RESILIENCE, RECOVERY, AND REALITY: HURRICANES, HOUSING, AND THE HUMAN COST OF DISASTER

by

DANIEL A. SHTOB

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Student: Daniel A. Shtob

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This dissertation has been accepted and approved in partial fulfillment of the requirements for the Doctor of Philosophy degree in the Environmental Studies, Sciences, and Policy Program by:

Richard F. York	Chair
Erin Moore	Core Member
Raoul Liévanos	Core Member
Leigh Johnson	Institutional Representative

and

Kate Mondloch	Interim Vice Provost and Dean of the Graduate School

Original approval is on file with the University of Oregon Graduate School.

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DISSERTATION ABSTRACT

Daniel A. Shtob

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ABSTRACT: Although resilience is an often-used term that can motivate and justify the deployment of significant resources, it has been criticized as meaningless and defined to death. Seeking to overcome this paradox—that the term is both conceptually powerful and derided as meaningless due to semantics—this dissertation seeks to reframe our approach to resilience by focusing on what it creates, rather than how it is described. Synthesizing natural hazards, environmental, and urban sociology with critical approaches to environmental justice, ideology, design, and the production of space, I argue that disaster-based environmental inequality sometimes originates in the pre-event preparedness phase, as programs focused on building resilience reflect and reproduce existing social priorities. These priorities may manifest both before and after the occurrence of disaster and may take shape by seemingly neutral efforts to protect people and structures. The goals of this project are to emphasize the importance of critical approaches to disaster planning well before a disaster focuses the public eye, as well as to challenge the assumption that uncritical disaster design and resilience planning represents a win-win. To illustrate this point, I introduce two case examples. The first is an analysis of the adoption of climate resilience criteria by the ratings agencies that analyze the creditworthiness of U.S. municipalities and their bond debt. I argue that the inclusion of environmental metrics in these ratings, while

potentially beneficial, may prejudice the ability of lower-income counties and potentially lead to a financial cumulative disadvantage. The second is a qualitative analysis of the experiences of residents of the lower Florida Keys with Hurricane Irma in 2017. Here, I find that trauma arising from the storm was joined by a deeper sort of trauma resulting from bureaucratic frustrations that arose from the structures and regulations, like building codes, put in place to ensure hurricane safety. Over time, this trauma discouraged local residents from staying and encouraged real estate speculation, potentially contributing to the conversion of working class neighborhoods to tourism and vacation rentals. This evidences how well meaning yet uncritical climate and disaster resilience regimes can lead to environmental injustice.

CURRICULUM VITAE

NAME OF AUTHOR: Daniel A. Shtob

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

University of Oregon. Eugene, Oregon.
Vanderbilt University School of Law. Nashville, Tennessee.
University of Pennsylvania. Philadelphia, Pennsylvania.

DEGREES AWARDED:

Doctor of Philosophy, Environmental Studies, Sciences, and Policy (Environmental Studies and Sociology). 2020, University of Oregon.
Master of Science, Sociology. 2017. University of Oregon.
Master of Science, Environmental Studies. 2016. University of Oregon.
Juris Doctor. 2004. Vanderbilt University School of Law.
Bachelor of Arts, Anthropology. 1999. University of Pennsylvania.

AREAS OF SPECIAL INTEREST:

Environmental Sociology and Natural Hazards.
Urban Sociology and Urban Development.
Environmental Justice.

PROFESSIONAL EXPERIENCE:

Teaching assistant, Department of Sociology and Environmental Studies Program, University of Oregon, Eugene, 2014 – 2020.

GRANTS, AWARDS, AND HONORS:

Graduate Teaching Excellence Award, University of Oregon. 2019.

Graduate Teaching Fellowship, Environmental Studies and Sociology, 2014 to present.

University of Oregon, Department of Sociology Marquina Award. 2018.

University of Oregon Environmental Studies Program Interdisciplinary Seed Grant.

First Year Fellowship, University of Oregon. 2016.

Articles Editor, *Vanderbilt Law Review*. 2003-2004.

Magna Cum Laude, with distinction in Anthropology, University of Pennsylvania, 1999.

PUBLICATIONS:

Patrick Trent Greiner, Daniel A. Shtob, and Jordan Fox Besek. 2020. "Is Urbanization Good for the Climate? A Cross-County Analysis of Impervious Surface, Affluence, and the Carbon Intensity of Well-Being." *Socius* 6(2020): 2378023119896896.

Daniel Shtob. 2019. "Remembering the Future: Natural Disaster, Place, and Symbolic Survival." *Rural Sociology*, 84(1):123-147.

Jordan Besek and Daniel Shtob. 2019. "Breaking the Divide: Setting Environmental Precedent in the Chicago River." *Law & Policy* 41(4):387-410.

Daniel Shtob. 2004. "Note: Corruption of a Term: The Problematic Nature of 18 U.S.C. §1512(c), the New Federal Obstruction of Justice Provision." *Vanderbilt Law Review* 57(4):1429-1464.

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For Brittany, Eli, and Alex, who let the sun shine through

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PREFACE: THE FLORIDA KEYS, HURRICANE IRMA, AND RESILIENCE

> "[M]y family's going to eat as long as anybody eats. What they're trying to do is starve you Conchs[1] out of here so they can burn down the shacks and put up apartments and make this a tourist town. That's what I hear. I hear they're buying up lots, and then after the poor people are starved out and gone somewhere else to starve some more they're going to come in and make it into a beauty spot for tourists."
>
> — Ernest Hemingway, *To Have and Have Not*, 1937

INTRODUCTION

Background: The Lower Florida Keys.

The lower Florida Keys occupy a unique spot in the United States geographically and culturally. A chain of small islands extending southwest from the greater Miami area, they are often described as a Caribbean tourist paradise that happens to be connected to the U.S. mainland by a road: the tail end of US Route 1 (US1) that is appropriately named the Overseas Highway. This description, however, belies a much more complex and hardscrabble history punctuated with periodic tragedy. Moreover, it belies the idea that the tourism conception of the Keys is natural; rather, tourism and the built form that supports it are the product of mutually reinforcing constructions. The first was a social construction of place derived both from its beauty and tropical amenities and federal and state efforts to overcome the Great Depression (Rogers 1996). The second involved the construction of infrastructure that was developed to transport, house, and serve tourists, as well as to support a number of local economies that ranged from cigar manufacture to sponge and sea turtle harvesting to the industry that initially gave Key West its *raison d'etre*: scavenging the wrecked ships that unsuccessfully tried to navigate the nearby Florida

[1] Residents who were born and raised in the Florida Keys.

Straits (Rogers 1996; Viele 2011a, 2011c). The lower Keys are also notable for the variety of migrations evident in their history: the Cuban and Bahamian influences are still palpable in the area, as are accents from across the mainland United States, the Caribbean, and Latin America.

Reading post-settlement histories of the Keys a familiar—although non-exclusive—formula soon emerges. Someone recognizes the local potential for an industry, tries it out, struggles for a period, and eventually either fails or abandons the effort, seeking greener pastures elsewhere (Viele 2011a, 2011b, 2011c). Over time, tourism stepped into the economic vacuum left by these industries, though not without help. By 1935, with eighty percent of the residents of Key West on emergency public assistance due to the decline of ship salvage and the overall effects of the Great Depression, the Federal Emergency Relief Administration took over the city and through the labor of local residents began to refashion its streets and buildings in the form of a resort town (Rogers 1996). This was a matter of image as much as substance: a 2018 exhibit at the Key West Art and Historical Society documented the efforts of Works Progress Administration artists who, through copious use of pastels, created an attractive vision of what vacationing at the end of the road could be. Any visit to the many art galleries and shops in the Keys hawking Guy Harvey paintings and maritime ephemera demonstrates the durability of these efforts.

Hurricanes, unfortunately, also figured into the form of the local development trajectory. In September of 1935 a massive storm hit the Keys, killing approximately 400 people, most of whom were railroad workers whose rescue train was washed off the single causeway that provided overland access to the Keys while *en route* to save them. The storm so damaged the causeway that it was sold to the state, signaling an end to Henry Flagler's

famous attempt to run a railroad over the open ocean. Out of this death and destruction—coupled with federal and state largesse—came perhaps the single most important development in the tourism economy of the Keys: a road from the mainland was built on the remains of the railroad causeway. This allowed automobile access for the first time, opening the Keys to the American motorist (Rogers 1996).

Yet lifelong residents of the Keys, colloquially known as Conchs in reference to the large-shelled mollusk that occupies local waters and gift shops, are nothing if not persistent. So, too, are the newcomers who have opted to make the Keys their home. An independent streak runs deep in the Keys, as evidenced by its one-day secession from the United States in 1982, after the Reagan administration put a roadblock at the northern end of US1, the single road serving the island chain. This effectively imposed a federal search for drugs or other contraband on any Keys resident who sought to travel to the mainland, and in unforgivable Keys fashion resulted in a miles-long traffic jam on their beloved route of ingress and egress: they take traffic on the Overseas Highway extremely seriously (Conch Republic 2001a). In the words of an informal local history:

> At noon, on the day of secession, at Mallory Square in Key West Florida, Mayor Wardlow read the proclamation of secession and proclaimed aloud that the Conch Republic was an independent nation separate from the U.S. and then symbolically began the Conch Republic's Civil Rebellion by breaking a loaf of stale Cuban bread over the head of a man dressed in a U.S. Navy uniform. After one minute of rebellion, the now Prime Minister Wardlow turned to the Admiral in charge of the Navy Base at Key West, and surrendered to the Union Forces, and demanded 1 Billion dollars in foreign aid and War Relief to rebuild our nation after the long Federal siege! (Conch Republic 2001b)

Notwithstanding the humorous approach taken to secession, the protest worked and the roadblock was subsequently removed, although the requested foreign aid never materialized. Prior to Hurricane Irma in 2017, the annual celebration of the Conch Republic

was preserved as a subset of local lore that was used primarily as am organizing story for tourists and new residents, in a town that celebrates local lore of Harry Truman's vacation house, Ernest Hemingway's carousing and six toed cats, and the roosters that noisily occupy seemingly every bit of public space. After Irma, the name of the Conch Republic was appropriated by a number of local residents who were disgusted with official delays in cleanup and resolved to clean—by hand—local waterways, estuaries, and mangroves of the flotsam and jetsam deposited there as the storm ripped buildings and boats apart. That the lore of place and community was so easily deployed to organize around an environmental catastrophe—and the perception of an official failure to respond—illustrates some of the depth of caring and spirit of the place.

As many of my research participants and other contacts in the Keys have related, the strong sense of pride in place found in the Keys is countenanced by its insular nature. This may not be particularly surprising for an island chain, but this is also a place that is wholly dependent on the mainland for everything from basic utilities to trash removal. It may also be explained, however, by a desire to be among people who are more tolerant than elsewhere and a desire to protect the area's uniquely accepting atmosphere. In the words of one local activist:

> Key West is the end of the road…and like all end of the road places, when it starts…people start to frequent that area, they start to move into that area. It always starts with like the rebels and the fishermen and the people that, that the rest of society tends to think [are] the bottom rung. [They are] the first to live in places like this. And…they're also some of the hardest working people. And again…it tends to form really close communities where people are watching out for each other and strangers are not, are not permitted a lot of leash. And because we are so far away from the mainland…the laws are a little different down here, things that may affect the rest of Florida. While they allegedly apply to us, they aren't generally paid as much attention to sometimes…because we are so far from any of that sort of political oversight or government oversight.

To understand the lower Keys it is also critical to understand each island has its own character based partially on place and partially on how, why, and when it developed. Despite being at the end of the chain, Key West is the administrative, bureaucratic, and tourist center. As you move up the chain in the lower Keys, the islands morph from the formerly working class but now rapidly gentrifying Stock Island to a number of residential keys featuring some mixture of single family homes, mobile home and RV parks, and palatial waterfront mansions. Long-term residents know the differences between islands and tend to identify with their own island or neighborhood.

On the northern end of the lower Keys is Big Pine Key, which has traditionally been known as the working class center of the islands. Big Pine Key is also commonly believed to be the island worst hit by Hurricane Irma. It sat on the leading edge of Irma to the right side of the eye, where the counter-clockwise spin of the Coriolis effect and the trajectory of the hurricane's path have an additive effect on wind speed and storm surge. While Irma affected each of the lower Keys in different ways, it is safe to say that Big Pine suffered especially, and featured a population that may have been least able to cope with the destruction physically and financially. Official storm statistics paint a horrible picture of Big Pine Key after Irma: compared to only 264 houses that were unaffected by Irma and about 2,200 that were affected or had minor damage, 299 housing units had major damage, and 473 were completely destroyed. These include included 52 mobile homes or RVs that were destroyed on that island alone (Monroe County Emergency Management n.d.) In short, about 24% of the housing stock on Big Pine Key was destroyed instantaneously or suffered major damage that would require major repair.

The prefatory quote from Hemingway's *To Have or Have Not* suggests that the development of tourism in the Keys has long created concerns that the island would become a series of resorts with no place for locals. In 1937 these concerns developed shortly after the New Deal and after the hurricane of 1935 severed the railroad connection used by most early travelers, and shortly before the 1938 completion of the automobile road that again linked Key West with the mainland (Rogers 1996). Housing, hurricanes, and official response were of the moment then, and they are now. Like the many hurricanes that have come before—and particularly the hurricane of 1935—Hurricane Irma in 2017 had the potential to fundamentally alter the character of the lower Keys and its population. The fear of this was palpable among many people with whom I spoke as well as in official accounts.

Two years after Hurricane Irma I found concerns that were eerily reminiscent of those expressed by Hemingway two years after the Hurricane of 1935. These include the tension between tourism and residents, and how housing—the right to determine the meaning of place and the built form of space (Gieryn 2000)—factors centrally in these disputes. Yet the mechanisms that are reflected in these fears are far more complex than the burning and rebuilding of Depression-era shacks: similar concern, different manifestation. Even bearing in mind Hemingway's propensity for embellishment (among other later-recognized literary and personality faults), it is relatively clear that the intersection of hurricanes, housing, and who may lay claim to life in the Keys is not a new question. However, in an age of intensified storms and real estate investment, it is one worth revisiting.

Background: Why Hurricane Irma?

On September 10, 2017 Hurricane Irma roared ashore in the lower Florida Keys, making its center of landfall on the quiet and beautiful but somewhat unremarkable residential island of Cudjoe Key. A massive category four on the five-category Saffir-Simpson scale, it had weakened slightly since its initial landfall on Barbuda in the eastern Caribbean. Although it had once featured sustained winds in excess of 180 miles per hour, as it passed over islands in the Caribbean they sapped its strength, resulting in a downgrade to category three. While residents of the Keys had prepared for this hurricane like they often do in the late summer and early fall, it appeared to be only moderate strength. Many Keys residents had experienced these before and consider them part of life.

The day before it made landfall, however, the National Weather Service reported that it was reorganizing and strengthening off the coast of Florida due to unusually warm water in local seas. While it had previously been forecast to only sideswipe the Keys and instead hit mainland south Florida, as its path bent west it became clear that the low-lying island chain was at substantial risk of a direct hit. Recognizing the changes in both speed and direction, Governor Rick Scott held a press conference on the evening of September 9th. He related that the Florida Keys were already endangered by winds and storm surge. He continued:

> This is a deadly storm and our state has never seen anything like it. Millions of Floridians will see major hurricane impacts with deadly storm surge and life threatening winds…Evacuations are in place throughout the state and more that 5.6 million Floridians have been ordered to evacuate. You need to listen to local evacuation orders. If you live in southwest Florida you need to be on the road by noon or find shelter (Associated Press 2017).

His language here is important. Although the storm was headed for the Keys the evacuation order covered all of southwest Florida and well over five million residents who

lived on the mainland with many escape routes from danger. The storm was massive. One participant described watching it approach during these last hours and noticing that it appeared on satellite to be larger than Florida. A satellite image of the storm superimposed next to 1992's infamous Hurricane Andrew showed a difference that was barely believable.

My own interest in Hurricane Irma was, at that time, not academic. Rather, it was personal. I had lived for a year on Cudjoe Key, during which time I volunteered with the Red Cross, serving on the local volunteer disaster action team and training to provide disaster relief in the inevitable event of the next hurricane. I still had friends in the lower Florida Keys, including in the mobile and modular home dominated retirement community in which I had lived. On September 10th I watched the storm come ashore and on September 11th—for the second time in my life on that date—I grappled with understanding seemingly incomprehensible destruction.

Shortly thereafter, those who had followed the evacuation order began posting on social media searching for those who had not. There were repeated and increasingly desperate pleas for any information about friends, family who had stayed, as well as animals who had been left, sometimes due to a belief that they would not be welcome in shelters or other places of refuge to the north. Driven both by concern about my friends who had not yet been located (all of whom eventually were) and a sense of voyeuristic curiosity that seems to be common after disasters, I paid close attention to both traditional and social media. I spent hours each day watching the Keys-local Facebook groups whose purpose shifted from selling old furniture, spinning yarns, and complaining about local politics to relating news of who was alive and well, whose homes were still standing, and who had an intact roof. Any news was critically important: one participant was only able

to contact his family outside of the Keys after it was discovered that a local supermarket had a working land line, and the sense of relief arising from that communication to his distant family cannot be overstated.

Over time, the topics of conversation on these groups began to shift. Once personal whereabouts and safety were established, the subject matter quickly refocused firmly on housing. Over time, as satellite and aerial maps of residential areas were released, residents of the lower Keys pored over them seeking confirmation that their houses remained in one piece. In many cases the news was not good. Once rudimentary communications were established, those who defied Governor Scott's order and stayed in the filthy shelter of last resort at the elementary school on Sugarloaf Key or in fortified houses, along with those who had received permission to return before the official exclusion order was lifted, would remit appraisals of their neighborhoods and neighbors' houses. Many residents, however, did not find out whether they had a place to return to until they were allowed to once again journey south weeks after the islands were evacuated.

As the scope and scale of the storm's damage began to become evident—along with the fact that its physical impacts were qualitatively different and worse than those of local hurricanes in relatively recent memory like Hurricane Wilma in 2005 and Hurricane Georges in 1998—conversations on social media shifted again. This time, they began to broach the difficult subject of rebuilding and recovery. The focus on housing remained central. Questions of rebuilding seemed, at least in the eyes of this distant observer, to nearly always be yoked to discussions of banks and mortgages, insurance, legal and administrative approvals like permitting, and the lack of contractors. Rather than just the built environment, these choices involved a complex of difficult choices about the variety

of social, governmental, and institutional forces that influence how and why the built environment takes the form it does.

Critically, stories of rebuilding must be tempered by an understanding of the strain of the hours, days, weeks, and months of personal labor in the late summer South Florida heat that were required to begin to clean up the mess created by the collision of buildings, land, wind, and water. By some accounts, the storm left a toxic film over the landscape consisting of everything that one might keep in a garage or boatyard mixed the remnants of local vegetation and salt water. If outdoors, this stew would putrefy and dry in the sun. If inside houses, it would fester and breed mold. Everything was out of place. One participant reported finding live ocean fish in a second floor bathtub that was washed over by storm surge. A recent study (Ross et al. 2019) demonstrated that Big Pine Key suffered 32% tree mortality, including to the eponymous slash pines that dominate the landscape. Larger trees uprooted by wind and significant numbers of smaller freshwater-dependent trees were killed due to storm surge and saltwater inundation, combining early acute death with chronic wasting of many trees that initially survived (Ross et al. 2019). There were also bodies. Although south Florida in September and October is typically extremely hot, the storm made it worse due to the lack of shade from tree death and stripped foliage, the loss of roofs from houses, and for extended periods after the storm the unavailability of the electricity needed to supply air conditioning. Over time, the fuel load from so many dead trees contributed to a massive brush fire on Big Pine Key that threatened the homes of study participants while they tried to rebuild, adding insult to injury. For many residents, including the many elderly people who had retired to the area, the initial shock was too much.

Some of those who I knew threw their hands up and left nearly immediately, others resolved with varying degrees of success to hold on and tough it out, while others who were minimally affected directly viewed the storm as more of a personal inconvenience (though this should not imply that they lacked empathy for their neighbors who had not been so lucky). Simply put, the more that I watched, the more it became clear that issues of long-term trauma were likely related to migration and displacement, and this trauma could not be reduced to a single factor. Where trauma, migration, and displacement seemed to be joined, however, were on the subjects of housing and affordability.

