an area like Staten Island where major coastal storms generally are not an annual occurrence. Chapter 5 will explore some of the individual- and household-level dimensions of recovery and resilience in the East Shore study area.

Conclusions

This chapter has demonstrated the utility of viewing hazard risk as a historically contingent process, an extension of Allan Pred’s notion that places are ever-evolving, historically contingent processes that are shaped by people and sociocultural forces and also shape those people and forces. It suggests that hazard risks evolve as places evolve, and in turn can also shape those places, and that policy and planning decisions relevant to hazard risks likewise evolve in tandem. The places of the East Shore of Staten Island first emerged in the late nineteenth century as seasonal commercial beach resorts. As they grew more popular, the footprint of these resorts on the landscape grew, precipitating the development of seasonal bungalow camps on the floodplain. During the Great Depression, broader economic forces and the growth of other, newer beach resorts resulted in the end of the seasonal resort culture of the East Shore and the eventual demolition of some of the structures at highest risk. A greatly increased demand for suburban-style housing after World War II, however, led many seasonal
structures to be expanded and converted to year-round round residences. In this process, a land use with much lower risks, commercial rental properties and second seasonal homes, was converted to a use where a major financial asset and a psychologically important place for residents was at frequent flood risk. Thus the emergence of a set of interconnected places and landscapes on the East Shore, built upon earlier land uses and transformed by internal and external forces, was closely tied to the emergence of the hazard risks realized during Hurricane Sandy.

Concurrently, hazards planning and policy, major influences on hazard risks and how they are realized during hazard events, are also historically contingent, but more importantly, represent an opportunity to reshape the future hazard risks of places in ways such that future emerging versions of places are less risky than those of today. The regular severe floods that affected the area through the early 1970s yielded minor, largely insufficient flood control measures, and several unimplemented proposals for more extensive mitigation. Responses to major flood events represented opportunities to alter the risks and risk trajectories of the East Shore, but these opportunities were not taken, for a variety of complex reasons described in this chapter. Hurricane Sandy represents another such opportunity. With a change in social, political, and cultural contexts in the form of different attitudes about development in floodplains that have emerged in recent decades and the specter of climate change-induced sea level rise, post-Sandy mitigation proposals seem to have more momentum than prior proposals. If these proposals succeed, the hazard risks on the East Shore will diminish considerably, and even the policies already implemented have greatly reduced hazard exposure in the area.

This work has at least two significant limitations. First, as with most historical studies, the analysis is restricted to material has been written about previously or that has been archived
in an accessible fashion. Many older periodicals were never archived at all, or were archived only in incomplete fashion, rendering their contemporary accounts of events unavailable. Relevant materials may be lost, damaged, or incorrectly categorized in archives. The 1890 Decennial Census rolls, for example, were destroyed (Blake 1996), and thus microdata for that census will never be available to researchers. For these reasons, it is impossible to know with complete certainty that the full picture has emerged. This chapter has attempted to overcome this limitation by carefully integrating data from a wide array of sources, but it cannot be fully eliminated.

Second, many dimensions of hazard risk are place-specific, and these attributes of place may shift over time in the process of becoming described in Chapters 1 and 2, diminishing their generalizability from the past to the present. The East Shore bungalow colonies developed as part of a “global phenomenon” of the early twentieth century, and development may have taken a different form if it had been undertaken in a different era. Likewise, Robert Moses, whose realized and unrealized plans for the area had a tremendous influence on its morphology to the present day, was a singular figure. The scope of his influence on New York City planning and policy during the period the East Shore developed has no parallel in any other city figure before or since (Caro 1974). A Moses-backed policy proposal of the 1950s was therefore generated by a very different process than a post-Sandy proposal backed by the Bloomberg mayoral administration, and the factors influencing proposal development and determining proposal success and failure are different. The intention of this chapter is not to imply that the experiences of the past will determine the success of post-Sandy proposals for the East Shore, but to suggest that an analysis of these proposals will be more accurate if it is historically informed.
Future work in this area could take several directions. First, it would be useful to extend this analysis to one or more other nearby areas that experienced similar levels of devastation during Sandy. Chapter 4 examines the degree to which differences observed may be the result of demographic compositions, but this is only one small element of the differences across places. As noted in the preceding chapter, some Staten Islanders might argue that they are uniquely neglected among the city’s five boroughs, and an analysis covering similar ground for coastal Brooklyn or Queens could test that conjecture. Similarly, Sandy-damaged areas of Long Island and New Jersey are outside the control of New York City government, and their experiences might provide additional clarity about any dimensions of historical hazard development that are specific to city government. Such analyses could also help to disentangle which aspects of ever-evolving hazard risks emerge in similar ways across places as they change over time, even as such processes are ultimately place-specific, and could therefore help to validate the practical utility of the framework of hazard risk as historically contingent process. Additional work could also interrogate prevailing attitudes about flooding, engineering, and risk in different eras and explore the degree to which that is and is not reflected in planning, policy, and development, so as to suggest whether policy has aligned and does align with the preferences of those at risk. Lastly, as governments worldwide plan for sea level rise and other locally experienced effects of global environmental changes, it will be important to analyze those policies for attention to historical experiences in the affected areas.
Chapter 4

Population Change on the East Shore and in the New York Metro Region

The population of the East Shore neighborhoods of Staten Island represents only a small fraction of the coastal area inundated by Hurricane Sandy. Although this dissertation is primarily a case study of these neighborhoods of Staten Island, and, to a lesser extent, Staten Island as a whole, in order to better contextualize the results, it is important to understand how these neighborhoods fit into the broader mosaic of Sandy-affected areas. Some of the historical forces that shaped the East Shore have strong parallels in other places affected by Sandy. Others do not. If the East Shore is dramatically different from other Sandy-affected areas, then perhaps the lessons learned in this study are unlikely to generalize well to other areas. Given the focus of this work on place-specificity, caution still must be exercised when undertaking generalization, but the analysis presented in this chapter at least suggests the potential maximum scope for such generalization.

From a theoretical perspective, the demographic attributes of a place are an important part of its character, and changing demographics are one important structural force that may reshape places over time. Moreover, population growth and changes in population composition specifically may increase, decrease, or shift hazard risks over time, and thus are important to understanding evolving hazard risks and the historical contingencies driving those risks.

As noted in Chapter 1, differences in demographic characteristics of populations affected by hazards have often been used as the basis for hazard risk or vulnerability assessment (Cutter et al. 2003; Frazier et al. 2014; Morrow 1999). Although these measures have been criticized as ineffective (Hinkel 2011), they are still widely used by academics and practitioners, and the underlying logic, that some socio-demographic groups will experience hazards differently, is
appealingly intuitive. As a result, observing changes in some population measures associated with hazard risk over time within the study area compared to other areas also affected by Sandy is one coarse way of partially disentangling the extent to which demographic changes in the study area, as opposed to other place-specific historical factors, may have been responsible for the severe impacts there.

This chapter traces several population characteristics of the East Shore study area over the period 1960 to 2010, and compares and contrasts those characteristics and changes in them over time with Staten Island as a whole, New York City as a whole, and the entire Atlantic Coast of New York and New Jersey from Cape May to the tip of Long Island. It also presents several maps of tract-level data that facilitate more detailed comparisons of distributions of demographic attributes across the study area and adjacent parts of New York and New Jersey. Although this chapter does not claim to make any novel independent contributions to the literature, it serves to help contextualize the case study focus of the other chapters of this dissertation in the broader region affected by Sandy.

**Data and Method**

Data were drawn from the National Historical Geographic Information System (NHGIS) (Minnesota Population Center 2011). The 1960 Census was the first conducted primarily by mail and the first processed primarily by computer, and for that reason could be considered the first “modern” Decennial Census in the United States. Moreover, the 1960 Census is arguably the first for which several variables are available for the study area in tract-level tabulations that also line up fairly well with tract boundaries for all subsequent censuses. It also reflects a post-World War II but pre-Verrazano Narrows Bridge Staten Island, and therefore is a suitable starting point
for the analysis. One important issue to note with the 1960 and 1970 data is that not all of the country was fully tracted prior to the 1980 census, and, as such, portions of coastal New Jersey have no tabulated population data at the tract level for those two years. All other data are from subsequent Decennial Censuses with the exception of two variables in 2010, educational attainment and nativity, which are no longer collected via the Decennial Census. These variables are taken from the 2010 5-year American Community Survey, also obtained from NHGIS.

Due to wide variation in the framing of census questions and reporting of responses across censuses, six variables were chosen as the focus of this analysis: total population, total housing units, percent of population aged under 15, percent of population aged 65 or older, percent owner-occupied housing, percent native born citizens, and percent of population whose highest level of educational attainment is high school. Due to relatively little racial variation within the study area, race variables were excluded from this analysis. Hispanicity, which could potentially be a more salient variable than race in a few tracts in the study area, is not considered due to its inconsistent treatment across censuses over time.

Total population and total housing units are a coarse measure of the people and assets exposed to hazard events. Several of the other variables are considered social dimensions of hazard risk. Elderly and youth populations are thought to be more susceptible to the effects of a hazard event than other age groups (Morrow 1999; Wang and Yarnal 2012). Foreign-born citizens are thought to be more susceptible to hazards than native-born citizens (Clark et al. 1998; Morrow 1999). Owner-occupants tend to have greater financial resources and more options for hazard mitigation and response than renters (Morrow 1999; Peacock et al. 2007), but homes are often the largest single financial asset of American families (Kochhar et al. 2011), so

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19 In 1960, this variable is only available as a dichotomous “native stock” or “foreign stock” and so cannot be directly compared with subsequent censuses.
owner occupants may also have more to lose. Individuals with more than a high school education are often of higher socioeconomic status and thus may also have greater resources to cope following a disaster (Clark et al. 1998; Morrow 1999).

Data were processed using the R statistical computing language (R Core Team 2016). Demographic data were joined to shapefiles in R and maps were generated using the ggplot2 package (Wickham 2009). Sums were calculated for the two count variables for each geography, and means were calculated for the other variables for each geography. Statistical summary tables summarizing changes in variables over time for each of the four geographies were also generated using R.

Results

At the outset of the data in 1960, the East Shore study area is broadly similar to the other geographies, but varies in some notable ways (Table 4.1). In 1960, the study area is considerably younger than the other geographies, with the lowest percentage above 65 and the highest percentage under 15. Its owner occupancy rate is in line with the rest of Staten Island, but much higher than New York City writ large. Education levels are modestly lower than the other three geographies, and nativity is a bit lower than New York City or the New York/New Jersey coast.