Developing these themes required an understanding of these varied elements; I sensed that there were a considerable number of themes focused on housing that could not be adequately captured by rapid response methods like demographic projection, economic assessment, or remote sensing alone. While there was broad general agreement that the Keys had lost pre-Irma residents and overall population, the details of the mechanisms of these processes were difficult to trace. Demographic estimates seemed inappropriate to capture the experience of the lower Keys, because they lumped the various Keys together regardless of the magnitude of damage or the pre-existing characteristics of the population (Associated Press 2018; Goodhue 2018; Rayer and Wang 2018). Other estimates, like those in the media, were questionable because they were developed from anecdotal estimates made shortly after the storm (e.g. Allen 2017). It also seemed like the rapid disaster assessments that are typically completed after storms could provide insight into what happened and what the geophysical drivers or infrastructure damage were—and could do so far more quickly than I could—but could not adequately explain the systemic questions that I suspected were mediating the storm experience.

For example, since the storm, two rapid assessments of building damage in the lower Keys—conducted by engineers and geophysical scientists—have suggested that the causes of much local housing damage was storm surge and elevated wave heights (i.e. combined effects of hydrodynamic forces), particularly in Big Pine Key on the leading edge of the storm (Xian et al. 2018; Tomiczek et al. 2020). One of these studies found that on Big Pine Key there was a positive, significant correlation between proximity to the coastline and overall damage. This finding makes intuitive sense, especially if you have spent considerable time on Big Pine and know its topography. Oddly, based on their rapid survey methodology they found a negative yet small and statistically insignificant relationship between size of housing structure by square meter (i.e. as a proxy for mobile home, single family homes etc.) and damage category (limited, minor, major, total) (Xian et al. 2018). In other words, their statistical measure suggests that housing type was potentially unimportant. This makes less intuitive sense.

While their innovative study serves a highly useful purpose—quickly assessing structural vulnerability—and the researchers were careful to include socio-economic concerns, the methodology used (driving at about 10 miles per hour, photographing houses and comparing them to satellite photos) reveals some weaknesses at the intersection of housing and affluence that could be remedied by later interviews. The first is that buildings that appear undamaged or minimally damaged from the outside may be wet and molding inside. Post-storm mold was a common, serious complaint. In some cases it required demolition, even when the structure suffered low water intrusion heights and might appear fine from aerial photographs or roadside observation. Second, it ignores that structural damage has to be placed in the context of the combination of joblessness, community and

other psychosocial stressors, as well as the cumulative effects of damage that for these and other reasons might be not be repaired quickly. In effect, while it focuses on housing form, it misses some of the combined influence of community and time (Xian et al. 2018).

Finally, although Xian et al. (2018) find that proximity to water is more important than type of housing on Big Pine Key, this may be because many neighborhoods near the water on Big Pine Key consist of mixed housing types. Conversely, while they observe that housing type is the single most significant factor on Marathon Key to the north, which lost all of its mobile home parks, it may be that the spatial arrangement of that island exposed them to different storm effects than on Big Pine. This is especially true for a neighborhood on Big Pine known as the Avenues, which was within the main crosshairs of storm surge and features mixed working class housing. It has many larger homes in terms of square footage than the mobile home parks that tend to be further inland and at higher elevation, but traditionally served as housing for working class families. They also may ignore the population effects in the lower Keys of the loss of housing on Marathon (to the north of the study area), as people may seek replacement housing further south. This is not to imply that their method or analysis was faulty or useless: rather, rapid post-storm assessments like this may require parsimony and speed that necessarily obscures other qualities of the environment under study. Moreover, they are careful to mention the need for greater attention to socioeconomic characteristics, even while trying to quickly distill patterns of visible housing damage (Xian et al. 2018). In sum, their results combined with the more qualitative approach here emphasize the importance of mixed methods that take account of structural analysis, sociological analysis, and an appreciation of local housing geographies.

As I continued to watch social media generalized complaints began to filter out that some constellation of housing, local bureaucracy, and building regulations were contributing to displacement in ways that prejudiced the interests of less affluent residents of the lower Keys. Over time, my initial climate migration question took on attributes of an environmental justice question. Surprisingly, many of these complaints were focused on laws and standards that had been passed for the express purpose of ensuring hurricane safety. Other complaints focused squarely on the official response. I suspected that I was watching the development of housing-based inequality in the aftermath of a natural disaster, but did not fully understand or appreciate the complexity of the systems by which it was being produced. Nor did I fully understand how seemingly well intentioned—and from a public safety standpoint essentially unassailable—rules like hurricane resistant building codes were a leading source of stress in the very communities they were intended to protect. Those who remained contended with, and complained of, severe consequences to their health, especially but not exclusively to mental health. Rules and practices intended to protect health, safety, and housing were jeopardizing them instead. Extending the paradox, difficulties in recovery and rebuilding derived from a variety of housing-related sources were, as I would come to understand over the subsequent two years, a source of constant complaint that enveloped concerns about mental health, displacement, and collective trauma.

INITIAL RESEARCH GOALS AND AGENDA

Based on this, this research project initially included two separate yet related goals. First, I sought to better understand the relationships between hurricanes, housing, and displacement over time, using the lower Keys as a case study. Beyond my personal

motivation, it made sense as a study area because it is a small collection of communities that have been repeatedly impacted by hurricanes. In addition, Keys residents and local government are active in their attempts to get ahead of hurricane threats through various rules and regulations, and the lower Keys happened to be the center of landfall of probably the least studied hurricane of the unprecedented 2017 season (compared to Hurricane Harvey in Texas and Hurricane Maria in Puerto Rico). Second, I hoped to better understand the complex linkages between hurricanes and the development of environmental inequality, especially at the intersection of housing affordability and residential instability. This would connect individual and community-based stories about housing concerns and stresses to broader features of our political economic system, including resilience and preparedness initiatives, real estate capital and speculation, and the development of laws and regulations.

As I embarked on this project it gradually became clear that that the processes by which we regulate the construction of our built environment—what might be called urbanization or development—serve as a link between disasters and sociospatial inequality. This suggested the need for a new approach to conceptualizing resilience and disaster planning that examined the specific mechanics of inequality formation. Coupling Henri Lefebvre's (1991, 2003) classical insights about urbanization with contemporary studies on resilience and sociological developments, Chapter 1 explores a new way to theorize and understand resilience. Given the increasing prominence of resilience in socio-environmental planning, I argue that resilience and preparedness efforts represent a distinct response to environmental change that operates through our built environment in ways that can create landscapes and inequality. Understanding resilience merely as measure of the

ability of a system to "bounce back" after a shock (i.e., Holling 1973) misses how its use can contribute to unjust outcomes well in advance of any disaster. Taking a sociospatial approach, alternatively, allows us to theorize how the complex interactions between systems of power, the built environment, and environmental change may lead to both increased disaster risk and inequality.

Chapter 2 builds off of this foundation through an analysis of credit ratings agencies, their ratings of municipal bonds, and the recent inclusion of resilience criteria in these ratings. The development of a private financial response to climate change and disaster risk potentially will to encourage particular pathways of climate response in a vast majority of American localities. Importantly, this provides a significant real-world example of how the introduction of environmental resilience into existing, seemingly non-environmental socio-financial processes may have broad landscape design consequences. This inquiry was driven by my realization, while I was collecting data in the Keys, of the importance of local government decisions and the forces that drive them. After discovering that municipal bond credit ratings agencies have begun to formally include environmental uncertainty and risk in their analyses, I realized that these changes may provide incentives for municipal managers to choose certain forms of resilience and environmental planning. In this way, it connects to the lower Keys' experience by exploring the incentivization of particular modes of resilience planning for municipal managers and bureaucrats.

Returning the analysis to the local context of the Florida Keys, in Chapter 3 I explore how real estate capital, speculation, and regulations focused on hurricane preparedness contribute to population displacement and residential instability. Unexpectedly, trauma and mental health began to factor significantly in this story. While the existence of trauma and

mental health questions in disaster is perhaps unsurprising, what was novel is the way that housing and trauma are reciprocally linked in nearly every participant account. The thematic connection between housing, trauma, and speculation was strong and appears to evidence a process that wears people down in disaster-affected communities over time, greasing the wheels of disaster opportunism. Therefore the analysis focuses not only on the political economy of housing through disasters, but also the ways that mental health and trauma seem to be deployed (intentionally or unwittingly) in the interests of real estate capital development. In short, the combined pressures of housing insecurity and navigating post-disaster housing bureaucracy can make community members more susceptible to displacement by capital investment. Over time, this can promote the conversion of neighborhoods to tourism and vacations rentals.

If the Keys represent something of a test case for the effects of climate change and storms in the United States due to issues of location and topography, the hope is that local experiences derived from this small island chain may translate to suggestions for other communities that are exploring how to cope with future disaster. Whether this is derived from their long history with hurricanes or their geographic isolation and exposure to high seas (the highest point is the Keys is a closed garbage dump outside of Key West known as Mount Trashmore), examples developed here with experiments into resilience and preparedness can teach about other contexts as sea levels rise and storms intensify. The Keys are small when compared to some other disaster-affected areas favored by scholars. This presents an opportunity to focus on discrete themes that affect the disaster experience, while helping to reform the process of hurricane preparation and preparedness in the name

of achieving real socio-environmental resilience, rather than a version laden with the danger of exploitation.

CHAPTER I. RESILIENCE SPACES: RETHINKING RESILIENCE AND THE DISASTER EXPERIENCE FROM THE PERSPECTIVE OF MATERIALIST ENVRONENTAL SOCIOLOGY

CHAPTER PREFACE AND AGENDA.

The term "resilience" remains central to disaster preparedness and planning regimes in a changing world. However, it has been condemned as meaningless buzzword, as well as a product of neoliberal ideology and political projects. This paper proposes an alternative conceptualization of resilience that synthesizes materialist approaches in disaster studies and urban and environmental sociology around questions regarding the use of risk reduction models for the material benefit of elites. It illustrates how resilience manifests through the production of space, emphasizing that resilience efforts are meaningful in their consequences, that these consequences are directed by a unique set of political concerns, and that special attention should be paid to the often-ignored effects of pre-disaster resilience planning. An understanding of resilience that foregrounds these relationships facilitates an analytical turn towards traceable effects on housing and other basic human needs well in advance of the next disaster, which could support better integration of critical approaches with those based in public policy.

INTRODUCTION.

C.S. Holling (1973) is typically credited with articulating a notion of "resilience" that has become influential in various scholarly and policy arenas (Anderson 2013; Bourbeau 2018; Colker 2020). In contrast to other ecological concepts like "stability," Holling (1973:14) defined "resilience" as "a measure of the…ability [of systems] to absorb change and disturbance and still maintain the same relationships between populations or state variables." Notwithstanding its increasingly central role in the collective management of environmental change and risk, it has been criticized as over-defined and meaningless jargon and dismissed as a sort of newspeak buzzword (Reghezza-Zitt et al. 2012; Linkov et al. 2014; Rogers 2015; Dawson 2017; Andresen 2019). Yet resilience is a concept that has the capacity to justify capital-intensive projects, to direct massive expenditures for public and private disaster planning, and to influence the ways that individuals and communities grapple with disasters well in advance of their occurrence (Gotham and Greenberg 2014; Tierney 2015; Dawson 2017; Colker 2020).

This presents a contradiction at the heart of the way we consider and plan for environmental change: how can something be characterized as meaningless if its outcomes are so consequential? Moreover, how can scholars analyze resilience in ways that provide insight about its effects, avoiding the morass of jargon? Conversations about resilience often focus on maintenance of socio-environmental equilibrium after a disaster event, without adequate consideration of how resilience efforts might drive pre-disaster conditions and generate impacts both before and after disaster. Like Holling (1973), in these conversations resilience is seen as a descriptive measure of change rather than a driver of change. Rethinking resilience from the standpoint of what it accomplishes allows a

deeper analysis of how it and deployed across social, spatial, and temporal scales (Neisser and Runkle 2017).

To address these questions, I develop a materialist perspective on resilience that examines the consequences of how resilience may be used and exploited. In the process I synthesize ideas from the sociologies of natural hazards, the environment, and urban spaces, as well as scholarship on ideology, resilience politics, and critical design. Rather than adding yet another confusing definition of resilience to the many that already exist, I argue that it is best considered in light of its creative nature. Resilience, in other words, can be used to create, develop, and justify courses of action that have material consequences, and these consequences originate from the interaction of risk assessment, structures of power, and how space is produced (Lefebvre 1991, 2003; Gotham and Greenberg 2014; Dawson 2017). This argument also builds on various existing criticisms of resilience—including that a return to a pre-existing state of inequality may be an undesirable bounce-back and that resilience may serve as a tool of economic exploitation (Cretney 2014; Tierney 2015; Anguelovski et al. 2016)—to develop a new critical approach that focuses on the distinctive contexts of disaster-sensitive urban development, planning, and design.

One element of this involves an explicit retheorizing of resilience that deviates from much of the literature that builds upon Holling's (1973) insights. This includes a departure from the common conceptualization of resilience as primarily as a measure of post-disaster processes of adaptation, coping, and bounce back that is based on a pre-existing array of social, infrastructural, and other qualities external to the disaster experience (e.g., Cutter et al. 2008; Gotham and Greenberg 2014; Cutter, Ash, and Emrich 2014; Tierney 2015; Graham, Debucquoy, and Anguelovski 2016; Dawson 2017). Another element involves

supplementing previous work that illuminates how sociospatial inequalities are (re)produced during disaster impacts and recovery and how resilience may reflect neoliberal priorities (Adams 2012; Cretney 2014; Gotham and Greenberg 2014; Tierney 2015). While useful, these works may ignore the possibility of a resilience logic that is somewhat independent of neoliberalism—even if it tends to be neoliberal-friendly. They may occlude the distinctive role that pre-disaster preparedness and planning regimes play in producing "uneven landscapes of risk and resilience," which are "landscape[s]...conditioned by the existing degree of inequality and risk and the strengths or weaknesses of social and environmental protections" (Gotham and Greenberg 2014:6).

Put simply, while a vast majority of sociological studies of disaster look at past events that have already occurred, resilience efforts may produce space in ways that support inequality without any need for an intervening disaster (Lefebvre 1991; Gould and Lewis 2018a). Moreover, they may create the conditions that mature into inequality with the occurrence of a disaster (Pellow 2000; Gould and Lewis 2018a). While modern disaster research has inordinately benefitted from the recognition that post-disaster crises may "originate in social conditions that are far removed from the [disaster] events themselves" (Gotham and Greenberg 2014:6), it is likewise useful to foreground how uneven landscapes of risk also derive from disaster planning and preparedness efforts that depend on the anticipation of a disaster event.[2]

[2] Among other considerations, these include infrastructural development, building codes, evacuation plans, land use modifications, and choices about coastal armoring, abandonment, or managed retreat (O'Neill, Van Abs and Gramling 2016; Koslov 2016). In the chapters that follow a number of discrete examples are provided. These include a case study analysis of how building codes, evacuation plans, and land use policies influenced the experience of the Florida Keys with Hurricane Irma, as well as the potential for broad systemic effects arising from the inclusion of a resilience metric into rating agency appraisals of municipal bonds.

This is similar to efforts that have: identified ways that maladaptive climate change resilience planning that can add to sociospatial inequality through distributive and procedural inequities (Anguelovski et al. 2016; Anguelovski, Irazabal-Zurita, and Connolly 2018; Davoudi 2018); the financialization of resilience infrastructures like dykes and sea walls (Shatkin 2019); the integration of existing systems of oppression into revanchist resilience plans (Alvarez and Cardenas 2019); or through the promotion of gentrification through resilience initiatives (Gould and Lewis 2018a). Despite this recent scholarly interest, according to Anguelovski, Irazabal-Zurita, and Connolly (2018:133) "[w]hile much attention has been paid to the drivers of and approaches to urban resilience…the socio-spatial implications of concrete interventions have not received much consideration…." I add to these developments by offering a novel theoretical foundation through which potential drivers, mechanisms, and consequences of concrete resilience interventions may be identified, analyzed, and reformed both before and after disaster.

A focus on elements of the planning process does not imply that conditions like structural inequality that are farther removed from the disaster event are any less important. Rather, it seeks to emphasize that at a time of greater overall disaster risk and intensified efforts to plan and prepare in the name of resilience (IPCC 2014; Angus 2016; Colker 2020) the sociospatial consequences of disaster planning and response[3] should be subject

[3] While planning and response are often thought of in a pre-disaster/post-disaster binary, this distinction is rarely so neat. For examples, many disaster "planning" regimes are undertaken in response to prior disasters, even those that happened at a great distance (i.e. they may also be in response to scientific advances, better understanding of environmental risk, and dissemination of information (Satake et. al 1996; Fowles, Liu, and Mamaril 2009; Shtob 2019)). "Response" regimes are often described as planning for the next disaster in addition to recovery. As used here, planning denotes activities that are undertaken generally in anticipation of a future event, while response denotes activities that are undertaken shortly after a disaster. The greater point is that these efforts bleed together. Planning may set the table for reproduction of inequality that only comes to pass in the post-disaster responsive phase. Alternatively, planning may result in inequality well before any disaster. Yet it is clear that more attention—scholarly, media, and lay—tends to be given to disaster initiatives that occur in the aftermath of a newsworthy event than in other contexts.

to heightened scrutiny at all stages of the disaster cycle. In this way this effort can dovetail with those focused on the sociospatial consequences of structural inequality and disaster, inviting analyses of how environmental change manifests in landscapes of uneven development in concert with other structural formations.

Moreover, this approach is relevant to a diverse array of communities and localities as its purview includes any municipality with a disaster plan or budget. An important goal is to continue the necessary work of demythologizing the experience of disaster (Tierney 2003; Tierney, Bevc, and Kuligowski 2006) by analyzing what is actually made in the name of resilience (as opposed to stated intentions). Dressing bad policy in the clothes of public safety and protection from disaster may be an easy means of uncritical justification. One benefit of an outcome-focused approach is to avoid political misdirection and sleight of hand. Another is to support proactive analysis of resilience efforts—and efforts focused on similar concepts like adaptive capacity—well before a hazard event occurs. A third is to produce a means of analysis of disaster planning and response that, while initially focused on resilience, may be applied to successor terms or ideas should "resilience" fall out of vogue.

There is an additional pragmatic purpose for the materialist approach: it may help to identify elements of our sociospatial systems that may be responsible for the production of disaster space. Drawing on the sociology of urban spaces and borrowing from the fields of urban planning and critical design, I outline some potential consequences of resilience through the political economies of real estate development, planning, and finance at a time when real estate interests wield considerable influence through political structures and the built environment (Logan and Molotch 1987; Lefebvre 1991; Foster, Clark, and York

2011; Gotham and Greenberg 2014; Boehnert 2014, 2019; Gould and Lewis 2016, 2017; Cowley et al. 2018; Stein 2019).

Focusing on how space is produced by through the interaction of agents such as architects, designers, and developers (Lefebvre 1991, 2003), I highlight the staggering influence of real estate development in the production and regulation of contemporary space (Stein 2019) to illustrate the potential danger arising from its interaction with the justificatory power of resilience and disaster readiness (Gotham and Greenberg 2014; Dawson 2017). In this way, I build upon previous analyses of how disasters and other crises influence the way that space is produced across scales. This reflects what Gotham and Greenberg (2014:229) describe as "crisis-driven urbanization," or "spatial dynamics" that depend on "the vagaries and contingencies of disasters…and the crisis dynamics they entrain," but applies to the periods of relative calm before the storm.

In addition to the departure from the post-disturbance view of resilience that has been common since its importation into the social sciences from ecology (Holling 1973), this requires rethinking how the pre-disaster state of "equilibrium" is influenced by the potential of future disturbance through planning. While this is certainly not the first attempt to think about how disasters affect urban development processes (Klein 2007, 2018; Gotham and Greenberg 2014; Gould and Lewis 2016, 2017), it is among the first to theorize the intersection of resilience, real estate development, design, and inequality and specifically focus on the broad consequences of the pre-disaster period: when the basal state of equilibrium is established and resilience initiatives are typically funded and undertaken (Colker 2020). By connecting diverse fields of study to the production of space

that surrounds disasters, I emphasize how distinctive elements of the production of space—from finance to design—may react to the risk of disaster.

These observations, coupled with numerous case studies analyzing post-disaster outcomes and a few analyzing thoughts about ongoing or coming disasters (Norgaard 2009, 2011; Shtob 2019), suggest that our interactions with environmental change may have creative effects on landscapes and communities before the occurrence of a hazard event, as well as after. Moreover, these effects are likely to intensify due to climate change and continued development in hazard zones (O'Neill, Van Abs, and Gramling 2016), emphasizing the need to not only describe resilience but also to understand the consequences of the pursuit of resilience.

To reiterate, the goals of this chapter are three-fold. The first goal is to rethink the way resilience is used in sociology and related social sciences from a materialist standpoint by focusing on what is created in its name. This benefits disaster scholarship by encouraging the avoidance of semantic arguments that have surrounded and obscured the meaning of resilience. The second goal emphasizes the potential and somewhat overlooked importance of the pre-disaster planning period on the production of disaster space and inequality, whether or not a disaster has occurred. The third is to develop a theoretical account of the production of disaster space that focuses on some distinctive qualities of disasters, finance, design, and planning, in order to rethink the relationship between resilience and the production of space (Lefebvre 1991) in disaster areas: the production of disaster space.

RETHINKING RESILIENCE

With numerous and often inconsistent definitions, resilience is as defined by its complexity as by any discrete definition. It has generated papers that ask, "what kind of thing is resilience?" (Anderson 2015) and whether it is a normative concept (Thorén and Olsson 2018). Others have discussed "the nature of resilience" both generally (Zebrowski 2013) and in discrete contexts like urban spaces (Meerow, Newell, and Stults 2016). At least one effort helps to clarify "what resilience is not" (Reghezza-Zitt et al. 2012). Yet despite a proliferation of attempts to explain resilience, it is commonly criticized as buzzword or jargon that has been defined to death (Reghezza-Zitt et al. 2012; Rogers 2015; Dawson 2017).

Moreover, resilience has been criticized for having been shaped by neoliberal approaches that, among other consequences, exploit disaster experiences in ways that generate or reproduce inequality (Adams 2012; Cretney 2014; Tierney 2015; Klein 2018). Scholars in this line of research observe that resilience efforts may privilege private market solutions and profits over effective aid. They may also require those affected by catastrophe to act as entrepreneurs, individualizing responsibility for recovery and ultimately resulting in housing instability and loss, community displacement, and a variety of adverse health effects for those unable to effectively advocate (Picou and Hudson 2010; Desmond 2012; Hall and Lamont 2013; Adeola and Picou 2014; Cretney 2014; Tierney 2015). In this section I will outline some of the definitional clashes over resilience in order to propose that, in the context of disasters, it is preferable to focus on material outcomes both for clarity and to better appreciate complex effects of resilience initiatives reflected in critiques like these.

The Resilience Question: Cutting Through the Definitional Tangle.

Due to the number and complexity of competing interpretations of resilience, it is useful to begin with a brief review of a selection of major approaches, as well as contemporary genealogies that have traced the use of the word over time. My intention is to illustrate the improbability of arriving at a perfect definition and the danger associated with reductive definitions. In essence, the use of resilience is complicated in ways not captured by Holling's (1973) definition. Recent genealogies challenge the linear etymology of the term that is widely accepted in the and social sciences and emphasize the complexity of its multiple and sometimes inconsistent forms and interpretations (Alexander 2013; Bourbeau 2015, 2018).

One widely acknowledged difference in the use of the term occurs among disciplines and involves its subject. For example, in "strands of psychology, resilience refers to the capacity of an *individual* to adapt positively after a traumatic event" while "[c]riminologists define resilience as a process of positive adaptation" and "ecologists use resilience to describe how an *ecosystem* can return to a state of equilibrium and maintain its function after disturbance" (Bourbeau 2018:19, emphasis added; Welsh 2014). Engineers and architects, alternatively, may use it to refer to the capacity of a *material or structure* to withstand stress and maintain or return to form (Alexander 2013; Dawson 2017). Yet all of these foci—the individual, the ecosystem, and built structures—are considered in concert in disaster resilience thinking notwithstanding their differences in disciplinary origin and treatment.

Despite this diversity, there is a dominant origin story for the importation of resilience into the social sciences and its subsequent proliferation: "ecologists and C.S.

Holling initially developed the idea in the 1970s and…other disciplines…[more] recently jumped on the resilience bandwagon" (Bourbeau 2018:22; Anderson 2013). Holling's principal innovation was to challenge and critique:

> mechanistic models of ecosystem equilibrium that dominated the Cold War era. These models assumed the 'balance of nature' (an equilibrium) to which life returns if left to repair itself following disruption. By contrast, Holling emphasized how nature absorbed and adapted to disruptions, describing resilience as 'the capacity of a system to absorb and utilize or even benefit from perturbations and changes that attain it, and so persist without a qualitative change in the system's structure'" (Dawson 2017:171, quoting in part Beatley 2009:3).

This definition incorporates an evident normative flair: resilience—that ability to adapt and overcome the curveballs that life throws at biotic or human systems—sounds like a good quality (Bourbeau 2015), even though its consequences may be selectively or absolutely adverse (Cretney 2014; Tierney 2015). Moreover, definitions such as these tend to distinguish between known pre-event characteristics of a system and whether the system can persist or effectively reorganize post-event. Conspicuously missing from many of these definitions are both the adverse consequences of resilience and its systemic effects before a disruption or in the interstitial period between disruptions (but see Anguelovski et al. (2016), Dawson (2017) and Neisser and Runkle (2017)).

Without denying the conceptual debt owed by social science to Holling's (1973) ecological resilience, the term entered social science through multiple paths, belying the simplicity of its linear importation from ecology. This presents problems in application to complex social contexts. Speaking to its use in politics and governmentality, Bourbeau (2018:27) observes that "[a]lthough a parsimonious shortcut may…be obtained, it is gained at the great expense of exactitude, richness, and complexity." Emphasizing this internal complexity, Welsh (2014) describes three separate strands that developed separately but in

conversation, including psycho-social resilience, which originated around child development and focused on recovery from trauma, socio-ecological resilience, which developed within ecology, and a third form that arose later "emphasiz[ed] the governance of risk and threats to the social body." (Welsh 2014:16). In short, the use of resilience throughout its journey to disaster sociology has been contested and complicated.

With this diversity of origins and uses, it is unsurprising that a perfect transdisciplinary definition of resilience may not exist. This, however, not render the term conceptually impotent. Quite the contrary, it is imbued with unique sort of power to motivate, create, and justify that is derived from its ubiquity as well as its significance to events and conversations that capture the public moment and implicate strong emotions (Hall and Lamont 2013; Gotham and Greenberg 2014; Anderson 2015; Colker 2020). Within the realm of global governance, the process of becoming resilient has "proliferated across multiple…domains of life…[as] the last iteration of the promise of security…offered as a desperate hope of survival in a world of roiling crises" (Anderson 2015:60). This also explains why resilience often resists universal definition: "there is both an empirical diversity of resiliences and a diversity of the types or forms that are extracted, in analysis, from that empirical diversity" (Anderson 2015:60; Olsson et al. 2015).

In turn, this clarifies why resilience serves as a boundary object through which different disciplines can communicate but also may suffer from the potential for abuse or miscommunication (Reghezza-Zitt et al. 2012; Tierney 2015).[4] Characterizations of resilience theories are likewise complex and variable:

[4] For the sake of clarity, here I use the term "boundary object" (Star and Griesemer 1989) in the manner used by Tierney (2015). In this formulation, she argues that resilience—like other popular socio-environmental concepts like sustainability—gained importance because of its potential to serve as a boundary object. This is because boundary objects may usefully serve as pliable concepts that invite collaboration on important and

> Some characterize resilience theories as reformatory, a normative philosophy for shaping change, producing active citizens, and facilitating self-securing agency, a dynamic process for 'bouncing forward' and changing to a new, sustainable state…while [o]thers find its deployment problematic…an ideology of constant adaptation attuned to the uncertainties of the neoliberal economy, where the resilient subject is conceived of as resilient to the extent it adapts to, rather than resists, the conditions of its suffering (Welsh 2014:16; Bourbeau 2015).

What is generally common to applications of resilience (notwithstanding their diversity) is that they tend towards the descriptive: how well does some quality or element of a person or system resist disturbance, or recover, or bounce back to the previous state, or bounce forward to an improved one? An example of an influential definition of resilience within the social sciences of natural hazards is "*the ability of a social system* to respond and recover from disasters [that] includes those *inherent conditions* that allow the system to absorb impacts and cope with an event, as well as *post-event adaptive processes* that facilitate the ability of a social system to re-organize, change, and learn in response to the threat" (Cutter et al. 2008:599, emphases added; see also Cutter, Ash and Emrich 2014).[5] Descriptive cases like this use qualities and relative strengths or weaknesses of a place or community to describe its ability to withstand an external disturbance. Despite the way that these efforts often usefully highlight the importance of social variables, they often invoke pre-event characteristics of a place or community without due consideration of the

far-reaching problems between members of disparate disciplines who may have different vocabularies and understandings of the world. By serving as common analytic pivot points, boundary objects allow communication that is less focused on definitional precision than on problem identification. She observes, however, that there is also a "Janus-faced" element to boundary objects, through which they can be manipulated to obscure power relations and potentially create inequality (Tierney 2015:1331).

[5] A small minority of definitions of the term include an element of preparedness, including that of the National Academy of Sciences (Dawson 2017). That definition, however, emphasizes many of the usual elements of contemporary resilience: a system's potential for response and recovery; measurement of the qualities of a specified set of pre-existing conditions within that system; and a process of estimation of the ability of that system to react and adapt effectively based on those qualities. In short, even in these formulations preparedness is viewed by reference to its post-disaster effects, meaning the effectiveness of preparation efforts in assisting the return to the previous form, as opposed to how they change that previous form.

diversity of the effects of resilience efforts themselves on these characteristics. Presumably the intention is to suggest ways that resilience may be enhanced with the eventual goal of protecting people and property from hazard risk, but an important subject of study is glossed over because resilience is framed as an effect or outcome that will only be converted into a cause in the subject disaster.

In short, these studies sometimes take resilience as the result of pre-defined drivers that are unrelated or only minimally related to disaster and omit that resilience efforts themselves can drive outcomes, and sometimes in unintended ways. Because resilience may be invoked in connection with disasters and other events that invoke strong feelings and appeals to public safety that require swift intervention, it may be especially prone to exploitation (Gotham and Greenberg 2014). Recognizing that a diversity of meanings attaches to resilience across multiple fields and disciplines that do not share a common definitional understanding—and the confusion that this may generate—also suggests that it may be especially ripe for manipulation and abuse. In turn, this suggests the importance of reimagining resilience in light of the tangible consequences of efforts made in its name.

Contemporary Critiques of Resilience: Politics, Deletion, and Policy

Notwithstanding the widespread adoption of resilience—or perhaps because of it—a number of critiques have arisen that also suggest the importance of a focus on its formative nature. First among these is the contention that reliance on Holling's (1973) ecological conception of resilience tends to obscure "questions of both political economy and power relations more broadly" (Cavanagh 2017:112; Fainstein 2015) because it is a "framework shaped by dominant societal values and hegemonic discourses" (Cretney 2014:628). A second related concern is that the vagueness of the resilience metaphor and

its "malleability in science combined with a popularity among powerful private or public actors…[presents] the risk of (un)intentional scientific justification for particular policies, projects, and practices" (Olsson et al. 2015:6). Part of the "increasing concern" with the use of resilience in social science research involves the uncritical application of concepts like the adaptive cycle, the assumption of societal collapse, and the lack of adequate consideration of human agency within socio-environmental systems (Cretney 2014:631; Olsson et al. 2015).

A third criticism is that theories of resilience have an *a priori* normative bias due to their roots in psychology, inasmuch as there exists an assumption that the shock or stress is inherently negative and the successful resilient reaction inherently positive (Bourbeau 2015). While it may be safe to assume that natural disasters are inherently negative, the same is not true about the products and consequences of resilience as applied to people and landscapes. Rather, recent research indicates that resilience efforts are a mixed bag: they may protect people and communities, but they also may exacerbate social problems (Adams 2012; Gotham and Greenberg 2014; Elliott 2015; Tierney 2015; Elliott and Howell 2017; Howell and Elliott 2019; Sovacool et al. 2019).

A more sensitive, multi-faceted view of resilience is particularly important for at least two additional reasons. First, given the exacerbation of global risk (Beck 1992, 1996) emerging from the climate change (IPCC 2014; Angus 2016), the potential scope of catastrophic environmental change is increasing. This corresponds with the sociological perspective that disasters should not be viewed as anomalous but as a regular part of life (Elliott and Howell 2017). Since "danger invites rescue"[6] recognizing disasters as normal

[6] Wagner v. International Railway Company, 232 N.Y. 176 (1921) (Benjamin Cardozo, J.)

suggests that disaster planning will likewise be normalized (i.e. Colker 2020). The second reason involves our rapidly expanding awareness that disasters may exacerbate sociospatial inequality in ways that may not be immediately evident. For example, a series of national quantitative studies has found positive correlations, on average, between: natural disasters and residential instability, along with associated race and class-based housing inequalities (Elliott 2015; Elliott and Howell 2017); natural disasters and wealth inequality, with real estate and real estate-dependent aid hypothesized as central to these processes (Howell and Elliott 2019); and natural disasters and accelerated land development, which may result in increased disaster risk to people and property as well as accelerated environmental degradation (Elliott and Clement 2017).

While the foregoing concerns may represent a more cautious approach to resilience, perhaps the most blistering critical approach is largely based on observations about Hurricane Katrina and neoliberal relief efforts. Tierney (2015:1339, quoting in part Adams 2012:195) describes how the disaster's aftermath was marked by salient signs of neoliberal ideology, from the privatization of aid to the observation that "survivors [needed] to become 'entrepreneurs' and 'empowered consumers' in order to receive the assistance they needed to get on with their lives." Put another way:

> Narratives that elevate resilience as a primary goal for disaster risk reduction have little meaning within this context…[and the claims] put forth by champions of sustainable development and now by resilience advocates stand in contrast with the on-the-ground realities not only of programs designed to enhance resilience but also of those that putatively integrate resilience into postdisaster recovery, which in the main reflect neoliberal ideals, ignore the workings of political and economic power and construct the residents of disaster-stricken areas not as political actors with rights, but as clients served by corporations for their own profit. Katrina offered us a vision of the future, and it is not a resilient one (Tierney 2015:1339, internal citations omitted).

Similarly, scholars in international relations have concluded that resilience "is a product of contemporary neoliberalism and a strategy permitting states to abdicate responsibility in times of crisis" (Bourbeau 2015:375; Chandler 2012; Duffield 2012). Bourbeau (2015:379) explores where resilience and neoliberalism meet, first by emphasizing a number of theses developed by scholars of politics, governance, and international relations. While some of these include a sanguine view of resilience as a site of social reformation or liberation (Duffield 2012; Chandler 2012), others see a less rosy picture, foregrounding dangers of entanglements between neoliberalism and resilience (Bourbeau 2015).

Yet Bourbeau (2015) argues that these works, individually and collectively, make the mistake of conflating neoliberal projects with the idea that resilience is derivative of neoliberalism. In essence, he feels that viewing resilience as merely an offshoot of neoliberal ideology is inherently limiting, as is "the idealistic position that resilience is purely positive." Instead, he proposes that "any extensive evaluation of resilience and its relationship to contemporary…politics must look beyond the questionable instrumentalization of resilience by some governments to the complex and multifaceted application of resilience" (Bourbeau 2015:380). Because disasters are easily exploited, disaster research should likewise embrace the potential for a dark side of resilience and eschew simplistic or derivative explanations for its consequences.

Because of this diversity in views, it is preferable to view resilience as its own ideological creature that may share a nest with neoliberalism but is not necessarily its offspring. This allows us to appreciate the complexity of its political entanglements and suggests that it should be explored on the basis what it *does* rather than what it *says*.

Refocusing the primary resilience lens from the descriptive to the formative also allows for processes of formation to be examined well before the occurrence of a hazard trigger, expanding the temporal of scope of typical disaster analysis to the time when resilience planning programs may capture significant social and financial capital and also may be most easily altered or improved (Klein 2007, 2018; Gotham and Greenberg 2014; Tierney 2015; Dawson 2017).

THEORIZING THE MATERIAL OUTCOMES OF RESILIENCE PLANNING

Tierney's (2015) strong criticism of resilience as a feature of neoliberalism centers primarily on post-disaster material effects that take the form of lack of effective access to aid, denial of housing, and dislocation of populations and neighborhoods based on predatory and profit-centered responses. Her effort is joined by many other case and quantitative studies evidence an ongoing failure of the better angels of human nature in the context of provision of disaster aid notwithstanding these efforts being dressed in good intentions (Klein 2007, 2018; Adams 2012; Gotham and Greenberg 2014; Elliott 2015; Dawson 2017; Elliott and Clement 2017; Elliott and Howell 2017; Howell and Elliott 2019).

If resilience is so intensely studied and is presumably based in many good intentions, why have commentators repeatedly concluded that strategies based in resilience not only may not help but may actively harm? It seems that the time has come to reevaluate it from a political economic standpoint. Building from the foundation of prior efforts (e.g. Gotham and Greenberg 2014; Dawson 2017), I focus on means of capital accumulation through real estate development and design both pre- and post-disaster, but with a special emphasis on the pre-disaster period. Moreover, this approach seeks to identify some likely mechanisms

from resilience-based exploitation that can be identified during planning, well in advance of disaster.

To illustrate this need, I use an excellent and important work in the political economy of disaster, Gotham and Greenberg's (2014) *Crisis Cities*. Tracing the parallel experiences of New York City and New Orleans, they explore how iterative crises—financial, political, and environmental—are exploited by growth machines (Logan and Molotch 1987) and other politically powerful forces to create and maintain systems of local inequality and increasingly disadvantage marginalized communities (Gotham and Greenberg 2014). For example, they dedicate one chapter to the question of what happens when neoliberal, market-oriented goals "are the ideas 'lying around' for resurgent growth coalitions to apply to post-disaster redevelopment?" (Gotham and Greenberg 2014:135).

Their primary focus is on how concatenated crises, including those prompted by disaster, result in crisis-driven urbanization. Disasters, viewed in this light, are "contingent events that under the proper conditions can trigger and be transformed into crises" that in turn drive future urban development trajectories (Gotham and Greenberg 2014:6). The element of concatenation directs that with repeated crises over time, "previous rounds of restructuring create the regulatory environment, public-private modes of governance, and socio-spatial inequalities that lay the ground for the crises and spatial politics of subsequent generations" (Gotham and Greenberg 2014:11; Biggs et al. 2011). In this vein, they use the term "landscapes of risk and resilience" to refer to "pre-existing socio-spatial, environmental, cultural, and political economic conditions that weaken or strengthen the ability of places to cope with or adapt to crises" (Gotham and Greenberg 2014:136). Their specific use of resilience "refers to the adaptive capacity of a social system and unit to

withstand shocks and protect against other hazards by organizing and innovating" (Gotham and Greenberg 2014:136). Importantly, they also emphasize how crises may justify projects that might be politically untenable during times of relative calm, emphasizing the danger of exploitation following disasters (Gotham and Greenberg 2014; Jacobsen 2016).

Yet the outcomes of the collision between neoliberal priorities and disaster—including the material effects, as severe as these are—are largely cabined within the context of post-disaster recovery and redevelopment. I do not mean to imply that they are ignorant of the pre-disaster period: they clearly recognize that the response to one crisis may serve as planning for the next. Their approach, however, tends to highlight that urban development trajectories are the residues of past recovery and redevelopment rather than pre-disaster planning. In this way their focus trends towards the responsive phase of the crisis experience and the trajectories that these set, without much attention to the efficacy of prophylactic intervention that is not triggered by a massive disaster. In essence, their use of resilience is (like most others in the literature) descriptive of how adaptive capacity exists (1) based on processes of investment and disinvestment in development projects that are the result of processes external to natural disaster like some historical forms of urban segregation or (2) are the product of post-disaster exploitation by powerful interests, including real estate developers. While of course many planning regimes and related sociospatial inequalities are the product of efforts external to disaster and resilience (Gotham 2000, 2002a, 2002b), analyses of inequality or segregation in urbanization should expand to consider the full effects of resilience planning efforts themselves.