<table>
<thead>
<tr>
<th></th>
<th>Total Pop.</th>
<th>Housing Units</th>
<th>Percent 65+</th>
<th>Percent Aged Under 15</th>
<th>Percent Owner-Occupied</th>
<th>Percent Native Stock</th>
<th>Percent H.S. Ed. or Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
<td>36,416</td>
<td>12,581</td>
<td>8.4%</td>
<td>31.5%</td>
<td>49.0%</td>
<td>42.4%</td>
<td>89.9%</td>
</tr>
<tr>
<td>Staten Island</td>
<td>221,991</td>
<td>71,348</td>
<td>10.0%</td>
<td>28.2%</td>
<td>50.7%</td>
<td>40.4%</td>
<td>84.7%</td>
</tr>
<tr>
<td>NYC</td>
<td>7,783,277</td>
<td>3,043,102</td>
<td>10.1%</td>
<td>22.9%</td>
<td>30.1%</td>
<td>48.3%</td>
<td>83.0%</td>
</tr>
<tr>
<td>NY/NJ Coastal Counties</td>
<td>6,764,488</td>
<td>2,340,456</td>
<td>9.2%</td>
<td>25.9%</td>
<td>43.7%</td>
<td>47.1%</td>
<td>83.5%</td>
</tr>
</tbody>
</table>
Figure 4.1 displays tract-level summary information for 1960 for three of the variables on choropleth maps for New York City, including the East Shore, Staten Island study area: tenure (percent owner-occupied), nativity (percent native stock), and education (percent high school education or less). These variables were chosen as examples so as to not include a surplus of maps, because count variables cannot be mapped using choropleth maps and because there is limited variation in the age variables across New York City in these years. Owner-occupancy rates on the East Shore are on the lower side for Staten Island, but still higher than tracts in many other parts of New York City, save for outer portions of some of the other boroughs. In 1960, very few individuals on Staten Island were of native stock (native born with native born parents), and the East Shore was no exception. There are pockets of tracts with higher concentrations of native stock in each of the other four boroughs. Relatively few people in 1960 had more than a high school education, and that is apparent in the map, with many tracts having a range of 80 to 100 percent residents with no more than a high school education. At this scale, it is possible to characterize the East Shore as broadly demographically similar to many other tracts of Staten Island at this time. It is less similar to some parts of the rest of New York City, with higher owner-occupancy rates than many tracts in the rest of the city, and lower proportion native stock than some parts of Brooklyn and Manhattan. There is a much greater variety of tract compositions at the largest geography, and the East Shore is like some areas and unlike others.
Figure 4.1: Tract-Level Maps of Three Demographic Variables for New York City, 1960
By 1970, substantial changes are underway in all four areas (Table 4.2). Population grows massively in all geographies except New York City, which increases only modestly. Housing units similarly grow in three of the four geographies, although at a substantially lower pace relative to 1960 than population. Housing units actually decline slightly in New York City. Proportions of population older than 65 grow modestly in all geographies, although from a fairly low baseline. Populations under 15 decline in the study area but increase slightly in the other geographies. It is important to note that the study area’s value for this variable is still the second-highest in absolute terms in 1970, despite the decline from 1960. Percent owner-occupied increases across all geographies, and percent of population with no more than a high school education declines slightly or holds steady across all geographies.

These changes have important implications for hazard risk in the study area and in the broader region during a period in which several major coastal storms affected the region (namely Hurricane Donna in 1960, the Ash Wednesday Storm in 1962, and Tropical Storm Doria in 1971, as described in the preceding chapter). The increases in population and housing units put more people at risk, and the relatively lower hazard coping ability of older adults suggests that the increase in the population of older adults has increased overall risk. The relative decline in youth population has the opposite effect, although, as previously noted, the absolute value of this

<table>
<thead>
<tr>
<th></th>
<th>Total Pop.</th>
<th>Housing Units</th>
<th>Percent Aged 65+</th>
<th>Percent Aged Under 15</th>
<th>Percent Owner-Occupied</th>
<th>Percent Native-Born</th>
<th>Percent H.S. Ed. or Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
<td>49,680</td>
<td>16,100</td>
<td>9.7%</td>
<td>28.1%</td>
<td>55.5%</td>
<td>90.4%</td>
<td>87.8%</td>
</tr>
<tr>
<td>+36.4%</td>
<td></td>
<td>+28.0%</td>
<td>+15.5%</td>
<td>-10.8%</td>
<td>+13.3%</td>
<td>(NA)</td>
<td>-2.3%</td>
</tr>
<tr>
<td>Staten Island</td>
<td>295,363</td>
<td>89,961</td>
<td>10.6%</td>
<td>28.3%</td>
<td>56.8%</td>
<td>90.1%</td>
<td>82.3%</td>
</tr>
<tr>
<td>+33.1%</td>
<td></td>
<td>+26.1%</td>
<td>+6.0%</td>
<td>+0.4%</td>
<td>+12.0%</td>
<td>(NA)</td>
<td>-2.3%</td>
</tr>
<tr>
<td>NYC</td>
<td>7,884,118</td>
<td>2,924,323</td>
<td>12.3%</td>
<td>23.2%</td>
<td>32.6%</td>
<td>81.4%</td>
<td>83.0%</td>
</tr>
<tr>
<td>+1.3%</td>
<td></td>
<td>-3.9%</td>
<td>+21.8%</td>
<td>+1.3%</td>
<td>+8.3%</td>
<td>(NA)</td>
<td>0.0%</td>
</tr>
<tr>
<td>NY/NJ Coastal Counties</td>
<td>8,613,053</td>
<td>2,816,607</td>
<td>10.8%</td>
<td>26.0%</td>
<td>51.9%</td>
<td>85.2%</td>
<td>81.5%</td>
</tr>
<tr>
<td>+27.3%</td>
<td></td>
<td>+20.3%</td>
<td>+17.4%</td>
<td>+0.4%</td>
<td>+18.8%</td>
<td>(NA)</td>
<td>-2.4%</td>
</tr>
</tbody>
</table>
variable remains fairly high in the study area. The modest decline in the higher-risk category of individuals with lower educational attainment also decreases overall risk. The increases in owner-occupied housing have the previously noted opposing effects on risk: an increase in socioeconomic status and therefore coping resources, but also an increase in the proportion of wealth tied up in an asset that can be badly damaged by a storm.

The 1980s were a period during which no major coastal storms affected Staten Island. Nonetheless, several factors contributed to increasing hazard risks during this period (Table 4.3). Populations continued to rise, except in New York City, where they actually declined, one of only two intercensal periods in the city’s history where this has occurred. Housing units increased across all four geographies, with the largest increases in Staten Island as a whole, but with sizable increases in the study area and the New York/New Jersey coastal counties as well.

Table 4.3: Summary of 1980 Census Data

<table>
<thead>
<tr>
<th>Geographical Region</th>
<th>Total Pop.</th>
<th>Housing Units</th>
<th>Percent 65+</th>
<th>Percent Aged Under 15</th>
<th>Percent Owner-Occupied</th>
<th>Percent Native-Born</th>
<th>Percent H.S. Ed. or Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
<td>52,919</td>
<td>18,572</td>
<td>12.4%</td>
<td>20.2%</td>
<td>56.0%</td>
<td>90.6%</td>
<td>79.2%</td>
</tr>
<tr>
<td></td>
<td>+6.5%</td>
<td>+15.4%</td>
<td>+27.8%</td>
<td>-28.1%</td>
<td>+0.9%</td>
<td>+0.2%</td>
<td>-9.8%</td>
</tr>
<tr>
<td>Staten Island</td>
<td>351,968</td>
<td>118,968</td>
<td>11.9%</td>
<td>21.7%</td>
<td>55.5%</td>
<td>87.5%</td>
<td>69.0%</td>
</tr>
<tr>
<td></td>
<td>+19.2%</td>
<td>+32.2%</td>
<td>+12.3%</td>
<td>-23.3%</td>
<td>-2.3%</td>
<td>-2.9%</td>
<td>-16.2%</td>
</tr>
<tr>
<td>NYC</td>
<td>7,070,625</td>
<td>2,946,378</td>
<td>12.2%</td>
<td>18.6%</td>
<td>28.3%</td>
<td>73.4%</td>
<td>70.0%</td>
</tr>
<tr>
<td></td>
<td>-10.3%</td>
<td>+0.8%</td>
<td>-0.8%</td>
<td>-19.8%</td>
<td>-13.2%</td>
<td>-9.8%</td>
<td>-15.7%</td>
</tr>
<tr>
<td>NY/NJ Coastal Counties</td>
<td>8,800,511</td>
<td>3,330,400</td>
<td>12.0%</td>
<td>20.2%</td>
<td>50.8%</td>
<td>80.1%</td>
<td>69.4%</td>
</tr>
<tr>
<td></td>
<td>+2.2%</td>
<td>+18.2%</td>
<td>+11.1%</td>
<td>-22.3%</td>
<td>-2.1%</td>
<td>-6.0%</td>
<td>-14.8%</td>
</tr>
</tbody>
</table>

Proportion of older adults increased sizably in all geographies except New York City, but again from a fairly modest baseline. There are substantial reductions in the youth proportion of the population in all geographies.

By 1990, New York City was growing again, but much of the population growth on Staten Island was outside the study area (Table 4.4). Housing within the study area continued to grow, indicating smaller household sizes in the area. The same was also true of Staten Island as a
whole, but not of New York City. Changes in factors affected exposure and risk in this census are important as it shortly predates the last major damaging coastal storm prior to Sandy, the 1992 Nor’easter. The study area became proportionally older between 1980 and 1990, with the percentage of older adults greatly increasing and the percentage of under-15 youths moderately decreasing. The trend in older adult populations is not matched in any of the other three geographies, but the trend in youth population is in line with Staten Island as a whole, and there is a relative decline in all geographies, albeit a smaller one in the other two. The percentage of population with a high school education or less declined considerably, indicating increasing socioeconomic status; the trend in owner-occupancy of housing, also an SES measure, moved in the same direction but with a smaller magnitude. Percent native-born decreased modestly.

Because there were no major coastal storms affecting the study area between 1992 and 2012, and to reduce the need for excessive repetition, 2000 and 2010 data are summarized together in Tables 4.5 and 4.6. Between 1990 and 2010, the population and number of housing units grew more quickly than New York City or the NY/NJ Coast region. The proportion of older adults in the population fell in the study area and in New York City during this period, but stayed relatively constant across the other geographies. The youth proportion increased in the

<table>
<thead>
<tr>
<th></th>
<th>Total Pop.</th>
<th>Housing Units</th>
<th>Percent 65+</th>
<th>Percent Aged Under 15</th>
<th>Percent Owner-Occupied</th>
<th>Percent Native-Born</th>
<th>Percent H.S. Ed. or Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
<td>53,120</td>
<td>20,636</td>
<td>15.4%</td>
<td>18.0%</td>
<td>58.5%</td>
<td>88.6%</td>
<td>65.1%</td>
</tr>
<tr>
<td>Staten Island</td>
<td>378,971</td>
<td>139,726</td>
<td>11.8%</td>
<td>-10.9%</td>
<td>+4.5%</td>
<td>-2.2%</td>
<td>-17.8%</td>
</tr>
<tr>
<td></td>
<td>+7.7%</td>
<td>+17.4%</td>
<td>-0.8%</td>
<td>-13.8%</td>
<td>+4.5%</td>
<td>-4.6%</td>
<td>-20.9%</td>
</tr>
<tr>
<td>NYC</td>
<td>7,322,301</td>
<td>2,992,169</td>
<td>12.3%</td>
<td>18.0%</td>
<td>32.4%</td>
<td>69.5%</td>
<td>58.3%</td>
</tr>
<tr>
<td></td>
<td>+3.6%</td>
<td>+1.6%</td>
<td>+0.8%</td>
<td>-3.2%</td>
<td>+14.5%</td>
<td>-5.3%</td>
<td>-16.7%</td>
</tr>
<tr>
<td>NY/NJ Coastal Counties</td>
<td>9,216,948</td>
<td>3,574,555</td>
<td>13.0%</td>
<td>18.6%</td>
<td>53.6%</td>
<td>77.0%</td>
<td>56.0%</td>
</tr>
<tr>
<td></td>
<td>+4.7%</td>
<td>+7.3%</td>
<td>+8.3%</td>
<td>-7.9%</td>
<td>+5.5%</td>
<td>-3.9%</td>
<td>-19.3%</td>
</tr>
</tbody>
</table>
study area to 2010, but then decreased to below the 1990 level, a pattern followed at all geographies. The proportion of housing occupied by owner increased slightly at all geographies. The percentage native-born declined modestly at all geographies, although particularly acutely in the study area. Last, the percentage with only a high school education or less declined across all four geographies, likely mostly a reflection of broader national trends, but perhaps partly a reflection of ever-increasing New York City housing prices, although one might conjecture that might also drive down the owner occupancy rate.