To be clear, I am not calling into question their methods, the factors used, or their overall distillation of how the exploitation of crises interacts with "race, class, and public

policy" to create uneven redevelopment and unjust outcomes for city dwellers (Gotham and Greenberg 2014:136). It may well be that in both New York City and New Orleans the relative *lack* of preparation was in fact the most salient feature of political economic analysis of the lead-up to these disasters (Freudenburg et al. 2009). Rather, I am arguing that efforts like this—as useful as they are—would benefit from the explicit integration of the political economic choices that justify themselves on the basis of resilience in light of actual or perceived hazard risk. In short, with expanded interest in resilience there need not have been a crisis for disaster exploitation to develop. These choices may affect neighborhoods and communities in advance of a disaster, regardless of whether that community has experienced a past disaster or will experience one in the future. The consideration of the pre-disaster context is critical for rethinking the consequences not only before crises, but in the interstitial periods between crises when memories may fade and consideration of risk may lose public purchase.

The Ideological Basis of Natural Hazards Resilience

In addition, given that planners are required to contend with adverse events with which we have no practical precedent (such as the long-term effects of climate change (IPCC 2014)), it is becoming increasingly important to consider resilience as its own entity that motivates decisions based upon the logic of protection from the "environment." Resilience initiatives developed in this vein may justify might not neatly conform to the contours of the neoliberal critique of resilience (Cretney 2014; Tierney 2015; Fainstein 2015; Andresen 2019). While resilience initiatives may certainly bear hallmarks of neoliberalism, in this section I argue that in order to understand the political economic implications of resilience, it should be viewed as its own conceptual entity.

In furtherance of this goal, it may be helpful to consider resilience as its own brand of ideology with its own logic. As with resilience, debates about "ideology" spanning many decades have failed to reach a single synthetic definition (Hall 1986; Hamilton 1987; Larrain 1991; Freeden 2007). This may be because ideology "is buffeted by the winds of academic fashion, reflecting not only substantive foci of interest but reigning methodologies" (Freeden 2007:2). One response to this confusion is to adopt an action-oriented view of ideology that accepts not a single, universal ideology (though accepting, of course, that one may be dominant or hegemonic in any particular time and place) but multiple, contestable, and differentiable ideologies that co-exist as "the building blocks and clusters of meaning which shape political worlds" (Freeden 2007:13). These may be traced from their outcomes in addition to (or in place of) the words or speeches in which they are presented. This "generous view" of ideology incorporates systems of both power and emotion that are expressed as "political thought [that] is not only embedded in texts and speech but in behavior, routines, and practices; and the political thinking discernible through the latter may often be closer to the pulse of a society" (Freeden 2007:18).

In other words, although much has been learned through the study of the discourses of resilience, seeing what resilience creates in a material sense may tell us more about it as an ideology or logic than how proponents of resilience brand their efforts. It is reasonable to assume that this would be amplified in systems where powerful interests may push ideological talking points while simultaneously obscuring the practice or consequences of that ideology. Allowing resilience to follow this flexible, impact-focused view of ideology presents the opportunity to circumvent definitional conflicts and to focus on the political economic logic and content of proposed interventions.

Applying this view, resilience may be viewed as a socio-environmental ideology that has political implications but is distinguishable from neoliberalism, which is a political ideology that may have socio-environmental implications. This is not to deny the significant cross-pollination and the socio-environmental service to neoliberalism that is performed by resilience (Gotham and Greenberg 2014; Cretney 2014; Fainstein 2015; Tierney 2015; Andresen 2019). Rather, it is to suggest that resilience serves as an ideology or logic that may be manipulated and exploited with consequential material results in ways that may or may not reflect neoliberal expectations (Freeden 2007).

For example, while it is clear that many resilience programs reflect neoliberal standard operating procedure, at times they may not. Tierney (2015:1334) is careful to note that while neoliberalism is not monolithic, it is still "possible to pinpoint key aspects of neoliberal social, political, and economic arrangements" in the context of resilience and disaster. Among the key elements of neoliberalism that she identifies include an emphasis on economic growth, deregulation and market-based controls, a relocation of trust from state power to market power, and privatization along with the development of public-private partnerships. Others have similarly identified governmental austerity as a key element of neoliberalism in urban politics. This includes how fiscal crises may be exploited to "roll back the frontiers of the state" from social welfare regulation and centralized responses to risk, devolving responsibility to localities and individuals who may be ill prepared (Peck 2012:629).

Yet many actual and suggested disaster-planning projects involve both massive public expenditures at the federal and state level and regulation of the free market through, among other means, building and land use codes (Gotham and Greenberg 2014; Dawson

2017; Colker 2020; Davis and Ryan 2020). While these efforts bear certain hallmarks of neoliberalism and may achieve neoliberal-friendly ends like private capital accumulation with minimal concern for inequality, they do not conform to key elements such as governmental austerity, devolution of control to localities and individuals, or anti-regulation. Understanding resilience as its own form of ideological project that may or may not perfectly map the contours of neoliberalism helps us to understand the distinctive logic through which it may promote sociospatial inequality. This represents an additional benefit of a materialist, outcome-based approach that features centrally in the production of disaster space: as we come to grips with greater risk (Beck 1992, 1996; IPCC 2014) the ways that we counter those risks deserve their own attention.

The Material Approach: Lefebvre, Urban Design, and the Production of Disaster Space.

How, then, may we conceptualize a socio-environmental ideology like resilience through its formative effect, with a particular eye towards effects that arise in the pre-disaster period? Moreover, where might we look for promising explanations for the development of inequality in disaster zones? One key comes from *The Production of Space*, in which Lefebvre (1991) theorized the growth of urban spaces in a way that exposes the "ideological underpinnings of [the] organization" of our built environment (Summers and Howell 2019:1088). Space, in this formulation, is both socially produced and productive of social life in its image. Landscapes develop in ways that reflect particular political economic systems and the built environment, rather than representing a neutral backdrop, plays a role in maintaining and reproducing systems and structures of power (Lefebvre 1991, 2003). Yet the ideological commitments that direct Lefebvre's (1991:9) "science of space" may be less than explicit, concealing the political use of knowledge with

"an ideology designed to conceal that use." Within this Lefebvrian framework careful attention must be paid to ideologies of space, particularly those formed at the intersection of emergent knowledge like that of climate change. Resilience—justified by public safety in changing times—may be such an ideology.

Another key likely lies within real estate development, both because of its size and political importance and because of its close relationship with the practice of building. Lefebvre (1991) observed that real estate constitutes a second circuit of capital in which "the channeling of money, the construction of housing, the development of space, financing, and speculation in land constitute a second means of acquiring wealth that is relatively independent of the 'first' circuit, industrial production" (Gottdeiner 1993:132). Yet even with this understanding of the motivation to produce space, why is space produced in a particular form? One explanation is the triple of representations of space, representational space, and spatial practice: the interlocking physical, mental, and social dimensions that align the use and organization of space with systems of social relations (Lefebvre 1991; Gottdeiner 1993; Helmuth 2019).

Yet it would be a mistake to focus solely on these and ignore the individuals and industries involved in the production of space. Lefebvre (1991:9) employs the triple of architecture, urbanism, and planning to denote how practice of the production of space—what he terms "projects concerned with space"—actually occurs.[7] Part of the mission of

[7] This is distinct from "spatial projects" inasmuch as the term "projects concerned with space" veers closer to the mechanics of how space is produced, as opposed to its political or ideological basis (though it certainly folds these into the analysis). Spatial projects refer to "the formative movement" of social relations into space such that "social life forms its spatial milieu in ways that are productive for it." In other words, the spatial project is "the dialectic between space and social relations itself" that inscribes political power upon space (Madden 2014:480). Projects concerned with space, alternatively, are presented by Lefebvre (1991) as a way of imagining the future even while stymied by the present mode of production, and is applied specifically to architects, planners, and designers. In this way it better reflects the restrictions on creative imagination imposed by a political economic system than spatial projects: while spatial projects emphasize creation,

The Production of Space is to demystify the processes by which finance, planning, design, and architecture are organized to construct landscapes and the built environment. In so doing Lefebvre (1991) argues that ostensibly politically neutral aesthetic processes are in fact motivated and organized by the needs of well-organized and powerful interests. In this way elements of planning and design—like building codes and land use plans—may be identified as the *mechanisms* through which political economic priority comes into spatial being. One immediate benefit of the application of the production of space to the material consequences of resilience initiatives is the ability to identify these mechanisms and their underlying logic (Lefebvre 1991, 2003).

While spatial projects are by definition political, the analysis of projects concerned with space goes a step further, examining the interplay between power structures and the mechanics of the activities of those professionally involved. At the same time, Lefebvre (Lefebvre 1991:64, 2003) proposes, presumably as part of his larger project to reimagine cities as sites of human agency and improvement (Swyngedouw and Heynen 2004) the analytical reunification of the three levels of architecture, urbanism, and planning. Rather than the agents of design being "isolated by existing spatial practice," in a manner that obscures the true social relationships of urban development, he emphasizes how power is expressed even in the day-to-day details of spatial production.

> For all that architectural projects have a seeming objectivity, for all that the producers of space may occasionally have the best intentions in the world, the fact is that volumes are invariably dealt with in a way that refers the space in question back to the land, to a land that is still privately (and privatively) owned; built-up space is thus emancipated from the land in appearance only….This relationship…is both a practice and an ideology: an ideology whose practitioners are unaware that their activity is of an ideological nature, even though their every

projects concerned with space are concerned with the means of creation (Lefebvre 1991). In this use, and my use of the term "projects of disaster space," the implication is the existence of a dual dialectical focus between political power, space, and the development of space by specially trained human beings.

> gesture makes this fact concrete. The supposed solutions of the planners thus impose the constraints of exchangeability on everyday life, while presenting them as both natural (or normal) and technical requirements—and often also as moral necessities….And this in turn implies a repressive ideology in social practice—and vice versa, so that each masks the other. Spatial interchangeability inevitably brings a powerful tendency towards quantification in its train, a tendency which naturally extends outwards into the surroundings of the housing itself into those areas variously represented as the environment, transitional spaces, means of access, facilities, and so on….Quantification in this context is technical in appearance, financial in reality, and moral in essence. (Lefebvre 1991:338-339).

The central axis of Lefebvre's (1991) argument is that the way that space is produced through ideology permeates all levels and scales of practical human interaction with the built environment. This production may be extravagant or mundane, and it may be explicit or shrouded in inaccurate justification. Promoters of disaster readiness may describe a technically grounded project as an ideologically neutral moral necessity (i.e. protection from a coming disaster), when it is financial in reality and primarily serves capital accumulation. The production of disaster space adds an element of catastrophe, expectation of catastrophe, and moral motivation for public safety to the mix, distinguishing these types of choices from regular civic policy.

Reading resilience into the production of disaster space also requires elaboration of Lefebvre's (1991) notion of how social space is converted to abstract space. Social space denotes space that is lived in and valued for its use by the general public, whereas abstract space represents space that is commodified and used for the development of exchange value by elites. The production of space involves choices about the conversion of social space to abstract space given political economic context and priorities (Lefebvre 1991, 2003; Danyluk 2019). Rather than a singular "elite," however, the different levels of production of space exist within a hierarchy of professional power in which each component experiences distinctive pressures and motivations. To the three agents of

design, planning, and architecture, Lefebvre (1991, 2003) prophetically added the agent of finance. Based on his guidance about the interrelationships between these levels, in the sections that follow I will consider a few examples of how different agents may be influenced by political economic context and resilience, including critical perspectives from the field of design.[8] This opens up a forum to consider how resilience projects may be accomplished by a variety of actors working within a political economic context: the production of disaster space. It also allows for the consequences of these projects to be measured and their underlying logic analyzed.

Scale 1: Integration of Real Estate Development, Governance, and Accumulation.

We begin with the world of real estate finance: the site of the conflict between financial reality and moral essence. As anticipated by Lefevbre (1991) the second circuit of capital is thriving and has significant implications for the experience of resilience and the production of disaster space. Yet the sheer scale may have been astonishing to him. "Global real estate is now worth $217 trillion, thirty-six times the amount of gold ever mined" (Stein 2019:3) and more than ten times the 2018 Gross Domestic Product of the United States (Bureau of Economic Analysis 2019). In fact, in the context of preparation for disasters Elliott and Clement (2017:853) report that "federal hazard programs and private insurance markets…now underwrite more than $64 trillion in built property values across the United States—roughly 3.5 times the nation's [then] current gross domestic product."

[8] Disasters may provide a frame for reflection and refraction of existing social practices, amplifying their signal and salience (Birkland 1996; Tierney 2007). Therefore, an additional benefit to the study of resilience in the natural disaster context may be the opportunity to not only better understand disasters, but also the forces behind uneven development in times of relative calm. A secondary goal of this effort is to introduce concepts of real estate development and finance that may gain analytical importance as climate change becomes more accepted and feared.

On a global or national scale, these capital valuation figures reflect what Stein (2019:7), an experienced urban planner, refers to as the "*real estate state*," or "the political formation in which real estate capital has inordinate influence over the shape of our cities and the lives we lead." As a consequence of the magnitude and importance of real estate to municipalities and other political units, the state may work at the behest of the needs of real estate capital, focusing on real property valorization and the conversion of neighborhood use values to exchange values to be realized on global markets (Logan and Molotch 1987; Weber 2002). In addition to political pressures that may be applied by holders of real estate assets, local political subdivisions in the United States are often dependent upon property values because municipal finance often depends on *ad valorem* real estate taxes. In turn, these may inform decisions made at the intersection of the market and local government about the "best" uses and forms of land, and at times be directed by secondary circuits of global capital (Weber 2002; Pacewitz 2013; Dawson 2017). This contributes to instability in real estate markets that may in turn further fuel housing instability, displacement, and the creation of inequality (Logan and Molotch 1987; Desmond 2012; Stein 2019).

Real estate as a site of contestation also reflects the treadmill of accumulation (Foster, Clark, and York 2011). This is an elaboration and correction of the earlier treadmill of production (Schnaiberg 1980; Schnaiberg and Gould 2000; Gould, Pellow, and Schnaiberg 2004) that uses the metaphor of an accelerating, consuming, and polluting treadmill to show describe the fundamental incompatibility between constant economic growth and maintenance of environmental quality. The treadmill of accumulation moves the conversation—and the powerful treadmill metaphor—beyond the earlier focus on

industrial production and into the realm of the second circuit of real estate capital. Foster, Clark, and York (2011, 202-203), emphasizing this distinction, argue that "capital, by its nature, is self-expanding value," and consequently the treadmill of production exhibits a "tendency to underestimate the role of accumulation as the 'juggernaut' of capital, along with the crisis tendencies it generates" (Weber 2002).

Therefore, the dangers of capital that needs a home and the speculative investment that follows may be a fertile source of motivation about the production of disaster space: a "follow the money" approach to resilience. The specific dangers presented by the forces behind capital accumulation and the co-option of the state by capital interests reflect Gotham's (2009) description of the development of securitization as a way to render real estate liquid. He argued that due to market desires and *ad hoc* regulatory reforms illiquid real estate was converted to tradable securities through securitization. This was intended to free capital that would otherwise be tied up for extended periods of spatial fixity: a condition where immobile real estate interests (i.e. real estate itself or mortgages) tended not to be sold or transferred, nor otherwise converted to surplus value that could be swiftly reinvested to continue the cycle of accumulation. At the same time, the homogenization and pooling of distinctive real estate holdings into securities reduced financial risk for investors (Gotham 2009).

The twin goals of accelerated capital accumulation through real estate conversion and risk reduction likewise appear in the production of disaster space. On a fundamental level disaster events may involve the unwanted turnover of real estate through destruction and may put inhabitants in a position of being forced to sell because they cannot afford repairs (Klein 2007, 2018). The pre-disaster planning process may also cause real estate

turnover through application of land use and building codes (Anguelovski et al. 2016), gentrification (Gould and Lewis 2018a), voluntary managed retreat (Koslov 2016), official abandonment of at-risk areas (Flavelle and Mazzei 2019), or requirements that incentivize the strengthening or replacement of existing structures (Colker 2020; Davis and Ryan 2020; Ambrosio et al. 2020). Real estate therefore should be viewed as a central mode of accumulation of capital for wealthy interests, an important site of municipal finance and the municipal fisc, and importantly one that may be catalyzed by disasters (or planning for disasters) into a more liquid form that better serves the needs of capital. Moreover, because it is an important factor in the generation of familial and intergenerational wealth it may also factors centrally in the production of disaster inequality (Gotham 2000, 2002a, 2002b; Lipsitz 2011; Howell and Elliott 2019).

What else can be learned about resilience, specifically, from these observations about real estate development and the increasingly intermixed role of the state and private capital? First is that resilience is mediated through real estate and projects of disaster space are likely subject to similar forces that otherwise influence land use and planning but with a distinctive twist. Considering the massive scale of real estate investment and its public-private entanglements, the ideology and logic of resilience likely serves development pressures in ways that may be justified by innocent-sounding public safety rationales. Second, through resilience the form of space may be exploited or weaponized, leading to adverse post-disaster consequences as well as adverse consequences before disaster (Anguelovski et al. 2016). Building on observations about the effects of post-disaster resilience gentrification in major cities (Gould and Lewis 2018a) the focus should also interrogate the effects of a multitude of disaster preparedness plans (see, e.g., Colker 2020)

that may affect smaller communities and may have less noisy consequences than those following disasters in major cities.

Third, rather than accepting the expressed intention of resilience plans—the discourses surrounding resilience—it is preferable to look to their consequences as projects of disaster space that unfold across the disaster cycle. Finally, since the best time to engage with the potential adverse consequences of environmental change is before the triggering event, this enlivens the study of disaster by encouraging proactive research on inequality formation in addition than retrospective, historical research (e.g., Gotham 2000, 2002a, 2002b; Pasciewicz 2013; Rugh, Albright, and Massey 2015). Building off of this, it is possible to disentangle some of the relationships that put pressure on other those occupying other levels of the production of disaster space.

Scale 2: The Design and Layout of Urbanity.

Now we enter the world of architecture and design in order to demystify some experiences in these fields, as well as to search for mechanisms by which the production of disaster space comes to life. This is partially to evidence the intrusion of political economic pressures on the creative process and partially to emphasize the competency of designers, architects, and planners to creatively speculate on future forms based on little more than plans: a skill that may come in handy when imagining the consequences of resilience plans. Some design professionals have commented on the influence of real estate capital in setting the parameters for their work, either through the real estate state or independently through market and client influences. Easterling (2014:15), an architect and theorist, describes the dual public-private power catalyzed into the form of space and infrastructure as "extrastatecraft." Extrastatecraft connotes a parallel the system of

administrative authority that directs "the often-undisclosed activities outside of, in addition to, and sometimes even in partnership with statecraft." She contends that "[c]ontemporary infrastructure is the secret weapon of the most powerful people in the world precisely because it orchestrates activities that remain unstated but nevertheless consequential" (Easterling 2014:15). Like Lefebvre (1991), she recognizes the importance of infrastructure in the practical expression of systems of power that goes beyond open legislation.

This may help to explain a central contradiction in the planning process that reflects the contradiction between the expressed neoliberal preference for austerity and free market solutions and the costly material reality of disaster planning. Stein (2019:14) argues that the "nature of planning…in the United States is mercurial and contradictory….Our political discourse valorizes the free market in a way that makes planning seem unnecessary, yet the United States has always planned its urban spaces in important and powerful ways." While this may be old news, these contradictory regulatory tendencies may be magnified or molded by anticipated impacts of disasters. Both the pre-and post-disaster periods may be manipulated due to the serious nature of disasters, the necessity of infrastructural considerations, the emotional intensity that disasters produce, and their effects on structures of social capital (Elliott, Hite, and Devine 2009; Picou and Hudson 2010; Adeola and Picou 2014; Anguelovski et al. 2016).

Other critical scholars have taken note of the contradictory tendencies not only in planning, but also in design. For example, Boehnert (2014, 2019), a design practitioner and theorist, observes that design as a professional practice should ideally address human needs through expert professional creativity. Yet she distinguishes this prosocial mission from

what is created by the design *industry*, which uses design agencies that direct individual designers to work in the service of the dominant economic system (Boehnert 2014). Within the resilience field specifically, this runs contrary to greater integration of the "creative imagination," rather than the instrumental thinking that commonly guides resilience initiatives (Dobraszczyk 2017:869).