Table 4.5: Summary of 2000 Census Data

<table>
<thead>
<tr>
<th></th>
<th>Total Pop.</th>
<th>Housing Units</th>
<th>Percent 65+</th>
<th>Percent Aged Under 15</th>
<th>Percent Owner-Occupied</th>
<th>Percent Native-Born</th>
<th>Percent H.S. Ed. or Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
<td>59,494</td>
<td>23,180</td>
<td>15.3%</td>
<td>19.6%</td>
<td>59.1%</td>
<td>84.1%</td>
<td>58.3%</td>
</tr>
<tr>
<td></td>
<td>+12.0%</td>
<td>+12.3%</td>
<td>-0.6%</td>
<td>+8.9%</td>
<td>+1.0%</td>
<td>-5.1%</td>
<td>-10.4%</td>
</tr>
<tr>
<td>Staten Island</td>
<td>443,728</td>
<td>163,993</td>
<td>11.5%</td>
<td>20.0%</td>
<td>59.3%</td>
<td>80.0%</td>
<td>48.5%</td>
</tr>
<tr>
<td></td>
<td>+17.1%</td>
<td>+17.4%</td>
<td>-2.5%</td>
<td>+7.0%</td>
<td>+2.2%</td>
<td>-4.2%</td>
<td>-11.2%</td>
</tr>
<tr>
<td>NYC</td>
<td>8,008,278</td>
<td>3,200,912</td>
<td>10.7%</td>
<td>19.0%</td>
<td>32.7%</td>
<td>61.8%</td>
<td>51.5%</td>
</tr>
<tr>
<td></td>
<td>+9.4%</td>
<td>+7.0%</td>
<td>-13.0%</td>
<td>+5.6%</td>
<td>+0.9%</td>
<td>-11.1%</td>
<td>-11.7%</td>
</tr>
<tr>
<td>NY/NJ Coastal</td>
<td>10,123,603</td>
<td>3,860,952</td>
<td>12.3%</td>
<td>19.7%</td>
<td>54.2%</td>
<td>70.2%</td>
<td>49.4%</td>
</tr>
<tr>
<td></td>
<td>+9.8%</td>
<td>+8.0%</td>
<td>-5.4%</td>
<td>+5.9%</td>
<td>+1.1%</td>
<td>-8.8%</td>
<td>-11.8%</td>
</tr>
</tbody>
</table>

Table 4.6: Summary of 2010 Census Data

<table>
<thead>
<tr>
<th></th>
<th>Total Pop.</th>
<th>Housing Units</th>
<th>Percent 65+</th>
<th>Percent Aged Under 15</th>
<th>Percent Owner-Occupied</th>
<th>Percent Native-Born</th>
<th>Percent H.S. Ed. or Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
<td>64,087</td>
<td>25,025</td>
<td>14.5%</td>
<td>17.0%</td>
<td>61.1%</td>
<td>75.1%</td>
<td>49.3%</td>
</tr>
<tr>
<td></td>
<td>+7.7%</td>
<td>+8.0%</td>
<td>-5.2%</td>
<td>-13.3%</td>
<td>+3.4%</td>
<td>-10.7%</td>
<td>-15.4%</td>
</tr>
<tr>
<td>Staten Island</td>
<td>468,730</td>
<td>176,656</td>
<td>11.7%</td>
<td>18.2%</td>
<td>60.0%</td>
<td>77.7%</td>
<td>44.6%</td>
</tr>
<tr>
<td></td>
<td>+5.6%</td>
<td>+7.7%</td>
<td>+1.7%</td>
<td>-9.0%</td>
<td>+1.2%</td>
<td>-2.9%</td>
<td>-8.0%</td>
</tr>
<tr>
<td>NYC</td>
<td>8,175,133</td>
<td>3,371,062</td>
<td>11.0%</td>
<td>16.5%</td>
<td>32.8%</td>
<td>59.9%</td>
<td>45.5%</td>
</tr>
<tr>
<td></td>
<td>+2.1%</td>
<td>+5.3%</td>
<td>+2.8%</td>
<td>-13.2%</td>
<td>+0.3%</td>
<td>-3.1%</td>
<td>-11.7%</td>
</tr>
<tr>
<td>NY/NJ Coastal</td>
<td>10,425,653</td>
<td>4,106,625</td>
<td>12.9%</td>
<td>17.4%</td>
<td>54.5%</td>
<td>68.2%</td>
<td>43.7%</td>
</tr>
<tr>
<td></td>
<td>+3.0%</td>
<td>+6.4%</td>
<td>+4.9%</td>
<td>-11.7%</td>
<td>+0.6%</td>
<td>-2.8%</td>
<td>-11.5%</td>
</tr>
</tbody>
</table>

Figure 4.2, similar to Figure 4.1, displays tract-level maps for New York City of tenure, nativity status, and educational attainment in 2010. The East Shore’s owner-occupancy rates are
comparable to much of the rest of Staten Island, but Staten Island’s rates are in turn much higher than most of the rest of the city, with the exception of some tracts on the outer portions of Queens and Brooklyn. The East Shore tracts have nativity rates that are on the lower side for Staten Island, but still higher than many other parts of New York City, particularly some portions of Queens and Brooklyn (although different tracts than referenced in the previous sentence). The East Shore tracts have comparable rates of low educational attainment to the rest of Staten Island, and these rates are also lower than most of the rest of New York City, although the pattern of rates in the other boroughs is different for this variable than the others, with high concentrations of low attainment in much of the Bronx and variables patterns in the other three boroughs.
Figure 4.2: Tract-Level Maps of Three Demographic Variables for New York City, 2010
To summarize, between 1960 and 2010, the following changes occurred, with the stated potential implications for hazard risk. It is important to note again that relationships between indicators of risk and actual experienced risk are not exact and are meant to identify general trends hypothesized by and observed in prior research.

- Population and housing units roughly doubled in both the study area and Staten Island as a whole, and grew by hundreds of thousands in the other geographies, greatly increasing the number of people and assets exposed to hazards.
- Like the U.S. population more generally, the proportion 65 and older grew in all geographies, and although the study area was the lowest of the four in 1960 and the highest of the four in 2010, the differences are modest. The increase in proportion of older adults may have increased hazard risk.
- The percent youth population declined precipitously in all geographies between 1960 and 2010, but given that the country was still in the midst of the postwar baby boom in 1960, this is perhaps unsurprising. The decrease in proportion of youth may decreased hazard risk.
- Proportion native-born does not track clearly for the 1960 to 2010 period due to different framing of the variable in the 1960 data, but there is a substantial decrease from 1970 to 2010, which may have been associated with an increase in hazard risk.
- The proportion of housing occupied by its owner increased in all four geographies during this period, although by much less in New York City than in the other three. As previously noted, owner occupancy has two opposing potential relationships with social risk associated with hazard events: increasing the proportion of a given household’s
assets tied up in an exposed asset, but also potentially indicating a higher level of socioeconomic status more generally.

- Average educational attainment also increased in all four geographies, reflecting a more general trend in educational attainment in the United States during this period. As higher levels of education generally indicate higher socioeconomic status, this may indicate a reduced level of hazard risk.

**Discussion**

The demographic trends reflected in this analysis help to set the East Shore study area in the context of the rest of Staten Island, the rest of New York City, and the region more broadly during the period 1960 to 2010. By the time Sandy struck, the study area represented about 14 percent of the population and housing units on Staten Island. It had a slightly older population than Staten Island as a whole, with both higher older adult proportion and lower youth proportion of population. Nativity was similar to Staten Island as a whole, but much higher than New York City or the New York/New Jersey coastal region. Similarly, owner occupancy was similar to Staten Island as a whole, but much higher than the other two geographies. Proportion of population with no more than a high school education was a bit higher than Staten Island as a whole.

In most censuses and over time, trends in the study area reflect broadly similar trends at the other geographies. Generally speaking, and unsurprisingly, the East Shore study area tracks more closely with Staten Island as a whole than it does with the other, larger geographies. Most notably, the period 1960 to 2010 was a time of steady population and housing growth in the study area, which was not consistently true of New York City, where population and housing
actually declined during the 1970s, despite the population and housing growth on Staten Island. Nonetheless, the East Shore study area can be said to be broadly representative of the demographic attributes of the other geographies. Therefore, differences in Sandy impacts between the study area and these other areas, which were also affected by Sandy, are likely to be the result of other factors rather than demographic attributes.

Conclusions

This chapter examined the historical trajectory of population characteristics for the East Shore study area, for Staten Island, for New York City, and for the coastal counties of New York and New Jersey affected by Hurricane Sandy. This analysis achieved two important goals. First, it supplemented the analyses in the previous two chapters by contextualizing Staten Island and the East Shore within the broader New York City metro region. In broad strokes, the East Shore experienced many of the same demographic changes that the city and region did over the same time period, and the demographic forces shaping it were similar, particularly when considering the full 1960 to 2010 span. The East Shore has long been, and remains, more similar to the rest of Staten Island than the other geographies, which is perhaps unsurprising given the differences between Staten Island and the rest of New York City laid out in the preceding two chapters. Pronounced differences between the East Shore/Staten Island and the other geographies exist in terms of tenure and nativity, with smaller differences for the other variables, but these differences are primarily driven by the inclusion of New York City in the other two geographies, which is something of a demographic outlier among U.S. cities. The maps presented in Figures 4.1 and 4.2 also make it clear that at finer tract-level scales, there is considerably more variation in some locations, although less on Staten Island than in other areas.
Second, the analysis addressed the implications of variations in demographic characteristics for hazard risk in the study area compared to other geographies. Given the broad similarities demonstrated between the study area and the larger geographies for several of the variables examined, this effort was less informative than anticipated. This suggests that of the potential drivers for variation in risk between the study area and other areas affected by Sandy, demographic composition may not be the most salient factor, and rather some of the other factors discussed in Chapter 3 may be more important. Nonetheless, particularly with regard to tenure and nativity, the East Shore and Staten Island appear to differ in ways that have implications for hazard risks. Tenure has potentially contradictory effects, but more likely decreasing risk more than increasing it, based on the ways this measure has been deployed in prior studies (Morrow 1999; Peacock et al. 2007). Nativity also likely represents a lower risk for the East Shore and Staten Island than the other geographies, again based on prior work (Clark et al. 1998; Morrow 1999). The next chapter will examine the relationships between several demographic attributes, including some of those examined here, and perceived hazard recovery, which can be considered a measure of the realization of hazard risks for residents of hazard-affected places.
Chapter 5

Place Attachment and Recovery after Sandy on Staten Island’s East Shore

Damaged and destroyed settlements have been rebuilt in vulnerable places throughout human history. Even the most destructive hazard events, those causing thousands of deaths and leveling large swaths of cities, rarely deter the affected communities from rebuilding (Vale and Campanella 2005b). This is often true even in places where similar events are likely to occur again in the future, such as in cities built near or on active fault lines or those built on low-lying hurricane-prone coastlines (Steinberg 2006). This is another manifestation of the notion that places are embedded in historical events and processes, and of the insights of structuration theory. As noted in previous chapters, even as places are constantly being remade by sociocultural contexts and individuals, places are influencing those contexts and the individuals embedded in them. One result of this process is the formation of attachments to places by the people and institutions that live in and around them.