Acknowledging a number of potential benefits of the practice of design—including producing new ways of thinking and combining these with emergent technologies to develop complex socio-environmental solutions—Boehnert (2014) observes that this potential often goes unrealized. This is due to the institutionalization of design as a business in an economic system that favors profit, as well as the source of that profit: paying clients. The "basic impasse," she observes, is that "design must operate according to reductive [economic] feedback…as opposed to the feedback from the system in which the economic system is situated and upon which it is dependent (the ecological system)" (Boehnert 2014:124-25). These environmental omissions may extend to the needs of the end user, who may be ignored in the design process by the assumptions of the architect or planning agency (Kostof 1989).

Notwithstanding the dictates of the market or of clients, critical spatial practice, like critical spatial theory in the vein of Lefebvre's (2003) right to the city, tries to "generate questions to facilitate the process of identifying critical temporary spatialities" (Etcétera… 2012; see also, Bhatia 2012). These efforts indicate that there is interest among creative workers in critical approaches based in the production of space. A materialist approach to resilience, projects concerned with space, and the production of disaster space that employs Lefebvre's (1991) levels of professional practice could draw upon these scholars and

practitioners (as well as their professional imagination) for their predictions about how planning initiatives would come into being.

For example, why does building things stronger often also imply building them bigger? What are the spatial consequences of this connection? What are the consequences before the feared disaster occurs? How will these mature thorough the disaster experience? Answering questions like these would help to avoid sociological accounts of disaster inequality formation that typically come years after the trigger event when there is little that can be done. Listening to designers and critical design theorists provides another promising avenue to identify elements of the production of disaster space that may have unintended negative effects, and also may help generate a set of new questions based on their professional imagination.

THE MATERIALIST APPROACH TO RESILIENCE: AN ILLUSTRATION.

If a material approach to resilience exists across spaces and elements of the production of space, from finance to design, then how may these be traced? Here, I will provide an example of how this new analytical method of resilience critique may play out in practice. The first employs one work from which I have drawn heavily for inspiration (Dawson 2017). Later chapters will elaborate on this using the interactions of resilience and municipal bond issuances, and then the experiences of residents of the lower Florida Keys with Hurricane Irma in 2017. My intention in each case is to illustrate the promise of a more materialist view of resilience and concepts that inhere within it, such as adaptive capacity, and to demonstrate how the materialist perspective has the capacity to expand analysis into new realms necessitated by climate change.

Extreme Cities and Suggestions for Integration

It is perhaps unsurprising that one academic work that approximates the argument made in this paper at the intersection of capital, design, and disaster. Dawson's (2017:14-15) *Extreme Cities*, focuses in large part on New York, the "capital of capital," and emphasizes the need to "question the extent to which free market ideology permeates [resilience] and the adaptation efforts deployed in [resilience's] name." While many works list a variety of resilience initiatives (e.g., Bourbeau 2015; Colker 2020), this one takes an in-depth and comparatively forward-looking approach to the city's response to Hurricane Sandy. Dawson (2017) identifies how the political moment at the beginning of recovery provided a platform for development of resilience (and related concepts like adaptive capacity). He also outlines the contradictions that emerged out of the collision of New York's newly recognized disaster risk and the city's basal state of frenzied real estate development.

For example, shortly after Hurricane Sandy, then-Mayor Bloomberg and the city administration rolled out multiple reports envisioning hundreds of projects and measures with price tags approaching $20 billion "that established New York as the most forward thinking city in the United States in addressing climate change in general and sea level rise in particular" (Dawson 2017:33). Yet "at the same time as city planners and expert consultants were issuing these increasingly stark warnings about climate change, the Bloomberg administration was spending hundreds of millions in public funds luring real estate developers to construct luxury apartment buildings in waterfront zones of the city" (Dawson 2017:33). In strong terms the mayor rejected any form of abandonment, managed retreat, or even gradual or partial undevelopment of the waterfront. This was even so at the

ceremony to release *A Stronger, More Resilient New York*: the city's response to Hurricane Sandy. Mayor Bloomberg embodied a central contradiction of contemporary resilience by supporting expenditures to both resist disaster and to increase development in a known disaster zone. And all of this while the danger was still fresh in New Yorkers' minds. This is what Dawson (2017:36) observed was the inherent dissonance between the city role as a "sink for 'surplus capital'" while it is, for practical purposes, slowly sinking.

What purpose might these resilience plans serve, and what form did they take, despite their contradictory relationship to city policy? Because pre-existing coastal development in this context was not done for resilience but seemingly in spite of it, Dawson (2017) argues that climate response plans like those found in New York City and other contradictory cities like Miami represent a form of municipal greenwashing, branding in the service of attracting capital, or a disaster growth machine through which public funds are invested and appropriated for private wealth accumulation (Logan and Molotch 1987; Gould and Lewis 2018a). Moreover, while some of these plans—which were developed in relative secret by members of a municipal management consultancy inner circle—were focused on decreasing the city's carbon emissions, many were firmly focused on and justified by "the jargon of resilience" (Dawson 2017:153). Adopting an approach that focuses on the practice of architecture and design, he argues that resilience, even when used in a holistic sense of the city as complex system, tends to obscure its political elements.

Rebuild by Design was a design competition sponsored by the Rockefeller Foundation and funded by the U.S. Department of Housing and Urban Development focused on enhancing New York City's storm resilience. By Dawson's (2017) account it

had many laudable features, including its collaborative design and jurying process and a community-engaged, participatory design process. It also represented the beginning of a shift in the focus from post-disaster reaction to pre-disaster resilience by encouraging a storm-proofing network. In terms of jargon, it appears to be an ideal example of resilience translating to ostensibly useful practice as it makes all the right noises. Yet his review of one of the competition winners indicates that it leaves much to be desired from a material standpoint. One objection to the so-called Big U—a bridging berm that that would wrap around the lower Manhattan financial district like the second wall of Wall Street—was that it would actually increase risk on long timescales, holding back sea levels as they rose until eventually it was unable to do so (Dawson 2017). The parallels to the levees of New Orleans are more than evident.

Another issue was that the Big U would not make the water disappear. Rather, it would redirect it away from wealthier areas like the financial district and towards less affluent communities of color (Dawson 2017). Other waterfront communities in New York City—including Harlem and Red Hook, a neighborhood across the river in Brooklyn where public housing was greatly affected by Hurricane Sandy—were not protected. Therefore, communities that have traditionally suffered the brunt of environmental injustice from industry and urban planning are once again subject to environmental injustice: a resilience-driven case of environmental inequality formation (Pellow 2000; Liévanos and Horne 2017; Liévanos, Greenberg, and Wishart 2018).

With Dawson's comprehensive account of the city's post-Hurricane Sandy efforts and the plan envisioned by Rebuild by Design, how could the material approach presented here improve efforts like his? Without in any way disparaging this excellent book, there

are a few ways. First, the case of New York City and Rebuild by Design is exceptional for a variety of reasons, not the least of which is New York's global status as a center of commerce and culture. For every New York City, there are many other areas that presently have resilience plans or have them under development, yet have not experienced a recent disaster. Second, while Rebuild by Design and its $930 million price tag, along with the Big U, serve as case examples of some potential pitfalls of resilience (Dawson 2017), many initiatives towards resilience and disaster planning are more mundane yet no less important. From building codes and zoning (Colker 2020) to plans of managed retreat (Koslov 2016), resilience planning manifests in a variety of ways. Many of these efforts will be consequential but it is often difficult to predict how. By tracing the tendrils of the second circuit of capital and interrogating the probable equity impacts of projects like these, it may be possible to better align protection from disasters with justice goals.

Third, while Rebuild by Design is in many ways a preparedness project (or at least is billed as such), it came to exist after a major storm and whether or not it will be fully or partially completed remains to be seen. One key insight from this paper should be that it should not take a major disaster to begin thinking about the future and to begin questioning what form the consequences of resilience planning will take. Nor should we count on well-intentioned efforts started after a disaster to persist in either form or intention into later planning.[9] Instead, materialist analyses of resilience plans should begin with the plan and

[9] Well after writing this, near the end of editing this chapter, New York City news outlet *Gothamist* published an article describing how New York City's "most expansive climate resiliency project" had been abruptly halted by the Army Corps of Engineers, ostensibly for the purpose of political retaliation. This study was focused on the evaluation of five types of coastal defense, including sea walls, berms, and biotic barriers (Offenhartz 2020). In addition to again demonstrating of the highly politicized nature of resiliency efforts—a month before the President tweeted that New Yorkers should "get their mops and buckets ready" rather than depend on a seawall—this evidences the idea that reactive efforts may not progress past the planning phase, as this one did (Offenhartz 2020). Its interaction with the principles of neoliberalism, resilience, and growth machine supported accumulation is more complex, including elements of federal-state entanglement,

projection of its outcomes both in the present and the future. Concerns over gentrification and unequal, cumulative exposure to risk should be front and center, as should the potential effects of real estate valorization and conversion of public funds to private wealth (i.e., Gould and Lewis 2018a).

This is especially important because environmental sociologists have begun to view disasters not as a bug but as a feature of the socio-environmental system in which we live (Elliott and Clement 2017). "Over the past half century, the average [U.S.] county has experienced multiple hazards per *year*" (Elliott and Howell 2017:1182, emphasis in original). Therefore, while the most well publicized plans of resilience may be focused on large disasters, it is likely that in thousands of smaller community different hazard risks—major disasters, localized fires or wildfires, or even more surprising events like hailstorms, locusts, or fisheries collapse—may motivate the public imagination to take action in the name of resilience. It is in these thousands of discrete contexts with their unique decision-making priorities that a view of the material outcomes of resilience takes on significant public importance.

CONCLUSION

The purpose of this paper has been to challenge and deepen our understanding of the term resilience. This is because it has increasingly become a dominant way of justifying the deployment of resources against environmental change and risk. Additionally, it is because research into resilience may be hampered by the definitional confusion that surrounds the term. By reconsidering resilience as a formative human response to modern

political pressure, and arguments about austerity and public works, including the possibility of a $119 billion—yes, billion—offshore gated seawall that is being considered partly because onshore projects may be unsightly (Barnard 2020).

environmental change, however, we can distinguish what it *could be* from what it *is*. This analysis may be interpreted as contributing to literatures on disaster-based gentrification (Gould and Lewis 2018a; Klein 2018), so-called "green" gentrification (Curran 2007; Quastel 2009; Checker 2011; Curran and Hamilton 2012; Kern 2015), analysis of the effects of structures of real estate capital on housing (Wyly et al., 2006, 2009; Gotham 2009), or how resilience is practiced by particular groups (Graham, Debucquoy, and Anguelovski 2016). It adds to the scant yet important literature on the potential for maladaptation in resilience planning (Anguelovski et al. 2016) by promoting a prospective view of resilience and then theorizing mechanisms by which it develops. In a fundamental sense, it also reflects calls to focus on institutionally promoted social vulnerability (e.g. Connolly 2018) by directing attention to the effects of discrete planning initiatives and the longer arc of public-private cooperation.

Moreover, my goal has been to elaborate upon recent innovations in our understanding of environmental change and human response (Gotham and Greenberg 2014; Dawson 2017) by foregrounding the sociospatial effects of the anticipation of disaster, including which actors may be involved and why. This promises to enhance our understanding of disasters and urban development more generally by focusing on the logic of real estate capital and accumulation (Lefebvre 1991, 2003; Foster, Clark, and York 2011; Stein 2019). By analyzing the way that capital takes shape within at-risk landscapes before a storm it may be possible to diagnose the mechanisms by which people and property are put at risk not only during a storm but before, as well as the cumulative effects of consequences like gentrification that may mature before or after a storm and those like destruction of housing that typically mature after. These effects likely include involuntary

housing migration, residential instability, and a wide range of social ills that follow housing precarity (Desmond 2012; Sullivan 2018).

Scholarship on resilience would benefit from a sharper focus on the ways that it reflects the interests of a variety of social actors. This can take the form of direct pronouncements and policies such as those in Dawson's (2017) description of New York City's recovery from Hurricane Sandy. The exigencies of real estate development and finance have been demonstrated to affect post-disaster experiences (Gotham and Greenberg 2014; Tierney 2015; Dawson 2017) but these cases represent the tip of the iceberg. Events that capture public attention should be joined with the routine and seemingly unremarkable day to day functioning of thousands of local governments and others who plan, regulate, design, and build in line with their understanding of resilience, the ideological elements of political economy and public safety that collide in disaster preparedness, and local context.

A first step to understanding the submerged portion of the iceberg is to supplement discursive approaches to resilience with direct analysis of their material outcomes. This includes systems of finance, design and development, the co-development of the built environment by public and private actors, and the dependencies that systems like this produce (Logan and Molotch 1987; Lefebvre 1991). This requires challenging the assumption that resilience initiatives are a win-win proposition, even if at times they are. Reframing resilience as its own ideology—or at least as its own set of distinct ideological concepts—also helps to analytically separate it from neoliberalism. It is not my intention to argue that resilience is somehow immune to neoliberalism (Cretney 2014; Tierney 2015). Instead, it is to suggest that resilience represents a semi-autonomous ideological

frame that often dovetails with neoliberal ways of thinking but should be studied as a reflection of socio-environmental systems of power and inequality in its own right.

Finally, a materialist, outcome-based approached also encourages those are interested in natural hazards and other forms of risk to think more proactively, building off of the momentum created by retrospective appraisals of disaster and inequality to consider what should be done in advance. Because much of what resilience creates is focused on the next disaster but may be independently consequential in advance of that disaster (or if that disaster never occurs), it is likely that the decisions that have not yet been catalyzed into disaster impacts also matter. In addition to representing an underexplored component of resilience, these impacts represent an underexplored component of the socio-environmental consequences of environmental change generally. Taking a material approach to resilience confers the advantage of nimble identification and tracing of the ways that these come into form.

CHAPTER II. SHOCKS, STRESSES, AND MUNICIPAL BONDS: THE CASE OF MOODY'S, CREDIT RATINGS, AND CREATION IN THE NAME OF RESILIENCE.

We are taking these risks very seriously….You can't mitigate what you don't understand.
—Myriam Durand, Global Head of Assessments, Moody's Investors Service (Quoted in Flavelle (2019)).

INTRODUCTION.

In July 2019, Moody's Corporation (along with Moody's Investor's Service and other business affiliates, referred to as Moody's) acquired a controlling interest in Four Twenty Seven, a company that analyzes the potential physical impacts of climate change (Flavelle 2019). Notwithstanding a political system featuring well-organized climate denial (Norgaard 2009, 2011; Dunlap and McCright 2011) this signaled that credit ratings agencies—of which Moody's is one of the big three along with Standard and Poor's (S&P) and Fitch Ratings (Fitch)—take the potential financial effects of climate change and climate-related disaster seriously. In fact, over a year before the acquisition, Moody's U.S. Public Finance group issued an explanatory report—*Evaluating the Impacts of Climate Change on US State and Local Issuers*—outlining a new methodology to incorporate climate risk and resilience into its assessments of the creditworthiness of local governments (Moody's 2017a). While they have not similarly described their methodologies, S&P and Fitch each appear to be following suit (Flavelle 2018; S&P 2019). While acknowledgement of the importance of climate change is welcome, the inclusion of resilience into this centralized system of credit assessment also presents cause for concern.

This is because municipal bond finance is a critically important yet historically under-appreciated element of our financial system that has effects well beyond the field of

finance (Cantor and Packer 1995; Omstedt 2019).[10] Ratings of municipal bonds—the rough equivalent of a personal credit score, but for local government—can encourage and discourage particular policy choices, with real and immediate consequences for municipal financial health (Hackworth 2007; Carruthers 2015). These include changes to the form and substance of public expenditures and resource deployment, infrastructural development, land use and building codes, the maintenance of property values and tax base, and other critical public housing and social welfare priorities (Hackworth 2007; Carruthers 2015; Adelino, Cunha, and Ferreira 2017; Omstedt 2019; Coffee 2020). Because resilience planning and other responses to climate risk have been largely devolved to states and localities[11] (Tierney 2015; Gotham and Faust 2020) and because localities do not have the luxury of relocation away from climate or disaster risk like individuals and corporations do (Painter 2020), the effects of credit ratings agencies' consideration of municipal climate risk and resilience are potentially vast (Moody's 2017a). With financialization and financial considerations becoming an increasingly essential part of the U.S. and global economies, it is important to consider how macroeconomic trends spread across thousands of individual sites help to set the stage for smaller-scale decisions (Carruthers and Kim 2011).

One reason why credit ratings can encourage particular courses of action is that ratings affect the value and cost of a municipality's debt, which may be used for everything

[10] In fact, a 2011 review piece in *Annual Review of Sociology* titled "The Sociology of Finance" does not mention municipal bonds or municipal finance at all (Carruthers and Kim 2011).

[11] Municipal bonds may be issued by "any local government unit within a county," including "counties, cities, townships, school districts, and special districts," among other political and special purpose municipal subdivisions (Adelino, Cunha, and Ferreira 2017:3225). For the sake of simplicity, the terms "locality" and "municipality" are used herein to refer to collectively refer to these potential issuers.

from building necessary infrastructure to covering temporary operating shortfalls (Carruthers 2013). In short, like an individual's credit score, a better rating means that state and local governments can borrow money for less: they result in lower interest rates and mean that debt is more affordable (Cornaggia, Cornaggia, and Israelsen 2017).[12] Yet these ratings do not take the form of an objective probability that the debt will be repaid. Instead, they rely on analysts' assessment of a variety of threats to repayment and the distillation of the cumulative uncertainty of these threats into ordinal categories (Cantor and Packer 1995). The process of assigning ratings is one of commensuration, in which many types of uncertainty are categorized and converted to an assessment of risk on a standardized scale. In other words, credit ratings helped to reduce "idiosyncratic uncertainties into calculable risks," domesticating them into formalized standard measures (Carruthers 2013:543; Carruthers and Stinchcombe 1999).

[12] In this way a comparison to Beck's (1992, 1996, 2008) insurability concept may be useful. This concept suggests that a "real world" way of assessing risks and uncertainty that are uncontrollable, unimaginable, or that we otherwise cannot prepare for is whether insurance markets will offer to insure that risk or uncertainty (Beck 1996, 2008). Yet those with a finance background might argue that anything is insurable, if the insured is willing to pay enough in premiums or carve out enough in the form of deductibles and similar holdbacks. In this way the issue is not insurability per se, but *affordability* of insurance. If the premiums and deductibles rise so high that they are either patently unaffordable or simply not worth obtaining (in the case of the premium approaching the insured amount, either individually or in the aggregate across the industry) then the insurance might be classified as non-existent when really it is just not affordable or economical. Although this is more useful as a clarification than a challenge to the insurability concept, it demonstrates some of the differences in translating social science approaches to finance and vice versa. Similarly, the issue with municipal bonds is not whether they can exist with a less than stellar rating. They can and they do. The issue is that the higher cost might render them unaffordable to the issuer through interest rates that they may be unable or unwilling to pay, or through other costs necessary to make them marketable. One of these potential costs is known as credit enhancement, in which a bond issue is insured (in the case of insurance, through a "monoline" insurer) or guaranteed by a third party with a high credit rating (like a bank issuing a letter of credit to cover bond repayment shortfalls or default), so that bondholders may have comfort that a creditworthy entity is backing their right to repayment. In essence, for a fee the issuer can assume the credit rating of the guarantor or insurer, leading to more affordable issuance costs. Reframing Beck's (1992, 1996, 2008) insights about insurance as ones of affordability rather than availability allows the critical element of pricing to take the fore and emphasizes that while no municipality's climate risk exposure has previously denied it access to credit markets, it makes that access more expensive (a *de facto* rather than a *de jure* denial). Because the abuse of disparities in affordability and access to credit has garnered sociological attention on an individual scale (Rugh, Albright, and Massey 2015), here I extend this sort of analysis to municipalities.

Sociologists have long recognized that "if [people] define situations as real, they are real in their consequences" (Thomas and Thomas 1928:572; Merton 1995). The perceived risk reflected in credit ratings are translated to practical reality through the affordability of borrowing (Cornaggia, Cornaggia, and Israelsen 2017); while they are sometimes educated guesses based on the ratings analysts' professional expertise and experience (Omstedt 2019), their effects are expressed in the real cost of credit. Mackenzie (2006) argues that in addition to merely reflecting the state of the "real" world, descriptive financial risk models create markets in their image. They may therefore alter the world that they were developed to describe in significant and durable ways through the pressures of the financial markets (Mackenzie 2006).