Thus, one reason that residents choose to rebuild after a disaster is because the attachment they feel to their communities outweighs their perceived risk of remaining in them (Henry 2013; Kytola et al. 2015). Fundamentally reshaping a place after a disaster might decrease (or increase) hazard risk, but rebuilding it just as it was will, by definition, maintain the same risks that existed before. Prior research has also suggested that an association exists between place attachment and the capacity for resilience and recovery in post-disaster contexts at both community and individual levels (Cope et al. 2013; Cox and Perry 2011; Cutter et al. 2010; Vale and Campanella 2005a). The implications of place attachment for resilience differ across scales. At a very local level, an association between stronger attachment to the community and ability to recover from a disaster suggests that place attachment is a boon to resilience. At the
scale of a broader region, place attachment may actually be an impediment to long-term resilience, as it reduces the likelihood that strategically abandoning areas with especially high exposure to hazards will be considered a viable option. Both possibilities suggest the critical importance of more concretely establishing the link between place attachment and disaster resilience.

Drawing on data from a structured survey of Staten Island residents in neighborhoods severely damaged by Hurricane Sandy, this study examines relationships between neighborhood-level place attachment and post-Sandy recovery. New York City, a city whose numerous and diverse neighborhoods are widely discussed in popular and academic writing (Grynbaum 2012; Jackson et al. 2010; Lobo et al. 2002; Mollenkopf 1993; New York City Planning 2014) and also a city that bore the brunt of some of Sandy’s most severe impacts (Blake 2013; Bloch et al. 2012; Keller et al. 2012), provides a particularly suitable location to study the relationships between place attachment and disaster recovery. Specifically, this study tests the hypothesis that place attachment is positively associated with recovery from Hurricane Sandy in several neighborhoods in Staten Island, New York. Based on prior work in this area, cited below, it is hypothesized that this relationship would exist because individuals with greater attachments would be those whose “biographies,” to use Pred’s language (1984, p. 282), are bound up in a place, and who would have both a strong desire to rebuild after Sandy and strong connections in the community to enable them to do so. It does so using two proxy measures of place attachment, namely neighborhood satisfaction and years at current residence. These terms are defined in greater detail in the next section.

This chapter makes three main contributions to the literature. First, it provides empirical evidence that place attachment is linked to recovery from a major hurricane disaster, a context
where such evidence is scant, expanding the body of evidence on correlates of disaster recovery and resilience. Second, it contributes to the growing literature on the effects of, and recovery from, Hurricane Sandy, the second-most expensive hurricane event in United States history (Leins 2014). Third, it examines another mechanism, beyond those detailed in Chapter 3, through which the becoming of places is linked to hazard risk.

**Place, Community, Resilience, and Recovery**

In recent years, the natural hazards literature has increasingly focused on the resilience of communities in the face of hazard events. Resilience, a concept borrowed from ecology (Holling 1973), is the capacity of systems “to withstand a wide array of shocks and stresses” (Leichenko 2011). Traditionally hazards research has more often focused on the vulnerability of places to hazard events, aiming to better prepare governments and residents, to undertake mitigation measures, and to predict where additional resources might be required if a hazard event occurs (Adger 2006; Burton et al. 1993; Cutter 1996; Wisner et al. 2003). Although frameworks relating to vulnerability and even the precise definition of the term itself remain a subject of academic debate (Fuchs et al. 2012; O’Brien et al. 2007), vulnerability is relatively well-understood, and there is an extensive literature on social and environmental determinants of hazard vulnerability (Cardona et al. 2012; Cutter et al. 2003; Fothergill 1996; Fothergill and Peek 2004; Fothergill et al. 1999; Morrow 1999).

The literature on hazard resilience has grown rapidly in recent years, but the social and environmental determinants of resilience are not as widely agreed upon as the determinants of vulnerability. Nonetheless, several existing studies point to the importance of place and community attachment in influencing communities’ ability to recover from disasters and thus
their disaster resilience, the relationship that is the focus of this study. Place attachment in this study refers to “an emotional connection to one’s neighborhood or city” (Norris et al. 2008), and may be considered either separately from (Cox and Perry 2011; Norris et al. 2008) or in conjunction with (Lee and Blanchard 2012; Mishra et al. 2010) one’s connection to the people who live there. The latter concept, connection to people, is sometimes called “sense of community” or “community attachment.” This study relies on the premise that attachments to a place itself and attachments to the people who live there are sufficiently intertwined that in practical terms they cannot be considered separately.

In one widely cited framework, the process by which people become attached to places is based on three dimensions: cognitive, affective, and behavioral (Scannell and Gifford 2010). The cognitive dimension consists of knowledge and organization of a place’s details – familiarity with cultural and biophysical features (Fullilove 1996; Scannell and Gifford 2010). The affective dimension refers to emotional relationships residents have with a place, both positive and negative (Manzo 2005; Scannell and Gifford 2010). The behavioral dimension refers to “proximity-maintaining” and social support actions (Scannell and Gifford 2010, p. 4), such as length of residence (Goudy 1982; Hay 1998; Kasarda and Janowitz 1974; Riger and Lavrakas 1981) and participation in neighborhood groups and activities (Riger and Lavrakas 1981). The explanation of the place attachment measures employed in this study, below, will return to these dimensions.

One widely cited recent effort to synthesize the socio-demographic determinants of hazard and disaster resilience was undertaken by the geographer Susan Cutter and colleagues (2010), who developed an index-based quantitative resilience indicator based on their Disaster Resilience of Place model (Cutter et al. 2008). The components of this index included seven to
eight variables in each of five categories: social, economic, institutional, and infrastructure resilience; and community capital. Most notably in the context of this study, two of the community capital indicators were proxy measures of place attachment: net international migration and percent of population born in a place still residing there (Cutter et al. 2010). The latter indicator, based on Vale and Campanella (2005a), is close to one of the two measures of place attachment employed in this study. Specifically, this study measures the length of time an individual has lived in their current residence. As described above, this has previously been used as a measure of the behavioral dimension of place attachment (Kasarda and Janowitz 1974; Riger and Lavrakas 1981).

The other measure of place attachment in this study, neighborhood satisfaction, is based on a measure in the Census Bureau’s American Housing Survey (AHS). Measures of neighborhood satisfaction have a long history in urban research and have repeatedly been shown to be strongly associated with neighborhood attachment (Adriaanse 2007; Fried 1982; Hipp 2009; Miller et al. 1980; Ringel and Finkelstein 1991). Neighborhood satisfaction measures capture the affective dimension of place attachment described above. Such measures rely on an assumption that residents are able to aggregate their assessment of positive and negative features of their neighborhoods into a numeric rating.

Much of the limited prior work on the relationship between community/place attachment and disaster resilience has taken inspiration from community psychology, specifically examining the relationship between individual psychological disaster resilience and community attachment. Cox and Perry (2011), drawing from qualitative data collected in a wildfire-affected community in British Columbia, argue that sense of place is fundamental to the process of disaster recovery and is “the ground upon which […] community disaster resilience [is] built.” Mishra et al. (2010)
found links between place attachment and disaster preparedness, one dimension of resilience, in Orissa, India. Cohen et al. (2013) observed a positive association between perceived community resilience more generally and place attachment in small and medium-sized towns in Israel. Cope et al. (2013) found lower negative mental health consequences of the BP Deepwater Horizon oil disaster for coastal Louisianans reporting higher levels of community attachment. By contrast, Lee and Blanchard (2012) found that community attachment was actually associated with negative affect in respondents in three coastal Louisiana parishes in the immediate aftermath of the BP Deepwater Horizon oil disaster. Mental health and affect are indicators of individual resilience, and this evidence suggests that the relationship between resilience and place attachment is a complex one.

Place attachment is also linked to recovery, a concept which is closely related to but distinct from resilience (Chamlee-Wright 2010; Miller and Rivera 2010). Whereas resilience, as previously noted, refers to an ability to cope with hazard-related shocks and stresses, recovery is the gradual process of making it possible to return to normal routines or develop new ones in a disaster-affected place (Aldrich 2012, pp. 5-7). Thus, one could argue that the successes and failures of post-disaster recovery in a place represent the realization of pre-disaster resilience in that place. Therefore, an assessment of post-disaster recovery in a particular place may suggest lessons for increasing resilience prior to another disaster in that location and in others.

**Study Area**

Staten Island, although New York City’s smallest borough, would be a large city in its own right if it were independent. It is home to nearly 500,000 people across dozens of neighborhoods, several of which experienced severe storm surge-related flooding during Sandy.
Five such neighborhoods on the island’s East Shore are the focus of this study: Arrochar, South Beach, Midland Beach, New Dorp, and Oakwood. Sandy’s impacts were particularly severe in portions of these neighborhoods, making them an appropriate site to study post-Sandy recovery. At Oakwood Beach, the hardest-hit East Shore neighborhood, storm surge reached a peak of 2.4 meters (Paulsen 2013). Fourteen residents of the East Shore neighborhoods were killed during the storm (Keller et al. 2012).

Figure 3.1 in the preceding chapter shows the location of the study area on Staten Island. The neighborhoods comprising the study area are predominantly white and middle class, with stable or slightly declining populations at the time Sandy struck. Table 4.1 summarizes some basic demographic attributes of the area.

Table 5.1: Demographic Characteristics of Census Tracts Comprising Study Area

<table>
<thead>
<tr>
<th>Total Population</th>
<th>63,356</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Age</td>
<td>40.17</td>
</tr>
<tr>
<td>Percent Female</td>
<td>51.48%</td>
</tr>
<tr>
<td>Percent Hispanic and/or Non-White</td>
<td>26.29%</td>
</tr>
<tr>
<td>A Language Other Than English is Sometimes Spoken at Home</td>
<td>38.34%</td>
</tr>
<tr>
<td>Percent of Population with Less than a Bachelor’s Degree</td>
<td>43.73%</td>
</tr>
<tr>
<td>Percent of Occupied Housing Units Occupied by Owner</td>
<td>67.25%</td>
</tr>
<tr>
<td>Median Income</td>
<td>$33,327</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2008-2012 American Community Survey

Data

A pen-and-paper survey was mailed to 1,000 residents of several Staten Island neighborhoods, 872 to the five that are the focus of this study and the remainder to a sixth non-contiguous area on the opposite side of the island that also experienced significant Sandy-related flooding. Pre-notification cards were sent to respondents two weeks before the mailing, and –
except for those addresses for which the initial mailing was returned undeliverable – one follow-up survey was mailed approximately six weeks after the initial mailing to all households who had not yet returned a survey.