Inclusion of environmental considerations in a partially subjective descriptive tool like credit ratings, similarly, may influence thousands of decisional processes (Hackworth 2007; Omstedt 2019). In addition to affecting the affordability of municipal credit (Cornaggia, Cornaggia, and Israelsen 2017), this is because higher ratings provide greater financial flexibility to managers through credit access (Adelino, Cunha, and Ferreira 2017). In fact, a recent handbook that focuses on the benefit to municipal managers of building resilient infrastructure suggests that the inclusion of climate risk in credit ratings supports access to climate-responsive finance capital (Coffee 2020). Environmental inclusions in municipal bond credit ratings marry the fields of climate change studies and finance in a way that is not focused on green finance, but on all local government finance in the United States. As with resilience (see Chapter I), it is therefore useful to view municipal credit ratings not only from the standpoint of what they describe, but also from the standpoint of what they create.

The formative effects of credit ratings were emphasized, if by nothing else, by the failure of many ratings of residential and commercial mortgage backed securities, as well as collateralized debt obligations and other financial products, which helped to trigger the financial crisis of the late 2000's (Benmelech and Dlugosz 2010; Carruthers 2013). Ratings attached to formerly obscure financial products had massive systemic effects on our economy and society when they turned out to be faulty. This is partially because of their perceived complexity notwithstanding that these products were attempts to pool and sell unremarkable things like the right to mortgage and car payments, and the unnecessary mystification that sometimes surrounds finance (Leyshon and Thrift 2007; Christophers 2009, 2015; Hall 2012).

Less recognized, however, is the importance of municipal bond credit ratings to cases of environmental injustice like the Flint Water Crisis. Beyond the various failures in water management, the racist and classist response, and the treatment of segments of the population as disposable, the foundational cause of the poisoning of thousands in Flint was the elevation of municipal financial health over the health of humans and institutional democracy. Specifically, the city's draconian fiscal austerity plan and the appointment of a now-infamous unelected emergency manager were imposed to maintain credit ratings on the State of Michigan's bonds in light of Flint's depleted tax base and dire financial situation (Fasenfest 2017). Clearly, the socio-environmental implications of municipal bond credit ratings extend well beyond how much bonds should cost, to the realm of human cost.

Yet despite the potential consequences of systemic changes to the bond rating industry and academic interest in the underlying processes of financialization as well as its

effects on space (e.g,, Krippner 2005; Fligstein and Dauter 2007; Leyshon and Thrift 2007; Christophers 2009, 2015; French, Leyshon, and Wainwright 2011; Martin 2011; Harvey 2012; Hall 2013; Fligstein and Goldstein 2015; Fligstein and Roehrkasse 2016; Ouma, Johnson, and Bigger 2018) no study has, to my knowledge, introduced the recent socio-environmental turn in municipal credit represented by Moody's (2017a) methodology. Furthermore, no study has considered the potential consequences of this change in methodology on the production of space and the formation of environmental inequality (Lefebvre 1991; Pellow 2000, 2018; Carruthers and Kim 2011; Bigger and Millington 2019). This is not due to lack of recognition of the importance of municipal finance. Omstedt (2019:3), for example, observes that urban political economists should pay attention to both the political effects and internal practices of the "relatively mundane municipal [bond] sector." Rather, it is likely due to the recency of these changes and the relative infancy of the analysis of municipal bonds outside of the field of financial economics.

To address this gap, this chapter has three interrelated aims. First, I introduce scholarship on municipal bonds and credit ratings from a variety of disciplines to acquaint sociologists with their broad scope and potential as drivers of socio-environmental inequality, including through environmental risk and resilience. Second, I outline and analyze Moody's (2017a) methodology for inclusion of climate risk and resilience in their ratings, as well as the stated purposes of the development of this methodology. Because these focus primarily on the potential effects of climate change on a municipality's ability to repay bonds when due, they represent a financial driver of climate resilience and adaptation. Third, I discuss some implications of the inclusion of resilience metrics in

municipal bond credit ratings of interest to environmental and urban sociologists, and outline a path forward using a materialist, outcome-based approach to the study of resilience to further develop this project.

MUNICIPAL BONDS AND CREDIT RATINGS

Balancing the Elements of Risk

While credit ratings may seem unfathomably dull to many scholars, their importance in the financial world (Cantor and Packer 1995) and how we produce space (Lefebvre 1991) cannot be understated. Ideally, rating agencies serve as independent analysts of credit risk across a variety of sectors, including corporate, local government, and sovereign debt. They assign ordinal categorical ratings to debt based on their analysis of the creditworthiness of the issuers (i.e. the original bond sellers), helping purchasers of debt (i.e. the bondholders) judge whether to buy those bonds and at what price (Carruthers and Kim 2011; Carruthers 2013). This provides an ostensibly independent estimate of the quality of the debt before purchase, while it is held, and when it is later marketed (Cantor and Packer 1995; Hackworth 2007; Omstedt 2019). A useful way to think of bonds, like much of the basic stuff of finance (Carruthers and Kim 2011), is that they represent a *promise* to pay a sum certain at a date certain. Their market value at any time equals their face value (how much they say has to be repaid), discounted for the time value of money (i.e. that a dollar today is worth more than a dollar tomorrow), and the risk that the repayment promise will be neither honored nor legally enforceable.[13] The process of

[13] For example, imagine a bond from Blackacre City that had a face value of $100, payable one year from today. That bond would be sold at a price less than $100, with the difference reflecting the interest to be earned while holding that bond. So a bond originally sold for $95 will accrue interest of $5 over that year. The decision about whether to invest in this bond depends on whether the buyer thinks that the expected payout is a good risk: this risk profile is reflected in credit ratings. The comparatively risky Whiteacre City, which is known for financial mismanagement, just had a major employer leave town, and has a stagnant real estate market, might only receive $90 for their promise to pay $100 in a year's time: the heightened risk of

commensuration—or the technological conversion of local uncertainty about the ability to repay to a standardized risk profile (Carruthers 2013)—reflects the need for a central clearinghouse for due diligence rather than each buyer facing the difficult and expensive task of assessment on its own (Fowles, Liu, and Mamaril 2009), with each paying its own transaction costs.

Because municipal credit ratings are intended to gauge risk of default or non-repayment, they account for a variety of factors across sectors of the economy that might create an economic shortfall. These include anything that materially affects the local tax base such as population dynamics, demographic shifts, and real estate valuation trends, as well as local political orientation, whether the locality is well managed, and its financial track record. In short, they reflect perceptions of ability and willingness to set other budget demands aside to pay bondholders as the locality's promises to pay come due (Bennett and Wang 2019; Omstedt 2019; Rashidi, Stadelmann, and Patt 2019). Ratings analysts are required to take all the messy complexity of each locality that issues bonds and distill it down to a rating, breaking apart, analyzing, and comparing any aspects of local context that might impact this all-important ability to repay, then recombining them into a single

non-repayment (i.e. default) means that investors will demand $10, rather than $5, for the city's promise to pay them $100 in a year's time.

Returning to the Blackacre City bond, however, after its original issue, however, its market value should equal that face value minus the expected cost of inflation (the time value of money) and investment opportunity cost minus the value of the probability that Blackacre City will be unable to repay the bond. Assuming for the sake of simplicity that there is no inflation and no opportunity cost (as well as no transaction costs), if Blackacre City has a robust tax base, significant assets in a rainy day fund, and no major identified risks, its bonds are likely to trade at close to the $100 face value. If, on the other hand, Blackacre City is located on the side of a recently awakened volcano and appears unlikely to repay the bond, the original buyers (and those they may have previously sold to) may decide to cut their losses and sell for whatever they can get as they expect the chance of default to be high. While this is a dramatic example and a vast oversimplification, it illustrates that credit ratings attached to municipal bonds can affect the original cost of bond financing for local government, and also that perceptions of market risk for a particular local government may be traced over the life of a bond by the way it is priced: the amount of the discount from its face value, or its discount rate.

synthetic symbol. These range from Aaa for the safest bonds and Aa for a slightly more risky category, down to a C for the riskiest bonds, including those that are already in default (Omstedt 2019; Moody's n.d.) Clearly, the occurrence of a major disaster may affect a municipality's ability to fulfill its promise to pay. This may occur due to the loss of its tax base through depopulation, a decline in business receipts, or a decline in real estate values, as well as a lack of willingness to prioritize bondholders over local communities that may be in dire need of immediate assistance (Painter 2020). This illustrates why the inclusion of socio-environmental resilience in credit ratings does not represent a single factor among many, but a type of uncertainty that may impact a variety of elements of default risk (Moody's 2017a).

While the category system and the differences between major ratings agencies are too complex to outline in detail here,[14] it is possible to draw analogies between these rankings and others that have systemic effects on the entities being ranked. These include the way that star-based consumer reviews like those featured on Yelp or Amazon may alter the organization of customer service to the way that private law school rankings have impacted the organization and practice of legal education (Espeland and Sauder 2007, 2008). As with other rankings, one benefit of the study of processes through which credit ratings are developed is a sharpened analysis of the way that rankings affect institutional decision-making and priorities (Espeland and Sauder 2007, 2008). This is especially true in the uncharted territory of bonds' inclusion of climate and disaster resilience because they potentially impact every single U.S. issuer of municipal debt for any reason, not just for

[14] For detailed descriptions of categories bond rating categories from the three major agencies, see Moody's (n.d.), Cantor and Packer (1995), Hackworth (2007), and Omstedt (2019). For a detailed historical background on their development over more than a century, see Carruthers (2013, 2015).

climate preparation and response. Yet there is a more direct (if less commonly implicated) reason why municipalities may be highly motivated to listen to bond ratings agencies: legal and regulatory access to important elements of the market. After rank ordering bonds into ordinal letter grades, the grades are then grouped into two broad categories: investment grade for the most secure bonds with the highest ratings; and speculative for more risky bonds with lower ratings (Cantor and Packer 1995; Hackworth 2007; Carruthers 2013; Omstedt 2019). Under a variety of regulatory regimes, municipal bonds without an investment grade rating may be excluded from the portfolios of many large, well-financed investors.[15]

In short, climate risk and resilience are reflected in a rank ordering system that is wholly focused on the ability to repay bonds, embedding socio-environmental decision-making into the cost of doing business for localities across the United States. The pursuit of "budget flexibility" for municipalities, therefore, may mean that "[p]rocesses of urban restructuring…become embedded not only in [the reasons why] cities…seek recourse in

[15] To explain, many institutional investors that deal with the public are required to keep a certain proportion of their assets in safe yet easily liquefiable holdings like municipal bonds. Liquefiable in this sense means easily convertible into cash to meet the institution's obligations as they come due, which in turn means that these holdings must be fungible and traded on an open and vibrant market (in short, neither real estate nor many private equity investments such as firm ownership qualify because they are some combination of unique—or at least not fungible—and difficult to sell in a pinch). Ratings help to ensure that bonds are fungible, providing a hopefully apples to apples comparison of creditworthiness of localities all over. The institutional investors that are subject to these investment rules include commercial banks (i.e. all storefront banks that take consumer deposits insured by the FDIC), insurance companies, and pension funds. One reason is that if there are banking or insurance shortfalls—including a run on the bank or a major event that leads to extraordinary insurance liability—these entities should be able to quickly convert a portion of their fractional asset reserves to cash to pay off depositors or claimants. In addition to ensuring continued viability of these entities so they and their customers do not have to be rescued or bailed out by the state, and to ensure pension fund solvency, these measures are in place to promote systemic confidence. This is because safe investment reserves tend to prevent a domino effect of failure, in which one company running out of cash means that others cannot withdraw their cash asset reserves and therefore run out, and so on (i.e. a run on one bank bankrupting other banks). Highly rated government-backed bonds are generally considered safe enough to satisfy many of these regulatory requirements (Cantor and Packer 1995; Carruthers 2013, 2015). Along with certain tax benefits that accrue from holding municipal bonds, this increases the attractiveness of highly rated municipal bonds to potential purchasers.

any increasingly speculative bond market, but also in the relatively mundane technicalities of the Moody's ratings scorecard" (Omstedt 2019:17). Environmental uncertainty and risk, mediated by the needs of finance and expressed in ordinal ratings categories, may encourage particular paths in urban priorities, development, and design.

There is a tension between the power of credit ratings to direct state behavior and the use of the judgment of private agencies and analysts to determine ratings. Contrary to the perception that actuarial risk assessment is quantitative and objective (Mackenzie 2006) the analysis of creditworthiness has been described as a mixture of art and science, mathematical precision and human judgment. Analysts make significant judgment calls based on the characteristics of an issuer, local, regional, or global trends that may impact its ability to repay, responses to questions posed by the analysts, and predictions about the future (Omstedt 2019). Notwithstanding its reliance on human judgment and conversation, it remains as a central private mechanism for the "disciplining of localities" that, in the absence of strong state regulation, is central to neoliberal thinking and governance (Hackworth 2007:17).

How did a collection of private, for-profit organizations assume such a central role in the disciplining and regulation of municipal finance? Hackworth (2007) asserts that the institutional importance of credit ratings agencies results from a migration away from traditional lending relationships with local banks that may have a sense of local creditworthiness to market-based investment with a world of potential investors for whom local knowledge may be expensive to acquire. Additionally, it was supported by a retreat of the federal government from social spending that pressured localities to finance expenditures ranging from housing to law enforcement, as well as legal shifts that require

many institutional investors like banks, pension funds, and insurance companies to hold a certain percentage of their investments in safer assets like investment grade municipal bonds. In this way, credit ratings agencies may be granted the force of financial regulatory law by directing that only those bonds issued by localities that "play ball" with their assessment system may be purchased by a significant portion of the investing world, despite being private, for-profit companies that are subject to little public oversight (Carruthers 2015). Needless to say, this disciplinary function should not be taken lightly as credit ratings may allow or deny access to affordable credit that is often necessary for local governments to function (Hackworth 2007).

In summary, the inclusion of socio-environmental resilience in ratings links macroeconomic processes of financialization with local decision-making, and features an embedded disciplinary effect that is now linked to climate change and disaster preparation. Importantly, the inclusion of resilience does not mean that each locality will receive a standalone resilience or environmental governance score that can be analyzed or debated. Instead, those considerations are analyzed in concert with assessments of a wide range of factors that impact creditworthiness, including the overall wealth of a community and the strength of its tax base. This suggests that inclusion of a resilience metric will not only have a causal effect on how municipalities decide to embrace resilience, but it presents a danger of injustice through the prioritization of fiscal safety over human safety, as well as through choices made about how to preserve a locality's tax base.

Credit Rating, Climate Change, and Disaster

Yet do financial markets really care about climate risk and resilience to such a degree that it might impact credit access and affordability? Based on an emerging literature, it

appears that they do. While we live in a time of well-organized and financed climate denial (Norgaard 2009, 2011; Dunlap and McCright 2011), the few studies that have analyzed the effects of climate and disaster risk indicate that the municipal bond market believes that denial is bad for business. In fact, Moody's (2019) released a research announcement that explained, based on an informal survey, that large cities "are increasingly adopting plans that detail specific projects to strengthen infrastructure and minimize disruption from natural disasters and long-term climate change." Because of this cost, however, a majority of respondent cities were planning on issuing debt to finance climate response initiatives. In essence, this means that climate plans are incorporated into assessments of debt for both climate and non-climate purposes (Moody's 2019).

One explanation for this acceptance notwithstanding the political salience of denial is that, even to deniers, climate risk may represent just another form of uncertainty in a sector that deals with many uncertain risks. Painter (2020:481) observes that the climate denial debate may be irrelevant to the process of municipal bond pricing, as "many forms of risk go unrealized, yet investors require a premium for the uncertainty that accompanies these risks." In other words, you can deny all you want, but in the process of commensuration (i.e. converting uncertainty to risk through analysis and ratings) you also should account for the chance that your denial may be wrong. Moreover, he finds that, even when controlling for credit rating, climate risk is significantly reflected in long-term municipal bonds for the average county to the tune of $1.7 million in annualized issuance costs for every one percent increase in climate risk (yet no significant relationship is found in short-term bond issuances) (Painter 2020).[16]

[16] Importantly, Painter (2020) reminds us that municipal bonds are useful for the analysis of climate finance for two reasons. First, they tend to have heterogeneous maturities, meaning that they come due on different

Similarly, Rashidi, Stadelman, and Patt (2019, 132) observe that the "presence of a link between climate policies and creditworthiness could provide a hidden financial benefit to cities far in excess of those policies' cost" through municipal bond cost savings. Testing the truth of this idea through interviews with professionals in the municipal bond industry, they find that ratings analysts included climate risk in some analyses even before Moody's (2017a) announced their policy change, yet that those least aware of these factors were city leaders themselves. One ratings agency participant in this study mentioned that they considered upcoming regulations as well as whether municipalities were directing funds towards assets that may be stranded in the future (Rashidi, Stadelman, and Patt 2019). It is likely that formal inclusion of these concerns in ratings agencies methodology would improve local familiarity with risks, as well as encourage a view towards the future. It is also intriguing to consider that this may prioritize anticipatory abandonment of some areas, or other proactive responses. On the other hand, it may be that economically depressed localities that have poor ratings may be subject to a kind of cumulative disadvantage through higher pre-disaster borrowing costs to prepare, a reduced ability to afford an adequate response, and a higher cost of post-disaster borrowing for immediate relief (Painter 2020) based on pre-disaster financial conditions.

These findings dovetail with studies arising in the finance literature that assess effects of disasters on municipal bond markets. While not directly relevant to questions involving climate change and denial because they focus on disasters that have already

schedules (i.e. some are 5 year, some 10 year, and so on). This allows for a comparison of short-term and long-term risk concerns by comparison of bonds from the same issuer(s) that have different maturities. Second, these bonds are issued by municipalities that are fixed in space. While a corporation may move a facility or its entire operation in response to perceived risk, municipalities have no such luxury (Painter 2020). In addition to providing an even playing field for the empirical analysis of how climate risk affects finance costs, this serves as a reminder that the only way that municipalities can mitigate their climate risk exposure is through actions taken within their fixed boundaries.

occurred, they suggest that markets reflect disaster risk and that local managers ought to take notice. Bennett and Wang (2019) find that bond issuances become significantly more costly after natural disasters, meaning that investors demand more from municipalities and financing costs increase. Unlike Painter's (2020) study of climate risk, they find that in the disaster context these effects apply temporarily to short-term yields, rather than long term yields. This association exists even though municipal credit ratings are rarely downgraded due to disaster (Bennett and Wang 2019). They also find that there is a relationship between the occurrence of disaster and the structure of financing. Bond issues that occur in the wake of disaster feature shorter maturities, more basic structures with fewer financial bells and whistles, and the absence of credit enhancement such as bond insurance and bank letters of credit that are used to guarantee repayment (Bennett and Wang 2019). This implies that the increased cost of credit, and credit enhancement, after a disaster may motivate particular courses of action, behavioral elements that may change practice even if this change is never reflected in a ratings downgrade.

Bourdeau-Brien and Kryzanowski (2019) find that local municipal bond costs spike after floods even after controlling for pre-existing flood risk and issuer characteristics. Because these increases fade quickly and are limited to areas without a history of flooding (i.e. a first time effect), they likewise believe that this is consistent with a behavioral explanation (Bourdeau-Brien and Kryzanowski 2019). Fowles, Liu, and Mamaril (2009) compared the cost of municipal bonds from localities in California with their earthquake risk. They found a relationship between earthquake risk and municipal bond cost, but surprisingly only for the period following Hurricane Katrina: a different kind of disaster in a different region of the country. The first explanation that they suggest for this surprising

result was that the municipal bond markets are so massively inefficient (in the financial economics sense, meaning information poor) that no one recognized the systemic risk of California earthquakes. The second was that the salience of Katrina sharpened the public eye to the possibility that municipalities had not prepared enough: an efficient response based not in environmental conditions but in a better understanding of the lack of municipal readiness. Katrina revealed "that existing governmental standards and preventative measures are inadequate to offset the underlying natural disaster risk" (Fowles, Liu, and Mamaril 2009:82). Either possibility suggests the importance of regular reminders of climate uncertainty and risk.

Among the implications of these studies is that, notwithstanding the existence of climate denial, when it is time to put your money where your mouth is municipal bond markets tend to reflect climate risk. Yet they do so in distinctive ways based on assessed climate risk as opposed to the aftermath of a disaster, emphasizing the distinction between long-term climate effects and comparatively short-term disaster response. Importantly, assuming efficient markets, the recent publication of results like these should indicate to municipal managers that climate costs are likely to matter, regardless of individual or local political temperament. Another implication is that government standards and preparedness—or even the perception of effective preparation—may influence the cost of finance. Taken together, these suggest that the systemic impacts of broad climate ratings policy will mean that resilience and adaptation will be expressed in the cost of credit. This cost of credit, in turn, may motivate particular decisions and priorities that may not be reflected in ratings but are derived from the expectations of markets and ratings agencies.

Finally, it is important to reiterate that the existence of climate resilience metrics should not imply a categorical separation from more traditional elements of risk such as the existence of a durable tax base. Instead, these elements operate in concert with other factors and may therefore double penalize localities that can least afford it through increased borrowing costs or extra expenditures. For example, a coastal county with high rates of poverty may suffer from a reduced ability to effectively prepare for climate change as well as high borrowing costs. Their inability to prepare may raise borrowing costs even more due to questions about their future tax base. Additionally, this may add extra pressure to respond in a way that supplements or maintains their tax base, raising the risk of resilience-based gentrification (Gould and Lewis 2018a) and providing an incentive to engage in resilience projects that preserve their tax base rather than those focused on preserving community use values.

The resilience metric may develop into environmental cumulative disadvantage for those localities that cannot respond ideally or quickly enough. This is partially because of the neoliberal emphasis on local solutions in place of federal aid (Tierney 2015), partially because of the reproduction of existing regional environmental inequality through financial market operations, and partially because those areas that are least able to respond may be labeled as a problem child. Yet all of these concerns focus less on the recognition of the climate risk and more on how climate preparedness regimes are organized and prosecuted. For this reason, the following section discusses the content of the Moody's (2017a) report *Evaluating the Impacts of Climate Change on US State and Local Issuers*, analyzing its express motives in the context of municipal bond markets.

CLIMATE CHANGE AND CREDIT RISK: THE MOODY'S APPROACH

Periodically, credit ratings agencies release reports describing elements of their analytical process and methodology. Preliminary evidence that large cities are developing and financing resilience plans (Moody's 2019) may be a bellwether of a broader trend in which localities view climate risk not only as an environmental issue, but a financial one. Presumably in response to this enhanced appreciation of the financial implications of growing climate risk, Moody's (2017a) released a report outlining how they translate climate risk to their assessment of state and local issuers. While a case study consisting of a single report from a single company usually would raise questions about applicability and generalizability across contexts, this is not a simple corporate report. Rather, it signals a significant shift in a major industry that impacts municipal finance from coast to coast, that exists as a virtual oligopoly, and that enjoys the force of regulatory law and economic consequence. Additionally, this methodology represents a way of formalizing climate risk across scales and in conjunction with municipal priorities and operations. Finally, it provides insight into how an industry that stands as a private quasi-regulator of municipal finance views climate risk and how their efforts may motivate particular courses of action by municipal regulators. For these reasons, the consequences of the procedures described by this report will likely influence thousands of case studies.

Introduction to the Analysis: Four Premises About Climate Impacts and Embedding.

The report starts off with four basic premises. First, they acknowledge that global climate change has been predicted to increase the frequency and severity of major climate events absent effective preparation. Second, they recognize that impacts will be regionally heterogeneous, and that their costs involve both well-known processes like sea level rise

and flooding, and less familiar consequences like agricultural impacts, labor and health impacts, and increased energy use.[17] Third, they mention that local, state, and federal efforts to promote immediate and long-term responses "enhance resilience to the physical and economic impact of severe weather events" and may reduce costs (Moody's 2017a:1). In addition to the express recognition of climate risk in their ratings (whether or not a bond issuer accepts these risks as real), these emphasize the variety of impacts on local credit and firmly assert that costs may be minimized through action.

Their fourth observation identifies how these concerns are embedded in their rating system, meaning that climate risks are not a standalone category but something of a semi-independent modifier of existing categories. They explain the "basis for [their] view of…credit resiliency to climate change" and how it fits into their existing "framework for evaluating the credit risk to local government issuers." Specifically, they discuss how "credit risks resulting from climate change are *embedded* in our existing approach to analyzing the key credit factors in our methodologies." This means that their "analysis of economic strength and diversity…captures climate-driven credit risks such as economic disruption, physical damage, health and public safety, and population displacement," as well as access to liquidity and means of raising additional revenue to repay bonds. Running through each of these themes are multiple reminders that mitigation can change the credit impacts of climate shocks and stresses, even if they are not expected to occur until many years in the future (Moody's 2017a:1, emphasis added).[18] In addition to demonstrating that

[17] Much of the report is devoted to outlining the particularities of regional shifts, drawing primarily from the *National Climate Assessment* prepared by the US Global Change Research Program (Moody's 2017a).

[18] Moody's (2017a) is careful to identify that climate impacts may come in the form of shocks (e.g. disasters like hurricanes, droughts, wildfires, or floods) as well as gradual stresses that over longer intervals of time may impact creditworthiness (e.g. warming trends, drying trends, or ocean acidification that can affect agriculture and fisheries).

denial may be costly, this explicitly encourages the development of responsive strategies to ensure affordable credit.

Translating Climate Risk to Credit Risk 1: The Basic Methodology.

After the four premises, they outline their methodology for translating climate risk to credit risk. This is important because it describes the pathways through which a variety of risks are included in their ratings, which in turn may impact the potential cost of credit for municipalities and consequently direct action. In addition to population displacement and threats to health and safety, they identify a variety of negative credit drivers including "compromised crop yields, economic disruption, damage to physical infrastructure, increased energy demand, recovery and restoration costs, and the cost of adaptive strategies for prevention or impact mitigation" (i.e. resilience planning initiatives). In their view, these may result in "lower revenue, increased expense, impaired assets, higher liabilities and increased debt" (Moody's 2017a:3). As mentioned previously, they are clear that their ratings methodologies "do not explicitly express climate change as a credit risk." Instead, "the credit challenges that climate change poses are captured in [the] analysis of economic strength and diversity, capital asset management, fiscal strength and governance, among other credit factors." In other words, the focus on climate risk is primarily a focus on how climate risk is embedded within recognized financial and governance categories, rather than a stand-alone.

Critically, they assert that "local governments that face a higher risk of climate shocks are specifically asked…during the rating process about their preparedness…and their activities in respect of adapting to climate trends" (Moody's 2017a:9). This imposes an affirmative obligation on high-risk municipalities to have an answer ready, but leaves

open the question of whether wealthier communities would be considered vulnerable to a shock. Resource-poor communities in at-risk areas may therefore asked to develop action plans that are not required of more affluent neighboring communities, because more affluent communities have other pots of money upon which to draw in the event of a disaster. In short, unique obligations may be imposed on poor communities in at-risk regions of the country through embedding of environmental risk. This also suggests that municipal financial managers should expect questions about ongoing or planned efforts to build credit resiliency to climate change that depend not only on their climate risk but on their pre-existing credit risk. This may motivate development of these types of programs, and in particular forms molded to the interests and concerns of rating agency analysts and their methodologies. In short, this combined approach suggests a list of privileged elements of socio-environmental vulnerability focused on repayment ability, which may in turn focus attention on things like real estate exchange values that support the local tax base (Logan and Molotch 1987).

Translating Climate Risk to Credit Risk 2: Factors and Processes of Embedding.

Later, Moody's (2017a) provides detailed guidance to industry professionals about their view of priority climate credit risks arising from climate trends and shocks, and how these are embedded in their existing ratings factors. It is important to remember that these are developed from a balance-sheet approach to municipal credit: how each may translate into lower tax revenues, increased expenses and other liabilities, and loss of assets. While disasters have social and environmental justice implications, Moody's (2017a) focus is how these translate to the ability of a city to pay its bills. For example, they describe their credit downgrade of some of New Orleans' bonds after Hurricane Katrina as being due to

the "unprecedented disruption to the city's economy and revenue…as well as concerns over the city's ability to fund ongoing operations" (Moody's 2017a:10). In this vein, their first factor is disruption to economic output due to loss of property and assets, supply chain disruptions, and long term increased cost of recovery such as rebuilding, adopting adaptation measures, and increased insurance costs. These factors are joined by physical damage, issues of health and public safety, and population displacement. Each of these can impact credit, but in different ways.

Usefully, after describing these factors generally, they then give some examples of how they fit within the specific weighted categories that are used to assess local government general obligation bonds.[19] The four categories they use are: (1) Economy/Tax Base, which is weighted at 30% of the evaluation and includes tax base size, full value per capita, and wealth expressed in median family income as proxies for the local revenue base; (2) Finances, which is weighted at 30% and includes investment fund and cash balance levels and trends as a proxy for financial flexibility; (3) Management, which is weighted at 20% and includes the locality's institutional framework and operating history; and (4) Debt/Pension, which is weighted at 20% and employs the ratio of present debt to full value and revenue, as well as the ratio of future pension liabilities to full value and revenue (similarly to how home mortgages may have restrictions on how much additional debt the

[19] A general obligation bond is usually considered the safest form of municipal bond investment. This is because "general obligation" indicates that the bond may be paid by resort to the general tax receipts that are collected by a municipality. This resort to the taxation power of government is what gives them their safe reputation and also means that the overall fiscal health of the issuing agency matters for repayment and credit risk. The other major category of municipal bond is referred to as a revenue bond. These are typically used to finance things that make money, and are repaid out of the revenue generated by the thing financed. An example might be a toll road that is built with funds from a bond issue and that pays off bondholders based on tolls collected (but usually not from other sources, unless there is a guarantee or other mechanism that is triggered by default). Because of this, revenue bonds require a more complex analysis model that takes into account the economic viability of the project itself, as well as an analysis of the issuer and any project guarantors.

borrower may incur) (Moody's 2017a). Based on the descriptions in each category it is possible to identify areas of primary concern.

Within the Economy/Tax Base category, Moody's (2017a) describes how climate shocks may impact issuers with less diverse economies to a greater extent than others, because climate shocks may reduce the issuer's tax revenue base. This is especially true for those with economies concentrated in climate-susceptible sectors and those without the ability to increase taxes due to limitations on legal tax rate (e.g., Martin and Beck 2017, 2018). In other words, one key to this analysis is fiscal flexibility, both in terms of economic output and the local tax rate (Moody's 2017a). Here, the advice to a municipal manager may be to encourage a diverse and climate-resistant economy, to encourage durable sources of income such as high value, climate resistant real estate projects, to increase overall median family wealth as a hedge against future tax losses, and to engage in preventative austerity to save money and keep space between the actual tax rate and the maximum allowed by law or political ability.

Similarly, in the Finances category the key is what may challenge fiscal flexibility in the event of a climate shock, such as unanticipated emergency response cost combined with the loss of revenue. These are balanced against the overall financial health of the municipality and whether it has recourse to a rainy-day fund (Moody's 2017a). Here, the advice may be to set aside funds or obtain insurance to help cover or offset these costs and develop ongoing liquidity, to improve or develop climate-resistant infrastructure to manage potential unanticipated costs, to remove development or people from risky areas to limit future emergency costs, or paradoxically to limit resilience and adaptation strategies that have costs yet that will not be reflected in future balance sheet health.

In the Management category, the climate factors at play involve the possibility that a climate shock will create impediments to the effective management of municipal budget, disrupting the municipality's business as usual operating history. The advice here may be to develop effective contingency plans for emergency management, financial management, and the potential for loss of personnel and resources in the wake of a disaster. This may translate to external contracting for consultants and others who can help to establish a strong track record and suggest an ability to support critical functions through disaster. In turn, this may impose additional costs that different localities may be differentially able to bear.

Finally, in the Debt/Pensions category they note that municipalities with significant existing obligations to pay may be less able to incur additional debt for emergency repair or replacement of infrastructure or assets without disrupting the balance between total debt and liability and expected revenues (Moody's 2017a). The takeaway from this category may be to manage existing debt by engaging in preventative austerity (including, paradoxically, by foregoing or deferring maintenance) or by paying down existing debt. Another may be to stop offering employee pensions. Wealth matters here, as well, as wealthier localities with recourse to a deeper tax base may have the ability to engage in projects without incurring significant debt or may be better able to retire old debt to maintain balance. They may also be better able to satisfy pension obligations and offer existing employees pensions, thereby gaining the ability to attract managers who may be perceived as better by ratings agencies and the financial industry, as well as avoiding consulting costs. In addition, debt and pension levels are expressed as ratios to full asset value and revenue. In a simple mathematical sense this means that a resource-poor

municipality has less flexibility in issuing new bonds (i.e. incurring new debt) than a wealthier community, including bonds that are for the purpose of resilience and adaptation projects.

Moreover, this analysis is neither hypothetical in the disaster response context nor is it meant merely as a descriptive exercise. Moody's used it after Hurricane Irma in south Florida to assess post-storm credit quality. They also specifically discuss how these metrics are intended to promote conversations with municipal management to better understand climate planning (Moody's 2017a). In other words, this has been used to assess post-storm circumstances and is expressly intended to encourage particular course of action by municipal managers. Given the recognized disciplinary weight of credit ratings (Hackworth 2007), it is likely that these considerations will have real, material consequences.

A few additional important themes may be identified from this description. As a prefatory note, however, it is clear that the potential consequences of including climate risk and resilience into municipal bonds are a mixed bag. For example, a rainy day fund may be a great idea. A rainy day fund that depends on taxes derived from the replacement of existing communities' use values with vacation resorts' exchange values, perhaps less so. The real question is how these efforts translate into practice: while it is possible to make a normative judgment about a system of motivation that focuses solely on the ability to repay debt, it is more difficult to make a normative judgment about any number of potential effects without an appreciation of how they are done. This opens up a world of opportunity at the intersection of finance and the environment that extends well beyond green efforts and questions about greenwashing, to the fundamental nature of how and why places are

developed in particular forms. In the next section I will develop a few suggestions for applying the study of municipal bonds.

DISCUSSION AND A RESEARCH PLAN.

Identifying the Changes: The Theory and Practice of Environment and Municipal Bonds.

How could scholars usefully study the inclusion of environmental risk and resilience metrics in municipal bonds? Developing a research plan first involves a process of demystification of the presumed complexity of finance (Christophers 2009, 2015). This is why in this chapter I have emphasized the concepts of promises to pay, risk of non-repayment, and affordability of credit. These concepts are what municipal bond analysis is all about, and emphasize the features that may motivate municipal managers without the use of industry jargon. All Moody's has done is formalize the entry of climate risk into the world of default risk that is governed by these relatively familiar terms. Having established the likelihood of disciplinary and economic effects of environmental elements of municipal bonds on municipal management, the next step is to consider how to assess and trace these effects (or lack thereof).

The inclusion of environmental risk and resilience in municipal bonds renders them conceptually similar to so-called green bonds, or debt issuances in which the proceeds are earmarked for resilience and adaptation measures (Bigger 2017; Bigger and Millington 2019; Christophers, Bigger, and Johnson 2020). General municipal bonds potentially affected by this environmental turn are distinguishable because unlike green bonds they are intended for essentially all purposes, and because bondholders expect no premium or discount from their pro-environmental stance. Even still, the "stretching" framework developed by Christophers, Bigger, and Johnson (2020) for green bonds provides a useful

analytical starting point. Through this framework, they argue that the emergence of green bonds represents a retreat from scalar processes that individualize financial risk, reversing the neoliberal historical trend from "you are on your own" back towards a Keynesian feeling that we "are all in this together" (Christophers, Bigger, and Johnson 2020, 90). A broad recognition of environmental risk, a broad mandate to prepare, and the creation of incentives to spend for social protection implied by Moody's (2017a) guidance seem consistent with this point of view, yet the difference in scope between municipal and green bonds cautions against drawing any conclusions by analogy. Future research should focus on whether the broad impact of credit ratings decisions like this similarly signals a retreat from assumptions about neoliberalism, or its reformation, due to climate risk.

Of course, a preliminary question to be addressed before adapting this framework is whether environmental inclusions in municipal bond ratings have any effect at all. For example, in an insurance industry trade journal, Flavelle (2018) describes complaints from insurers that the rating agencies were taking insufficient steps to ensure adequate municipal climate credit protection. A representative of Moody's responded to deny the claim: "If we look at our rating universe, a huge percentage of them are actually taking resilience measures. In the AA category and above [highly rated debt judged to carry low levels of risk], it's like 100 percent" (Flavelle 2018). Questioning this pronouncement, the article then highlighted a number of localities whose debt had been highly rated either while they are at severe risk (like Palm Beach Florida, which is located on a barrier island) or just before they experienced major disasters (like Wilmington, North Carolina), as well as the opinions of a number of experts who were skeptical of the quality of the ratings' climate inclusions. Pulling no punches, Flavelle (2018) mentions that "last November, all three

[major credit ratings agencies] issued perfect AAA ratings to Charleston County, South Carolina, where flooding is so frequent that the Charleston City website includes a page titled 'Why does it seem like Charleston always floods when it rains?'"

Questions about the practical effects of ratings decisions are complicated by the proprietary and confidential nature of the specifics of the ratings process and because methodological reports such as the one described here may be privately disseminated to some but not all market participants prior to public release, rendering it difficult to assess market changes before and after a set announcement or roll-out date. Regardless of who is correct in this war of words between the insurance and credit ratings industries, it seems likely from the literature on the effects of climate risk on bond pricing (Fowles, Liu, and Mamaril 2009; Bennett and Wang 2019; Bourdeau-Brien and Kryzanowski 2019; Omstedt 2019; Rashidi, Stadelmann, and Patt 2019; Painter 2020) that the public pronouncements and private conversations upon which the ratings system depends are likely to motivate particular modes of response to climate risk. Moreover, because complexities in process and timing may interfere with the type of quantitative analyses that seem to be preferred by scholars in financial economics, it appears that a creative mixed methodological approach would add to understanding the details of the motivations and practice of socio-environmental municipal finance.

Points of Intersection: Municipal Bonds and A Materialist Approach to Resilience.

Notwithstanding questions about the details, the availability of appropriate credit for an affordable price provides a major incentive for municipalities to develop a climate risk action plan. This underscores both the importance of an anticipatory approach to the impacts of climate change and disaster (Anguelovski et al. 2016) while improving on

existing efforts by introducing a systemic approach that ventures beyond case studies. The materialist approach encourages a focus on broadly applicable consequences, as opposed to intent.

A materialist approach to resilience (see Chapter 1) seeks to avoid the semantic arguments that sometimes befuddle resilience scholarship by focusing on the consequences of resilience initiatives. In the specific case of the inclusion of risk and resilience in municipal bonds, it confers a number of analytic advantages. First, it refocuses our view of resilience away from the descriptive sense of the term common in natural sciences and discursive approaches common in the social sciences (Holling 1973; Alexander 2013; Welsh 2014; Bourbeau 2015, 2018) to a sense of what is created in the name of resilience and risk reduction. Without diminishing the important contributions made by scholars in these fields, this better reflects the modern tendency to justify projects and initiatives with resilience (Colker 2020). Credit ratings serve as a vehicle through which concerns about risk and disaster planning are translated to costs of credit. Second, it provides an analytic bridge between disaster scholarship and sociospatial approaches that focus on the production of space (Lefebvre 1991, 2003) by connecting spatial projects with the financialization of climate risk. Finally, it emphasizes pre-disaster consequences of resilience planning, which are distinct from post-disaster approaches that describe the ability of a system to bounce back from disturbance (Holling 1973; Alexander 2013; Welsh 2014; Bourbeau 2015, 2018). Taken together, these illustrate one mechanism by which the production of disaster space operates through financial resilience planning. In addition, they focus on the real-world consequences of these initiatives, including the promotion of

environmental awareness and inequality, which may manifest regardless of whether a disaster ever happens in the subject locality.

While the intent of credit ratings is simple—what are the chances that the promise of payment will not be honored?—the consequences may be highly complex. Here, I suggest a few avenues of research focusing on the interaction of this materialist approach to resilience in municipal finance with elements of urban environmental sociology, including environmental justice, property taxation, and building codes. This is not intended to suggest that these are the only elements germane to this interaction nor that their consequences will only manifest in urban areas; because municipal bonds are a potentially truly systemic motivator no single element could capture all possible effects in all places. However, because municipal bonds are linked to both the conversion of untaxable use values to taxable exchange values through the use of public-private growth coalitions (Logan and Molotch 1987) as well as the use of infrastructural decisions to convert social space to abstract space that reproduces systems of power (Lefebvre 1991, 2003; Coffee 2020), an urban analytical approach makes sense.