Mailing addresses for residents of the five neighborhoods were obtained from address broker InfoUSA based on a map polygon representing the study area. The broker was asked to select addresses randomly from within the polygon. Fifteen hundred addresses were purchased, geocoded, and mapped in Esri ArcGIS, where a small number of addresses falling outside the study area were removed. A random subset of the remaining addresses, stratified by neighborhood, were then selected for mailing.

This analysis is based on 108 responses to the 872 surveys sent to residents of the East Shore neighborhoods. Because the relatively small number of responses in each neighborhood made neighborhood-level inference impossible, responses from all five neighborhoods were pooled. The survey asked respondents a range of questions about their experiences with Hurricane Sandy, their attitudes toward their neighborhoods, their perceptions of their vulnerability to future storms, and their general demographic characteristics. Respondents were asked a mixture of dichotomous and multiple choice questions, Likert scale items, and open-ended prompts. Only 49 of the responses are truly 100 percent complete cases, but item-level non-response rates vary considerably by question and are fairly low for many of the key variables of interest. Missing data are addressed with multiple imputation, described in the Methods section below. Summary statistics, including the number of observations, are presented for the variables considered in this study in Table 4.2.
Table 5.2: Summary Statistics for Survey Variables Included in Regression Models

<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>Max</th>
<th>Median</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Moran's I*</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Things are Back to Normal</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>2.65</td>
<td>1.10</td>
<td>-0.04</td>
<td>103</td>
</tr>
<tr>
<td>Neighborhood Rating</td>
<td>1</td>
<td>10</td>
<td>7</td>
<td>7.07</td>
<td>1.59</td>
<td>0.04</td>
<td>104</td>
</tr>
<tr>
<td>Sandy Damaged Property</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.85</td>
<td>0.36</td>
<td><strong>0.19</strong></td>
<td>108</td>
</tr>
<tr>
<td>Years at Current Residence</td>
<td>0.1</td>
<td>8.4</td>
<td>1.65</td>
<td>2.11</td>
<td>1.63</td>
<td>-0.07</td>
<td>106</td>
</tr>
<tr>
<td>Insurance Claims Paid</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2.21</td>
<td>1.27</td>
<td>-0.04</td>
<td>77 **</td>
</tr>
<tr>
<td>Satisfied with FEMA Response</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2.28</td>
<td>1.17</td>
<td>-0.07</td>
<td>99</td>
</tr>
<tr>
<td>Year Born</td>
<td>2.5</td>
<td>8.7</td>
<td>5.9</td>
<td>5.89</td>
<td>1.28</td>
<td>-0.02</td>
<td>104</td>
</tr>
<tr>
<td>Owns Home</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.86</td>
<td>0.35</td>
<td>0.06</td>
<td>105</td>
</tr>
<tr>
<td>Is Female</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.57</td>
<td>0.50</td>
<td>0.01</td>
<td>106</td>
</tr>
<tr>
<td>Primary Language is Not English</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.18</td>
<td>0.38</td>
<td><strong>0.14</strong></td>
<td>106</td>
</tr>
<tr>
<td>Education Level**</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1.67</td>
<td>0.47</td>
<td>0.09</td>
<td>107</td>
</tr>
</tbody>
</table>

* Moran’s I value based on 4 neighbors. Moran’s I values presented are based on one of the five full imputed datasets to better reflect autocorrelation in the data actually used in the regression models. Bolded value significant at p <0.05.

** Individuals who answered this question “not applicable” are excluded from the complete cases alongside the individuals who did not answer the question.

**+** The distribution of the education level variable is 36 high school or less, 71 undergraduate or higher.

The primary outcome variable of interest is recovery from Hurricane Sandy. This variable is measured by respondent agreement with a one to four Likert scale item stating “Things are back to normal after Sandy.” Responses to this item are fairly well distributed, with 22 respondents selecting one, 18 respondents selecting two, 33 respondents selecting three, and 30 respondents selecting four.

The primary independent variables of interest are two dimensions of place attachment: years the respondent has been at their current residence, expressed in years divided by ten, and neighborhood satisfaction. Measuring place attachment is challenging. The survey asked respondents a range of questions related to neighborhood attachment based on past major urban research surveys (Earls et al. 1994; Lee and Campbell 1988), which were then subjected to
principal components analysis and tested in regression models. Ultimately this approach did not yield any apparent statistical or interpretative advantages over the simpler measures, so the latter were the place attachment measures selected for inclusion in the final models.

A variety of demographic variables are included as controls. Although the sample is not random, many demographic characteristics in the sample are generally similar to those in the study area as a whole, as presented in Table 4.1. For example, 33% of sample respondents have a high school education or less, whereas 38% of residents of the study area have a high school education or less as of the 2012 ACS. Similarly, the sample is 57% female, compared to 52% in the actual population. That said, some measures diverge by a greater amount, such as median age (59 in the sample vs. 41 in the ACS). Of course, given that the Census median age measure is a total population measure, whereas only heads of household or their spouses are likely to answer the survey, this divergence may be substantially smaller than it appears. In any case, the sample is believed to be broadly representative of the local population, but caution should be taken not to overgeneralize findings to a larger population.

Methods

This chapter relies on quantitative regression models to test its hypothesis. Preliminary bivariate tests are performed using Pearson correlations. Based on the hypothesis laid out above, the hazards and disasters literature, and the correlations identified in the bivariate tests, several regression models are then fitted.

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20 The complete survey instrument as mailed to respondents is available in the Appendix.
Because the outcome variables of interest are Likert scale items and consist of ordered categorical data, Ordinary Least Squares regression is not appropriate and ordinal logistic models must be used. These models are of the form

\[
\text{odds}(Y \leq i) = \logit^{-1}(\beta_0 + \beta_1 X_1 + \cdots + \beta_m X_m) + \epsilon, \; i = 1, \ldots, k
\]

where Y is the dependent variable of interest, \(\beta_0\) is an intercept, \(X_m\) are independent variables, \(\beta_m\) is a regression coefficient, \(i\) is one of each of the cutoff points in the ordinal variable, \(k+1\) is the number of categories in the ordinal variable, and \(\epsilon\) is an error term (Bender and Grouven 1997). This specifies the cumulative odds at each cut point (1, 2, and 3 in this case), meaning that the probability of each additional level of the ordinal variable are the odds of that outcome relative to the combined probability of each of the lower levels. A model with a second-level random effects term (Bender and Grouven 1997) was tested using the `clmm` function in the `ordinal` package in R (Christensen 2015), but given the minimal effects of the more complex model on the relationships identified with key independent variables of interest and the very low levels of spatial autocorrelation in the data, as reflected in the low and mostly insignificant Moran’s I values presented in Table 4.2, the simpler model is presented here.

Ordinal logistic regression models were fitted using the `svyolr` function in the `survey` package in R 3.2.3 (Lumley 2014; R Core Team 2015). The `svyolr` function is based on the `polr` function from the `MASS` package (Venables and Ripley 2002), with appropriate adjustments made for multiply imputed datasets. All continuous variables are mean-centered before being entered into regression models.

To restate information presented earlier, the primary associations of interest are those between two measures of place attachment and recovery from Sandy. Recovery, the extent to which respondents feel things are “back to normal” after Sandy, is treated as the dependent
variable. Rating of neighborhood from 1 to 10 and year moved to current address are treated as key independent variables. Various demographic and other controls listed in Table 4.2 are included in other model variations.

There are four models examined in this study. Model 1 is the simplest, an ordinal logistic regression of the Sandy recovery measure on the two key independent variables. Model 2 introduces a variable indicating whether or not the respondent’s property was damaged by Sandy. Because of the unexpected finding of no statistically significant relationship between years at current residence and recovery, a number of interactions were tested with other covariates. An interaction between years at residence and Sandy damage, discussed in greater detail below, improved model behavior, and is included in all subsequent models. Models 3 through 5 test the robustness of the statistically significant association identified in Models 1 and 2 to various controls identified in other literature on disaster recovery. Model 3 includes two additional variables hypothesized to be important to recovery in this context: respondents’ level of agreement that their insurance has paid their claims completely, and respondents’ satisfaction with FEMA’s response to Sandy. Model 4 introduces a suite of demographic controls commonly found to be associated with hazard vulnerability and/or resilience to Model 2 (e.g. Cutter et al. 2003; Cutter et al. 2010; Fothergill et al. 1999; Morrow 1999). Model 5 includes all variables present in the other models.

As noted above, roughly half of the observations have a missing value on at least one variable. The statistical literature is unequivocal that unless survey responses can be assumed to be missing at random, which is rarely possible to demonstrate, dropping observations with missingness on variables of interest can lead to biased results (Gelman and Hill 2006). The preferred approach to missing data is multiple imputation, as first proposed by Rubin (1987) and
subsequently refined by others. Multiple imputation is implemented in this study using chained equations via the \textit{mice} package in R (Van Buuren and Groothuis-Oudshoorn 2011).

\section*{Results}

The first tests conducted were of pairwise Pearson correlations between key variables.\footnote{Several additional variables collected in the survey were tested that are not presented here. A list of these variables can be found in the Appendix. Generally these variables were poorly correlated with the dependent variable (recovery) and/or were highly correlated with other measures that were more highly correlated with recovery.} Although bivariate correlations do not definitively establish that meaningful relationships exist, they provide a useful starting point. Table 4.3 presents these correlations.

The demographic variables are generally not strongly correlated with one another. Two exceptions are that older individuals appear likely to have moved to their current address earlier than younger residents, and that higher income individuals are more likely to own than rent their residences, both of which are intuitive results.

Critical to one of the approaches used to test the hypothesis considered by this study, the correlation between year moved to current address and agreement with the statement “Things are back to normal after Sandy” is very low (0.004) and not statistically significant, which suggests that any potential direct relationship is weak to non-existent. Regression model testing suggests a more complicated story.

The relationship between neighborhood rating and self-reported Sandy recovery is modest at 0.24, but is statistically significant ($p < 0.05$) and merits further testing in multivariate regression models. Table 4.4 presents results from four regression models testing associations between the dependent variables, the place attachment measures, and the robustness of those relationships to adding additional variables and controls.
In Model 1, which includes only the two key independent variables, there is a statistically significant positive association between greater neighborhood satisfaction and self-reported recovery from Sandy. The odds ratio (OR) is 1.33, indicating that a one unit increase in neighborhood rating is associated with a 33 percent increase in the cumulative probability of higher levels of self-reported recovery. Put another way, it is associated with a 33 percent increase in: the combined likelihood of a 2, 3, or 4 response to the recovery item relative to a 1 response; the combined likelihood of a 3 or 4 response relative to the combined likelihood of a 1 or 2 response, and the likelihood of a 4 response relative to the combined likelihood of a 1, 2, or 3 response. Although cumulative probabilities may be less intuitive to interpret than some other statistical models, the key point is that there is a statistically significant positive association between the two variables. As with the bivariate correlations, no evidence is found for a relationship between recovery and year moved to current residence.

As previously noted, Model 2 introduces a variable indicating whether or not a respondent reported property damage from Sandy and an interaction between that variable and years living at current address. The property damage variable is not statistically significantly associated with the dependent variable in any model, likely due to limited variation in it—roughly 80 percent of respondents experienced some Sandy-related damage. When interacted with the years at current address variable, however, both the interaction term and duration of residence are marginally significant in this model (p < 0.1), and more significant in subsequent models. The implications of the negative coefficient (odds ratio between zero and one) for years at address and positive coefficients (odds ratio greater than one) for the interaction term and damage caused by Sandy are as follows. For individuals experiencing no Sandy-related property damage, the longer they have lived at their address, the lower their likelihood of reporting higher
levels of recovery, holding all else equal. The interpretation of this result is not straightforward, but one possibility is that these individuals have less emotional investment in the recovery process, and therefore are more focused on visual cues like boarded up houses and incomplete repairs in their neighborhoods than on the progress that has been made. For individuals who did experience Sandy-related property damage, the story is much different. These respondents are more likely to report higher levels of recovery the longer they have lived in their communities, but the result of the non-linear term is that effect of additional years at residence on the odds ratio is fairly small, on the order of seven to eight percent for every ten additional years at current address in Model 2.

The statistically significant association between neighborhood rating and recovery remains significant in Model 3 (p < 0.05), but is slightly smaller in magnitude than in Model 1 (OR = 1.31). The odds ratio for years at current address remains the same but is significant at p < 0.05 in this model, while the interaction with damage from Sandy remains only marginally significant and is slightly attenuated. There is no statistically significant association between recovery and either satisfaction with FEMA’s response to Sandy or insurance claim payment. This is somewhat surprising given the costs associated with repair, renovation, and rebuilding in the hardest-hit areas and given the important role government plays in disaster response.
Table 5.3: Bivariate Correlations between Regression Variables

<table>
<thead>
<tr>
<th></th>
<th>Back to normal</th>
<th>N’hood rating</th>
<th>Yr. Moved to Current Residence</th>
<th>Sandy Damage</th>
<th>Insurance Paid</th>
<th>Satisfied w/ FEMA</th>
<th>Year Born</th>
<th>Owns Home</th>
<th>Is Female</th>
<th>Non-Eng. Speaker</th>
<th>Max. Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back to normal</td>
<td></td>
<td>0.242</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N’hood rating</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years at Current Residence</td>
<td>0.004</td>
<td>0.036</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandy Damage</td>
<td>-0.02</td>
<td>-0.146</td>
<td>0.136</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance Paid</td>
<td>0.282</td>
<td>0.132</td>
<td>0.11</td>
<td>0.016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied w/ FEMA</td>
<td>0.286</td>
<td>0.158</td>
<td>0.048</td>
<td>0.024</td>
<td>0.338</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Born</td>
<td>-0.084</td>
<td>-0.02</td>
<td>-0.48</td>
<td>-0.092</td>
<td>0.192</td>
<td>-0.078</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owns home</td>
<td>-0.036</td>
<td>0.044</td>
<td>0.37</td>
<td>-0.032</td>
<td>0.074</td>
<td>0.044</td>
<td>0.03</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is Female</td>
<td>-0.038</td>
<td>-0.072</td>
<td>0.076</td>
<td>-0.04</td>
<td>0.008</td>
<td>-0.172</td>
<td>0.048</td>
<td>-0.12</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Eng. Speaker</td>
<td>0.106</td>
<td>-0.016</td>
<td>-0.192</td>
<td>-0.15</td>
<td>0.05</td>
<td>0.148</td>
<td>0.118</td>
<td>-0.032</td>
<td>0.146</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Education</td>
<td>0.21</td>
<td>0.088</td>
<td>-0.082</td>
<td>-0.072</td>
<td>0.088</td>
<td>-0.112</td>
<td>0.262</td>
<td>0.05</td>
<td>0.232</td>
<td>0.072</td>
<td>1</td>
</tr>
</tbody>
</table>

Bolded values are significant at p < 0.05.
In Model 4, which includes the variables in Model 2 as well as demographic controls, the magnitude of the association between neighborhood rating and recovery increases slightly relative to Model 2 (OR = 1.39) and is statistically significant (p < 0.01). Both years at residence
and the interaction term with damage from Sandy are statistically significant in this model, with odds ratios moving further from one in their respective directions. Among the controls, the education dummy variable is statistically significant (p < 0.01), and year born is marginally statistically significant (p < 0.1). Respondents with a college education or more are much more likely to report a higher level of recovery than are those without a bachelor’s degree (OR = 2.52). Education is a measure of socioeconomic status, and given that hazards and disasters researchers have long found that lower socioeconomic status makes recovery more difficult (Fothergill and Peak 2004), it seems unsurprising that those with only a high school education or less would have more difficulty recovering than those with a higher levels of education.

Model 5, the full model, includes all variables in the other models. Neighborhood rating remains significant (p < 0.05) although the coefficient is attenuated relative to most other models (OR = 1.33). The only other variables that remain statistically significant in this model are the dummy variable for educational attainment (OR = 4.34, p < 0.01), and years at current address and its interaction term with damage from Sandy. Odds ratios for the latter variables are attenuated relative to Model 4 but still further from one than they are in Models 2 or 3.

Discussion

This chapter set out to test the hypothesis that there is a positive association between two measures of place attachment and self-reported perceptions of post-Sandy recovery in the East Shore neighborhoods of Staten Island, New York. For one of these measures of attachment, a relationship with perceived recovery could only be identified by including an interaction term with respondent reports of Sandy-related damages to property. Given the overwhelming
proportion of the sample that experienced property damage from Sandy, it is somewhat surprising that this interaction makes such a difference in the model. As previously stated, one conjecture is that individuals without Sandy-related property damage are less personally invested in the recovery process and therefore perceive it differently than individuals whose assets were actually damaged by the storm. The data do not provide any insight into the factors underlying this process, so this is only one possible explanation. Nonetheless, the relationship identified is robust to a range of covariates and controls. That the relationship is not otherwise identifiable may suggest a number of possibilities. Perhaps living in a neighborhood longer has some positive effects and some negative effects on recovery. It is also possible that the hypothesized relationship exists in the population but was not apparent in this sample, or that no relationship exists one way or another. It is important to emphasize that failure to reject the null hypothesis in a single study does not allow for the possibility of distinguishing whether or not a relationship truly exists or the direction of any such relationship, and therefore does not allow for anything more than speculate about an appropriate interpretation of the result.

A statistically significant positive association between neighborhood satisfaction and perceived recovery was also identified in the data. Although a thirty percent increase in cumulative probability of higher levels of recovery for each additional “Likert point” of neighborhood satisfaction may seem relatively modest at first glance, it is worth keeping in mind that the neighborhood satisfaction scale (1 to 10) is much more dispersed than the recovery scale (1 to 4). These differences probably do not scale in linear fashion, and the values of the scales are abstractions to begin with – thereby rendering precise numerical interpretation ambiguous – but this does suggest that the effect may be larger than it initially appears. Moreover, this effect is also robust to covariates and controls. These include not only demographic controls, but also
measures of the payment of Sandy-related insurance claims and of satisfaction with FEMA’s response to Sandy. This provides additional confidence that the association between place attachment and perceived recovery identified in the data is actually present.

In the context of this dissertation, this finding reinforces the notion that the ways in which places are created and recreated over time has implications for hazard risk (via recovery potential) not only at the neighborhood scale, but also at the individual scale. This ties into the relationship between place and “biography” described in the work of Giddens and Pred, and serves as a reminder that an analysis of historically contingent hazard risks is not solely about the relationships between governments or social and economic forces and hazards, but also about the relationships between individuals and hazards.

The findings of this chapter also contribute to the growing literature on social factors associated with recovery and resilience in post-disaster contexts. Specifically, this work provides empirical evidence that neighborhood satisfaction and place attachment may be beneficial in promoting recovery at the neighborhood scale. If place attachment promotes recovery in a post-disaster context, then it may also be viewed as a source of resilience in vulnerable communities, even those that have not yet or not recently experienced a severe natural hazard event.

This suggests an additional avenue for policymakers and planners to increase resilience in local communities. There is an extensive literature on attributes of places that contribute to place attachment and satisfaction (Fried 1982; Hipp 2009; Miller et al. 1980). Targeting these attributes with policy and planning initiatives could increase place resilience, and could also have numerous co-benefits associated with neighborhood satisfaction, such as higher neighborhood social capital (Grillo et al. 2009) and lower perceived fear of crime (Baba and Austin 1989). Put
another way, the places that emerged following such an effort would be better for their residents overall, and would be on a better trajectory moving forward.

**Limitations**

This work has several limitations. First, the data are cross-sectional, so the relationships identified are associational, rather than causal. It is possible that respondents who are more satisfied with their neighborhoods are more satisfied because their neighborhoods have recovered better from Sandy, rather than vice versa. Another possible mechanism of reverse causation would be that residents who stayed and repaired their homes or who could not afford to leave consciously or subconsciously adjusted their neighborhood satisfaction levels upward in light of these circumstances. It is also possible that both recovery and neighborhood satisfaction are causally associated with an unmeasured covariate and that the relationship between the two is indirect. There is not, however, any clear candidate covariate in the literature that would be responsible for the latter possibility.

A second limitation is the survey sample itself. Although the demographic attributes of the sample are broadly similar to those of the study area writ large, the use of an address list purchased from a commercial vendor makes it a non-probability sample. The fairly low response rate (twelve percent in the study area) further suggests that the respondents may not be fully representative of the population of the study area as a whole. It is also possible that those with particularly bad or particularly good post-Sandy experiences are more likely to respond than others, and/or that individuals who left the area between Sandy and the time the survey was conducted in fall 2015 differed systematically in some statistically relevant way from the
individuals who remained. Nonetheless, the relationships identified in the data are statistically significant despite the small sample size, which suggests that the positive relationship between neighborhood satisfaction and perceived recovery is likely to exist for some non-trivial proportion of residents of the affected area.

Third, although this is more a delimitation than a limitation, it is important not to overgeneralize these results. As demonstrated in earlier chapters, the East Shore of Staten Island is historically, demographically, and morphologically different from many other parts of New York and New Jersey affected by Sandy. Natural hazard and disaster research has pointed out repeatedly the place-specificity of vulnerability and resilience (Cutter 1996; Cutter et al. 2008; Frazier et al. 2014; Füssel 2007; Jones and Andrey 2007; Yarnal et al. 2009), and the notion that places evolve based on a confluence of individual actors, structural forces, and landscapes reinforces that idea. Policy prescriptions suggested above are based on the fact multiple studies have found similar associations in other types of disasters in other places. Nonetheless, such evidence remains limited to a fairly small number of studies, and it is important to bear this caveat in mind when attempting to generalize these results.
Chapter 6

Conclusions

Summary of Main Findings

This study has examined complex, place-specific dimensions of coastal storm-related flood hazards in the urban context of Staten Island, New York, a borough of New York City. Specifically, it has analyzed the ways in which the physical and cultural dimensions of landscapes across the borough have been produced over a period of centuries, with particular attention to the East Shore neighborhoods, where flood risk is especially high, and then used that analysis as a starting point to examine post-Hurricane Sandy resilience and recovery efforts in those neighborhoods. The study employed a mixed-methods approach, relying on a combination of quantitative and qualitative historical and present-day data sources.

Chapter 1 introduced the themes, objectives, and research questions explored in the study and laid out its structure. Chapter 2 examined the study site in detail, tracing the historical development of landscapes across Staten Island from early rural colonial settlements to the sprawling suburbs of today. Chapter 3 built upon that broader historical analysis of Staten Island by focusing on the neighborhoods with the highest flood risk, discussing historical hazard events in tandem with development and population growth, and using that discussion as a basis for an analysis of post-Sandy flood resilience and mitigation planning in the area. Chapter 4 examined demographic change in the East Shore study area in the context of demographic changes in the broader region to test the possibility that demographic composition could have driven differential outcomes between the East Shore and other Sandy-affected areas. Chapter 5 examined the ways
in which the attitudes of residents of these same places toward their neighborhoods are and are not associated with their perceived recovery from Hurricane Sandy. This final chapter, Chapter 6, summarizes the main findings from the previous chapters, synthesizes these findings, discusses their limitations, and looks ahead to future directions for research on related topics.

The concept of hazard risk as historically contingent process, derived from Allen Pred’s adaptation of the structuration theory of Giddens for geographical analysis (Pred 1984; 1985), was also introduced. This utility of this framework was demonstrated throughout the study. Chapter 2 took direct inspiration from Pred’s original concept of “places as historically contingent process” or “places as becoming,” seeking to understand the complex interplay between actors, structural forces, and landscapes that shaped the Staten Island of today. To accomplish this, the chapter incorporated information from government documents, newspaper accounts, censuses, historical maps, and previous scholarship. This chapter found that despite the fairly homogeneous suburban morphology of many parts of present-day Staten Island, a diverse set of cultural, political, and economic factors shaped the borough’s development, and that the nature and relative importance of these influences changed considerably over time. Looking more closely at today’s suburban landscape, traces of these earlier influences can still be discerned in many of the island’s neighborhoods.

Chapter 3, building on Chapter 2, extended the idea of places as historically contingent process to the new framework of hazards as historically contingent process. It examined the historical antecedents of the Hurricane Sandy disaster on Staten Island’s East Shore, tracing in tandem the area’s rapid growth of population and economic development, and its experience with more than a century of major storm-related floods.
Chapter 3 had several important findings. First, there were multiple prior coastal flood events throughout the twentieth century that provided unambiguous evidence that a disaster of Sandy’s magnitude was possible, but these events seem to have had little effect on the places that emerged on the East Shore. Second and relatedly, much of the original development of the area was for commercial uses tied to seasonal beach tourism, but growth pressures tied to the island’s burgeoning population made the land increasingly attractive for year-round residential development, particularly after the 1964 opening of the Verrazano-Narrows Bridge, resulting in a much larger flood-exposed population over time. Thus, broader socioeconomic forces played a major role in reshaping place. Third, several flood control measures were proposed from the 1930s onward that could have substantially mitigated Hurricane Sandy’s effects on the East Shore, but these proposals were not funded or carried out, and the measures that were implemented were insufficiently protective against even a much less severe storm than Sandy. This demonstrates that existing ways of doing things can become entrenched as they are reinforced over time. Last, the flood mitigation measures proposed under the banner of increasing coastal resilience post-Sandy appear to be a significant improvement on all past proposals, and the portions that have already been implemented have significantly reduced flood exposure. Thus, the future places of the East Shore will likely experience lower levels of hazard risk than was present at the time Sandy struck. There is reason for caution, however, given the history of large-scale mitigation projects for the area that were proposed but never built, and given the possibility of another lengthy return interval between major storms, which could last long enough for residents and local officials to lose sight of the lessons of Hurricane Sandy.

Chapter 4 examined demographic change in the East Shore study area in the context of demographic changes in Staten Island as a whole, New York City as a whole, and the entirety of
coastal New York and New Jersey, for the period 1960 to 2010. Significant changes occurred at all four geographic levels, with the East Shore’s changes most similar to those of Staten Island as a whole. Much of the difference included in the other geographies is a result of the inclusion of New York City, a demographic outlier relative to most of the United States, and overall the similarities in trends over the five-decade period are nonetheless greater than the differences. This suggests that spatial variation in hazard risks across places realized during Hurricane Sandy was likely not primarily driven by variation in demographic composition. Given the tendency of some hazard risk analyses to rely on demographic data to the detriment or exclusion of other factors, this is an important finding. Moreover, it points to the complexity of place specificity and changes in places over time, which cannot be reduced to demographic or even social factors, but must be understood to be embedded in social, cultural, and political forces, individual decisions, and the physical and cultural landscape.

Chapter 5 relied on data from an original structured survey of East Shore residents in areas affected by Hurricane Sandy to assess relationships between place attachment and perceived recovery three years after the storm. Place attachments are one expression of the historical contingency of places. This is expressed directly by the behavioral dimension of place attachment, for example the amount of time a person has lived in a particular location, as a person becomes embedded in the becoming of that place. It is also expressed indirectly through cognitive and affective dimensions of place attachment, such that people’s thinking about, and feelings toward, places they live evolve over time alongside those places. The analysis in this chapter found a robust, statistically significant association between neighborhood satisfaction, which is a measure of the affective dimension of place attachment, and self-reported perceived recovery from Hurricane Sandy. It found a complex, interactive relationship between length of
time at current residence, which is a measure of the behavioral dimension of place attachment, and perceived recovery. The former finding may suggest that place satisfaction and affective place attachment aid recovery. Reverse causality is also possible: those who stayed to recover may have liked the neighborhood better in the first place, or may feel more invested in it now having put the resources into rebuilding. The latter finding may have a similar interpretation, but the importance of the interaction term with property damage considerably confounds the interpretation of this finding, which suggests caution should be exercised so as to not overinterpret it.

**Synthesis**

As noted in the introduction of this study, Chapters 2-5 are individual pieces of scholarship linked together by a spatio-temporal theoretical framework for assessing the relationship between place and hazard risk. This synthesis will focus on themes that are present in two or more of these chapters, but not all are equally relevant to all four chapters. The combination of issues studied and the range of approaches utilized makes it possible to draw insights from multiple fields of study and subfields of geography in a way that is rarely done in hazards and disasters research.

**Becoming of Hazardous Places**

That hazard risks are place-specific has been recognized for decades, and is perhaps the most important contribution of geographers to the hazards literature (Burton et al. 1978). Often
left implicit in the discussion of hazard risks is that they are also specific to particular points or eras in time. Chapters 2 and 3 clearly demonstrate that today’s East Shore and Staten Island, more generally, are the product of repeated rewritings of the landscape and of the continual becoming of places over a period of decades to centuries. Thus, the nature of the coastal storm risks on the East Shore in the 1920s, for example, when it was primarily a seasonal destination for vacationers from other parts of Staten Island and New York City, differed greatly from the risks in October 2012, when Hurricane Sandy struck. In the earlier period, only a small year-round population, likely in the hundreds at most, would have been present outside of the peak season between late spring and late summer. For nor’easters and late-season hurricanes, therefore, the risks were primarily to the owners of the beach resorts, a much smaller population, and presumably one with non-trivial financial resources. In October 2012, the beach resorts and seasonal communities were gone, most for half a century, and many had been converted to or replaced with year-round residences. The number of potential victims was therefore several orders of magnitude larger than in the earlier era. As a result, over twenty people in the area lost their lives, and thousands of residents, particularly those without flood insurance, experienced major damages both to valuable assets and to a place to which they were emotionally bonded. Through the process of reconstruction and recovery, discussed in Chapters 3 and 5, the East Shore communities will continue to change, and future coastal storm risk will again be different than it was in 2012. Hazard risk is always contingent on earlier policies, events, decisions, and forces, and an event like Sandy offers an opening to change the emergent trajectory of places.
History Must Inform Policy

Chapters 2 and 3 examined the historical emergence of places on Staten Island, and specifically the East Shore neighborhoods, where coastal flood risks are highest. This story contains lessons both for future development in other coastal areas, and for future mitigation and resilience projects for Staten Island itself.

The parts of the analysis that may prove instructive in avoiding the future creation of similar high-risk places elsewhere pertain to the reasons the East Shore was developed in the first place. The Staten Island Railway, opened in 1860 and expanded to three branches by the late nineteenth century, greatly increased the accessibility of Staten Island from and to other parts of New York City and from and to New Jersey, and also increased the accessibility of the middle portion of the island from its relatively more densely populated northernmost and southernmost areas. This, in turn, made Staten Island a more desirable location to live, increasing demand for housing, which made previously undeveloped parcels more attractive sites for new construction. This process, which was further exacerbated by the opening of the Verrazano-Narrows Bridge in 1964, suggests that policymakers need to think carefully about unintended incentives that infrastructure projects may create for new development in hazardous areas.

New York City was an early leader in urban planning, but housing and zoning tools also were not adequately utilized to mitigate flood risk. In the late nineteenth and early twentieth centuries, prominent businessmen and real estate developers, inspired by the success of Coney Island in Brooklyn, built beachfront summer resorts along the entire extent of the East Shore. These highly flood-exposed developments were a mix of residential and commercial uses, with the residential component mostly seasonal. If development is to be allowed in a flood-exposed
place, this sort of land use, where few people are likely to be present for potential hurricanes in
September through November or for winter nor’easters, is better than most. Factors ranging from
the Great Depression to water pollution to burgeoning housing demand incentivized the
conversion and replacement of these seasonal uses with year-round residential developments.
Particularly during the Robert Moses era when the city planning department was at its most
powerful, the city conceivably could have intervened by zoning out year-round residential uses
in the floodplain and/or by strengthening building codes to require elevated houses, but did not
attempt to do so.

The other policy-relevant aspect of the historical analysis pertains to flood mitigation
proposals for Staten Island and other areas affected by Hurricane Sandy. The loose patchwork of
private flood control infrastructure of the early twentieth century accomplished very little, but
later publicly funded infrastructure, including tide gates and beach nourishment, were not much
better, failing to provide sufficient protection in several major mid-twentieth century storms.
Larger projects more in line with the scope of the problem were proposed in the 1960s and
1970s, but were never built. As noted above, building codes and zoning laws likewise failed to
force developers to adequately mitigate risk in new construction in the area.

In sum, future flood mitigation policies for the East Shore must consider the failures of
prior policymaking if they are to succeed. Alternatives for future policy are, of course, also
constrained by the ways in which places and policies have been shaped in the past. To cite only
one obvious example, with the rare and limited exceptions of small-scale strategic retreat efforts
like the New York State buyout of several hundred very high risk homes, risky residential
developments of the past cannot simply be undone. Policies instead must focus on reducing risks
for the housing that already exists while insuring that additional high-risk housing is not built. As
described in Chapter 3 and more briefly in this chapter, post-Sandy proposals for Staten Island seem to have done so, but policymakers must see them through, lest they suffer the fate of the long-abandoned US ACE proposals of the 1960s and 70s.

**Hazard Risks Cannot Be Oversimplified**

Disasters like Hurricane Sandy are highly complex multi-dimensional phenomena. They bring together biophysical and human systems that operate and interact at multiple spatial and temporal scales. Early exposure-focused work on natural hazards (e.g., White 1945) was quickly recognized as overly simplistic (e.g., Hewitt 1983), even by its practitioners, and in the decades since, research in the field has acknowledged an ever-wider set of factors as important to the overall scientific understanding of hazards. This study, by incorporating insights and methods drawn from the literature of natural hazards, historical geography, demography, urban geography, and urban studies, demonstrates the importance of recognizing the unique contributions of these fields and subfields to understanding the construction of hazards and disasters. Chapter 4, for example, demonstrates that an analysis of the changing demographics of hazard-affected areas may not always be informative for explaining why some areas are more susceptible to hazards and realize greater damage in an actual hazard event. Rather, even with the sum total of information about the emergence of places (Chapter 2), the production and reproduction of hazard risks (Chapter 3), the broader context in which the populations of the East Shore are situated (Chapter 4), and empirical work linking individual relationships to place with disaster recovery in places (Chapter 5), a truly complete and holistic understanding of the hazard
risks realized during Sandy on the East Shore and their implications for recovery and resilience would still require additional work, as detailed below.

**Limitations and Delimitations**

It is important to note major limitations and delimitations of this study and to acknowledge that the divide between limitations and delimitations is not always clean. First, as discussed in the preceding paragraph, disasters are far too complex for a single study to capture every relevant dimension, even in a relatively restricted spatial area like the East Shore (i.e., a limitation). To give only two examples, this study does not devote much attention to the biophysical dimensions of Hurricane Sandy, nor to quantifying economic damages to residents and businesses. These are important parts of a holistic understanding of Sandy’s effects on Staten Island, but were not considered by this study (i.e., delimitations). Other studies have addressed aspects of these dimensions (e.g., Decker and Robinson 2016; U.S. Department of Commerce 2013), and these studies likewise devote little if any attention to the issues considered in this study.

Second, each chapter has its own limitations, as previously noted. To recap briefly, Chapters 2 and 3 are heavily reliant on the historical record, which is open to a range of possible interpretations, is full of gaps, and is subject to the biases of those who wrote and archived it, and on the present author’s ability to track down all available pieces of that record. Chapter 3 analyzes policy proposals that are in varying stages of development and implementation. While some of these efforts are already well underway, others may never be implemented, or may be subjected to major revisions that would lead to different conclusions. Chapter 4, due to data
limitations, is only able to examine demographic variation across the study area and the context in which it is situated with fairly broad strokes, and is forced to rely on a few demographic measures that are fairly coarse proxies for hazard risk. Chapter 5 is based on a non-probability sample of 108 residents of the East Shore neighborhoods who had not sold or moved out of their residences as of roughly three years from the date of the storm. It is possible that these individuals differ in systematic ways from the people who left, or from others who remained but who did not respond to the survey. In addition, the most important relationship identified, between neighborhood satisfaction and perceived recovery, is not necessarily causal.

**Future Directions**

Future work drawing from this research may take several directions. First, additional relationships could be explored in the survey data that are not addressed here because they were not the primary focus of this study. Survey respondents answered a wide range of questions about their neighborhoods, about their beliefs about future hazard risks, and about governmental responses to Hurricane Sandy that might provide insight into other issues discussed in the hazards literature. Also, many respondents provided contact details that would make it possible to schedule in-depth interviews to more deeply probe some of the ambiguities in the quantitative survey data.

Second, much work on the historical dimensions of hazards to date relies on case studies, and future work should consider comparative approaches to elucidate themes that transcend the aforementioned place- and time-specificity (Harrington et al. 2009). Such studies could take several directions. At a regional scale, additional analyses of historical tropical cyclone and
nor’easter experiences of other mid-Atlantic and northeastern U.S. cities would make it possible to hold the biophysical hazard itself relatively constant and focus on social differences in places that share some similar features. At a broader scale, prior works on hurricane hazard in the Gulf Coast region of the United States (Colten 2005; Colten 2009; Logan et al. 2016), flood hazard in Los Angeles (Davis 1998), wildfire hazard in Oakland (Simon 2014), and an earlier preliminary effort at synthesizing political economy dimensions of historical hazards (Steinberg 2006), taken together with this study, may provide a foundation for synthesizing some basic principles of the historical study of hazards that apply to a range of hazards.

Last, future research must consider the implications of studies like this one for a changing planet. The high rate of relative sea level rise in many parts of the world implies that in the coming decades, cities that previously have not had to grapple with flood hazards will increasingly be exposed to flood risk, and existing flood hazards will worsen (e.g., Lin et al. 2016). A recent New York Times report (Gertner 2016) discussing the extreme case of Virginia’s Tangier Island in the Chesapeake Bay points to this reality. The island, only a few feet above sea level, is likely to be rendered uninhabitable by relative sea level rise and erosion sometime around the middle of this century, and the only options will be strategic retreat or very inexpensive and possibly unsustainable structural mitigation measures. Communities like Tangier Island will need to think carefully about their options for policy responses, being mindful of the complex historical development of local landscapes and of the meaningful attachments that their inhabitants experience in the places they call home. Larger cities, although unlikely to be fully abandoned due to different cultural values placed on them and a different cost benefit calculus, must seek out mitigation measures both established and novel to prevent future Sandys. The landscape architect Kristina Hill, for example, has suggested that a rather
than relying solely on hard infrastructure like the proposed East Shore seawall, “cyborg”

coastlines that are a mixture of hard infrastructure and green infrastructure like marshes could be equally protective with lower costs and reduced technical challenges (Fitzgerald 2016).

Regardless of the form adaptation and mitigation take, they will be necessary, and they will be easier if they are undertaken before another major event like Sandy occurs.
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Appendix

Survey Instrument Described in Chapter 5

[begins on next page]
Questions about your neighborhood-
Q1: When did you first move to your current address? Month ____________ Year _______

Q2: Where did you move from? (If you moved from elsewhere in New York City, please provide the neighborhood name. Otherwise, provide a zip code.) ______________

Q3: Do you rent your current home or own it? ______________

Q4: People sometimes call their neighborhood by different names. What is the main name you use for your neighborhood? _____________________________

Q5: Please select one answer for each statement that best describes how you feel about it.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Neither agree nor disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like living in New York City</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I like living on Staten Island</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I like living in my neighborhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I like my neighborhood better than other neighborhoods in the city</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel unsafe where I live</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>My neighborhood has changed since I moved here</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>My neighborhood is changing today</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Changes in my neighborhood have been mostly negative</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Things will be better in my neighborhood a few years from now than they are today</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>My neighbors are friendly</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Local schools are good</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I am satisfied with police protection in my neighborhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Q6: Describe some things you like about living where you live now.
Q7: Describe some things you don’t like about living where you live now.

__________________________________________________________________
__________________________________________________________________

Q8: Do you have plans to move away from your current residence at some point in the future?

Yes  No  Not sure

Q9: Why do you think you might move in the future (check as many as apply)?

_____ Want to be closer to family  _____ Too expensive
_____ Weather/climate  _____ Don’t want to raise children here
_____ Quality of schools  _____ Want nicer housing
_____ Work-related reasons  _____ Don’t like living here
_____ Safety/crime  _____ Other (specify) _______________
_____ Racial or ethnic tensions  _____ Definitely will not move

Q10: Regardless of whether you plan to move or not, if you could move to anywhere you chose, where would you move?

a. Another neighborhood in New York City (give name or location) ______________________
b. Other city/town/place (give name) ______________________
c. Would not move (check) _____

Q11: On a scale of 1-10 (1=worst, 10=best), how would you rate your neighborhood? _______
Q12: If for some reason you had to move away from your neighborhood, how much would you miss it? (circle one)

<table>
<thead>
<tr>
<th>A lot</th>
<th>Somewhat</th>
<th>Not Much</th>
<th>Not at all</th>
</tr>
</thead>
</table>

Questions about storms

Q13: Do you have flood insurance? (Note: a standard renters/homeowners insurance policy typically does not cover floods)

Yes  No

Q14: Did you have flood insurance prior to 2012?

Yes  No

Q15: Have you ever been injured or had property belonging to you damaged in a major storm other than Sandy?

Yes  No

Q16: For each question, please indicate how likely you think the scenario is.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Very unlikely</th>
<th>Neither likely nor unlikely</th>
<th>Very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>A major storm will strike the Northeastern United States within the next 5 years</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>A major storm will strike New York within the next 5 years</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>A major storm will cause major damage to your property within the next 5 years</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>A major storm will cause injury to you or your loved ones within the next 5 years</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Q17: Did Superstorm Sandy damage your home and/or other property?

Home  Other property  Both  Neither
Q18: Briefly describe your experience with Superstorm Sandy.

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Q19: Please select one answer for each statement that best describes how you feel about it.

<table>
<thead>
<tr>
<th>People came together after Sandy</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>My friends and neighbors helped me after Sandy</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I helped my friends and neighbors after Sandy</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am satisfied with the city’s response to Sandy</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am satisfied with the state’s response to Sandy</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am satisfied with FEMA’s response to Sandy</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My insurance has paid my Sandy-related claims completely</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My insurance has paid my Sandy-related claims in a timely fashion</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel like things are back to normal after Sandy</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If a storm like Sandy ever happened again, I would be better prepared</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q20: Were you or any members of your household physically injured by Sandy?

Yes

No
Q21: Have you paid money out of pocket for property damaged by Sandy?

Yes  
No

Q23: Have you received insurance money for property damaged by Sandy?

Yes  
No

Q24: Was anyone else you know affected by Sandy? (Circle each that applies)

Yes – property damaged  
Yes - injured  
No

Questions about yourself

Q25: In what year were you born? ____________

Q26: What is your gender? (circle one)

Female  
Male

Q27: How would you describe your race and ethnicity? (check as many as apply)

_____ American Indian  
_____ Asian/Pacific Islander  
_____ Black/African-American  
_____ Hispanic/Latino  
_____ White/Caucasian  
_____ Other (please specify) __________________________

Q28: What languages are spoken in your household?

First: __________________________

Second: _______________________

Others: ____________________________

Q29: What was your total household income last year?

- Under $20,000

- $20,000 - $29,999
• $30,000 - $39,999
• $40,000 - $59,999
• $60,000 - $79,999
• $80,000 - $99,999
• $100,000 to $149,999
• More than $150,000
• Prefer not to say

Q30: What is the highest level of education you have completed?

<table>
<thead>
<tr>
<th>Graduate</th>
<th>Undergraduate</th>
<th>High School</th>
<th>Did Not Finish High School</th>
</tr>
</thead>
</table>

Q31: Are you willing to be contacted by someone working on this project to discuss your responses? (If yes, provide contact number or email) _____________________________

Q32: Is there anything else you want to tell us about your community, Sandy, or any other aspect of this survey?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Thank you for your time!
EDUCATION

The Pennsylvania State University, University Park, PA
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