Adelino, Cunha, and Ferreira (2017) show that ratings upgrades can improve a locality's financial flexibility, allowing it to weather financial storms like recessions and also fund public and private (i.e. pass-through) initiatives. This underscores the importance of viewing the production of space by political elites and the involvement of public-private growth coalitions in financial terms, as predicted by Lefebvre (1991, 2003). Future research should focus, in part, on whether these potential effects will be realized, and if they are what form they assume in urban decision-making and landscape. It should also focus on the connection between global markets and local conditions, through the assessment of

how the climate demands of these markets may translate into local action. While Michigan's emergency manager law and its consequences in Flint provide strong evidence that credit ratings matter enough that some will prioritize them over human health (Fasenfest 2017), there may be a variety of less obvious, more subtle instances in which the needs of public coffers direct the form of local governance.

Critically, linking political processes to municipal bond concerns presents a point of departure for scholars interested in processes of environmental inequality formation and environmental justice (Pellow 2000, 2018). The questions of how Moody's (2017a) methodology motivates municipal managers and financiers invokes the long-standing call to view environmental inequality formation as a complex and contested process across time (Pellow 2000), as well as an opportunity to rethink the role of the state's regulatory function and individual dispensability in light of economic pressure (Pellow 2018; Gould and Lewis 2018a). Pulido (2000) wrote that environmental racism can arise from millions of seemingly race-neutral decisions made within a racialized society. It is difficult to think of a single decision within finance—short of a change to federal regulatory law—that can so easily translate into millions of individual and ostensibly neutral decisions that in the aggregate may lead to unjust results.

This is further complicated by regional and local variability that calls into question one-size fits all resilience and adaptation planning (Gotham and Faust 2020), especially as credit ratings are known to encourage synchronization and correlation of market actors (Carruthers 2013). The tension between a tendency towards standardization and the vast differences among the many thousands of affected municipalities provides an opportunity to employ environmental justice and financial frameworks in concert. Across scales from

the national to the local, it would be worthwhile to assess how the development of standardized socio-environmental metrics for government credit quality may reproduce environmental injustice or may use emergent climate concerns to develop or justify new sources of injustice.

Two discrete areas of research in urban sociology that are potentially impacted involve property taxes and building codes, two highly local processes through which space is produced. Property taxes are arguably the single most important element of municipal financial health, are included in municipal credit ratings directly as an estimate of receipts to come, and also are included indirectly as an estimate of financial flexibility based on how much they may be increased in the future (Moody's 2017a). Protection of property tax receipts may motivate infrastructural and social choices ranging from resilience gentrification (Gould and Lewis 2018a) to building infrastructure in such a way that the protection of high value real estate is prioritized (Dawson 2017).

Because of the element of financial flexibility, property tax limitations are likewise highly relevant. Recent studies have found that property tax limitations may exacerbate racial inequality (Martin and Beck 2017) but that property tax increases due to gentrification do not seem to result in population displacement (Martin and Beck 2018). Moreover, a meta-analysis has found that property tax limitations may provide some social protections but at the cost of diminished state capacity to provide others (Martin 2019). These concerns suggest the need for inquiry into how bonds' reliance on tax proceeds for repayment may motivate changes in tax policy that may encourage some priorities at the expense of others, as well as policies that may promote land development for the purpose of real estate valorization and deep tax rolls. While these studies have focused primarily

on property tax ceilings, it is also intriguing to consider the implications of property tax floors that come from the need to pay off bonds, the need to funnel a set amount of property tax revenues to pay existing debt or finance resilience projects, and the need to start thinking longer-term. Studying the relationship between municipal bonds, infrastructural development, and local taxation answers the call of scholars interested in "fiscal geographies," or a deep and process-based appreciation of the intersection of urban development, finance, and taxation that occur not only during or just after a crisis, but during the "long trough of recovery" (Tapp and Kay 2019:575).

A second potential topic involves building codes, zoning and land use decisions, and the processes through which the production of space is regulated by local government. Recent work by Bartram (2019a, 2019b) suggests the importance of building codes and standards to systemic reproduction of inequality and the promotion of real estate valorization by growth machines. One reason is that codes may increase costs for less affluent property owners and serve as a driver of gentrification. She cautions, however, that in practice code enforcement agents may use their judgment to protect marginalized individuals and communities. In this way anything that may provide motivation for building codes that require significant capital expenditures, or requires expensive initial construction, may result in both inequality formation and potential resistance from members of the public bureaucracy (Bartram 2019a, 2019b). In turn, this suggests the importance of identifying and analyzing forces that may impact infrastructural policy, especially when the desire for stronger structures is supplemented by the desire for greater tax receipts that would presumably flow from bigger, fancier, stronger, and more real estate development (cf. Elliott and Clement 2017).

Finally, the development of a resilience strategy by so many municipalities as a condition of obtaining inexpensive credit is consequential for a variety of other reasons. The first is that debt quality and municipal financial health are gauged by an external, private institution that seems subject to little regulatory or normative oversight (but see Cantor and Packer (1995) for a decidedly pre-2008 perspective that normative pressure should ensure accuracy in credit ratings). This creates the potential for differential debt pricing in areas that are likely to experience different consequences of changing climate, especially because mimetic isomorphism and other copycat effects may normalize certain decisional pathways to the derogation of others (DiMaggio and Powell 1983; Carruthers 2013). The acceptance of resilience within the world of finance may, for example, carry over to discourage coastal development or increase the cost of coastal development to the point of exclusion and displacement of less affluent populations.

As with other environmental justice concerns (Pellow 2000, 2018; Pulido 2000), there is a chance that environmental risk arising from climate change—or even the perception of risk—may create or reify differences between municipalities based on their ability to get with the established program, leading to a cumulative disadvantage for localities that are already in difficult financial or environmental positions. Embedding of environmental concerns in existing ratings categories means that these concerns necessarily operate in concert. Identifying and analyzing how competing concerns are weighed and balanced against each other presents an opportunity to predict and hopefully mitigate cumulative disadvantage. Moreover, it may help to foreground the need for scalar stretching and processes that challenge the individualization or localization of response, and encourage research into the potential for pro-social outcomes. Because of this, and

notwithstanding the dangers of environmental injustice, there may be worthwhile aspects of this methodology, including proactive, protective local government response to climate risk that might otherwise have gone unaddressed.

CONCLUSION.

The inclusion of discrete, described elements of climate and disaster risk into municipal bond credit ratings may reflect a preexisting informal tendency to consider these risks in municipal creditworthiness. However, it also represents a potential expansion of consideration of these risks by formalizing the direct financial consequences for municipalities that will likely be taken into account regardless of the existence of a political climate of denial. While bond ratings are certainly not the only motivating force, they provide a direct link between climate risk, increased financialization, and the material outcomes of resilience planning. An enhanced appreciation of climate change may have the positive effect of encouraging preparation. It may also encourage a view that we are all in this together, challenging the neoliberal individualization of climate and disaster response. That said, it presents cause for concern because it tends to elevate the right to repayment over social protections, may prioritize fiscal health over human health, and may manifest in a variety of unpredictable ways across all U.S. municipalities and municipal subdivisions.

A number of features of these ratings may be useful to scholars interested in the intersection of finance, climate, the state, and justice. First is the way that climate risks are viewed primarily in light of the ability of each municipality to pay off its debt. This provides an avenue through which seemingly neutral economic decision-making may create inequalities, both within municipalities and between them. Second is that climate

risks are not standalone considerations, but are embedded in established risk categories and must be understood in concert with these categories. Climate risk is therefore linked to exogenous matters of governance, geography, labor, and inequality. In short, any element of municipal policy that involves taxation, expenditure, or development trajectories is in play. Third, links between these categories emphasize points of connection to other areas of social science interest, including how tax regimes and building and land use regulations are developed. Finally, taken together, these suggest that seemingly neutral financial decisions may develop into the form and substance of resilience plans in ways that may result in environmental injustice.

In short, it is hard to predict how the inclusion of climate risk by Moody's (2017a) and other ratings agencies will affect municipal bond markets and courses of action chosen by municipal managers (or chosen for them). Likewise, it is hard to predict whether these changes will motivate "good" or "bad" behavior, if they motivate behavior at all. What is clear, however, is that there is a strong likelihood that these will have some sort of systemic effect on municipal finance that will trickle down to municipal decision-making by encouraging resilience planning. Additionally, it is likely that the form of this planning will reflect the priorities of finance. Rather than stop the analysis with the intent of the bond ratings agencies—to assess how climate risk might affect the chance of bond default—a materialist approach to resilience emphasizes the importance of beginning the analysis of how this will affect the production of space before the effects may be detected. Future socio-environmental research should build on the materialist approach's attention to structures of financialization, like municipal bonds, that are not usually assumed to be environmental but may have both environmental and social consequences.

CHAPTER III. TRAUMA, DISPLACEMENT, AND OPPORTUNISM IN THE FLORIDA KEYS.

INTRODUCTION

In the first chapter I introduced the conceptual value of a revised approach to resilience and disaster planning, including how disaster readiness initiatives may produce disaster space in ways that serve the needs of capital. The second chapter introduced how resilience and climate adaptive planning may take shape through effects on municipal bond markets, providing an example of how an administrative or technical financial decision may have wide-reaching effects. In this chapter I continue to develop the material approach to resilience and disaster planning, but using an example on a more local scale, by outlining the experience of some residents of the lower Florida Keys with Hurricane Irma in 2017. My goals are: to identify mechanisms by which unequal residential displacement took shape in this community; to better understand how exploitation of storm trauma may contribute to displacement; and to identify how disaster readiness initiatives contribute to these problems, both in the lower Keys specifically and in ways that may be generally applicable to coastal communities that engage in disaster planning.

Nearly two years after Hurricane Irma decimated many areas of the lower Florida Keys, Bloomberg News characterized the area's post-disaster experience as the bellwether of "America's Great Climate Exodus" (Gopal 2019). With climate change predicted to increase the severity of hurricane impacts (IPCC 2014; Angus 2016), sociologists have focused on the way that the political economic context influences planning, response, and recovery regimes (e.g., Tierney 2007, 2015; Gotham and Greenberg 2014; Dawson 2017). Important as studies like these are, however, they tend to focus on a few large scale and well-known disasters that impacted large cities, such as Hurricane Katrina in New Orleans

and Hurricane Sandy in New York City (e.g., Freudenburg et al. 2009; Adams 2012; Gotham and Greenberg 2014; Tierney 2015).

They also tend to focus on the aftermath of disaster, limit their analytic purview to the effects of resilience and recovery initiatives in the post-disaster period, and to see pre-existing political economic context primarily as a driver of vulnerability, occluding the ways that expectations of future environmental change may themselves change the political economic context and the disaster experience (Pais and Elliott 2008; for an exception, see Anguelovski et al. 2016). In this chapter I seek to address these issues using a case study of the lower Florida Keys' experience with Hurricane Irma. I emphasize the generative power of pre-disaster resilience planning in a relatively ideal test site: a small community with unusually high disaster risk and an unusually long and involved history of disaster planning. Hurricane Irma presented the opportunity to understand how these initiatives interacted with political economic context in a way that reveals the mechanisms of sociospatial inequality formation.

To analyze how sociospatial inequality develops, I synthesize the production of disaster space and the predevelopment treadmill introduced in the first chapter with literatures on natural hazards, trauma, and environmental justice. I find that while trauma arising from the initial disaster and evacuation tends to be moderate (or at least fleeting), disaster-related bureaucracy and regulation combine to create severe trauma in the post-disaster period. To be clear, I do not argue that living through a hurricane and suffering housing damage is not traumatic. Rather, I argue that trauma arising from the long post-disaster tail is qualitatively distinct from, and appears to exceed, that arising earlier (Eyerman 2015). In turn, this severe trauma wears down local residents in the months and

years after a hurricane—well after most relief efforts have ended—and appears to create susceptibility to exploitative real estate speculation and displacement over a long time horizon. Additionally, this highlights the effects of multiple hazards on the ability and desire to stay, emphasizing that while displacement patterns are rooted in wealth disparities, they are not determined solely by wealth.

LITERATURE REVIEW

The Mechanisms: The Generative Power of Disasters and Political Economy.

While demographics, landscapes, and systems of power can each affect disasters, there have been few studies on the effects of preparedness and resilience projects themselves both before and after disaster. Just as political economic context can change how disasters impact communities, preparation for disasters can change communities (Angeulovski et al. 2016). It may be dangerous to focus primarily on pre-disaster vulnerabilities and post-disaster response, without considering the effects of preparedness initiatives themselves. This is because disasters may be understood to 'land' on a pre-determined set of infrastructural conditions and social relations rather than fundamentally contributing to their development. Studies such as these therefore run the risk of failing to capture important elements of the disaster cycle (Tierney 2007, 2015). These include the effects of preparedness initiatives before a disaster occurs and how the mechanics of processes like disaster capitalism (Klein 2007, 2018) comes to pass *both before and after* disaster (Anguelovski et al. 2016; Dawson 2017; Gould and Lewis 2018a).

A similar danger arises from the important work that links disaster experiences to neoliberalism (Cretney 2014; Tierney 2015). This is the tendency to explain reactions to disasters and environmental change as the result of neoliberal ideology absent an

assessment of which elements of neoliberal ideology are at play and how they intersect with the specifics of disaster planning and response. While there is no denying that disaster response is often influenced by neoliberal priorities (Cretney 2014; Gotham and Greenberg 2014; Tierney 2015; Dawson 2017), disasters represent special circumstances that may operate by their own logic. In a time of rapid environmental change, viewing disaster planning not as derivative but as formative—and formative in ways that employ distinctive ways of thinking and logic—may provide insight into the unintended (or intended but unspoken) consequences of disaster planning. Housing, moreover, presents a unique case to study how social relations of disaster are emplaced: the production of disaster space (Lefebvre 1991) that is formed in anticipation of disaster (Shtob 2019).

Displacement and the Predevelopment Treadmill

Population displacement is central to disaster analysis. While displacement and migration are sometimes thought to consist of unidirectional depopulation (Goodhue 2018), organized managed retreat (Koslov 2016), or officially-sanctioned abandonment (O'Neill, Van Abs, and Gramling 2016; Flavelle and Mazzei 2019), other studies hint that climate-related migration may instead involve multi-directional churn, with displacement and replacement (Fussell and Elliott 2009; Curtis et al. 2015; Gould and Lewis 2017, 2018a). Moreover, displacement due to affordability, economics, or environmental risk is usually neither fully compelled nor fully voluntary. Instead, it involves a complex array of considerations that include affordability and distance from social support structures (Fussell and Elliott 2009; Curtis et al. 2015).

For those in the "middle of the volitional continuum" between forced and voluntary migration the "overriding point is that an acute environmental impact does not generate

one type of migratory response but rather many types that are organized by and through dynamic and highly variable combinations of individual autonomy and social structure" (Fussell and Elliott 2009, 382). Outside of the form that migration takes, however, there is the overarching question of why it occurs in the first place. This suggests that America's Great Climate Exodus (Gopal 2019), while conceptually useful to frame climate change and disaster migration as a national concern, may obscure a variety of displacement and migration types.[20]

In this way an analogy to green gentrification is useful. Green gentrification occurs due to the development of environmental amenities in urban areas. In addition to environmental improvement, however, these initiatives "draw in wealthier groups of residents and push out lower-income residents" (Gould and Lewis 2017:23). While simple and ostensibly local in its basic form, green gentrification results from the actions of investors and speculators who "appropriate[e] the economic values of an environmental resource by one class from another" (Gould and Lewis 2017:25). Real estate markets and those operating within them, therefore, can serve to structure differential race- and class-based access to environmental resources through economic incentives as basic as affordability.

Gould and Lewis (2017:35) argue that in urban spaces green gentrification of this type may manifest through the logic of the treadmill of production; specifically, they argue that "green growth coalitions operate along the logic of an urban greening treadmill." As

[20] As described in the Preface, the uneven damage patterns reported by Xian et al. (2018) to mobile homes in Big Pine Key (moderate) and its neighbor to the north Marathon Key (extensive) imply that there may have been displacement within the lower Keys in addition to out-migration to the mainland. This, along with numerous participant accounts that outline movement among the islands, suggests that population dynamics in the lower Keys were more complex than may be implied by the term "exodus."

the treadmill accelerates due to the concerted efforts of both real estate investors and others interested in maintaining growth, environmental amenities are reserved for the more affluent while environmental harms are pushed down towards less affluent and otherwise marginalized people and communities (Gould and Lewis 2017). The green veneer of this treadmill obscures the inequality that accelerating and intensifying real estate growth promotes, as well as its primary focus on capital accumulation (Foster, Clark, and York 2011; Gould and Lewis 2018a).

The mechanics of the operation of the urban greening treadmill and its constituent coalitions are based on the logic of the urban growth machine (Logan and Molotch 1987; Gould and Lewis 2017). Growth machine theory emphasizes the centrality of real estate development and investment within a complex of urban development and redevelopment, illustrating how growth coalitions comprised of government, elites, business interests, and others like labor interests seeking to ensure employment, work together to promote constant urban development and growth (Logan and Molotch 1987). This "model argues that developers lobby and otherwise manipulate municipal government to make public investments that will raise property values, thus generating profits for themselves with the consequence of displacement of local populations" (Gould and Lewis 2017:35).

Pais and Elliott (2008) developed an outlet for growth machine specifically keyed to the disaster context. They summarize the importance of this innovation—the recovery machine—to the sociological study of disaster by arguing that:

> Inserting this perspective into disaster studies moves us beyond the simple recognition that some groups are more vulnerable to environmental hazards than others to illuminate how this vulnerability is generated by ongoing and unequal struggles over local development. In turn, it also raises the question of how these struggles change *after a major disaster hits*, as competing interests respond to opportunities created by the damage, displacement and rebuilding that ensues, that

> is, as the local growth machine transforms into a recovery machine (Pais and Elliott 2008:1419, emphasis added).

As with other scholarship, this account reflects the dominant binary distinction between vulnerabilities developed from pre-disaster conditions (outside of preparedness and resilience initiatives) and those that develop during post-disaster recovery. That is, they accept that pre-existing struggles over uneven land development can prime patterns of vulnerability and argue that after a disaster the growth machine opportunistically mutates to take advantage of destruction (Pais and Elliott 2008). They do not, however, explicitly address how struggles over local development may be influenced by resilience and preparedness measures.

Others have made similar conceptual arguments about exploitation in post-disaster contexts that come closer to a resilience-based approach. Gotham and Greenberg (2014:133) describe the development of a number of growth coalitions after Hurricane Sandy in New York that they term "'recovery' growth coalitions" while Gould and Lewis (2016:148) use the term "redevelopment treadmill" to depict an analog of green gentrification that occurs when urban redevelopment continues through a disaster. In each case, the activities of the growth machine or coalition often results in environmental amenities being appropriated for their cash value (Gould and Lewis 2016). This is because environmental amenities support the quick and profitable sale of properties and encourage a culture of flipping, rendering the sometimes-illiquid real estate market more liquid and more prone to speculation. This speculation can lead to the displacement of residents due to restricted rental markets and increased housing costs.[21]

[21] Resilience gentrification itself has been described in New York City. Building on the ideas underlying green gentrification and the urban growth machine, it argues that a "structural mitigation approach" focused on strengthening homes and infrastructure has the capacity to create gentrification due to the desirability of

As much as policy interventions may be required to ensure that inequality does not arise during disaster recovery, these policies may also promote inequality. In the context of the eastern Caribbean island of Barbuda, which arguably suffered the worst impacts of Hurricane Irma and inarguably suffered significant population displacement, Gould and Lewis (2018b) demonstrate the disaster capitalism—the opportunistic development of tourism on the island due to the confluence of neoliberal ideology and political economic pressure—led to a policy preference for tourism over local recovery that was dressed in the clothes of public aid. There, "Hurricane Irma made it possible to recast development geared towards serving non-Barbudans as a humanitarian effort to rebuild and improve" (Gould and Lewis 2018b:151).

> As such, global developers teamed up with the national government to lead a 'green' recovery. But these actors are renewing the island to attract wealthy outsiders, not the displaced. In this way, the disaster and subsequent evacuation cleared the way for the global green growth machine to create green gentrification on the island and shift power from local, place-based control to extra-local, capital based control and decision-making (Gould and Lewis 2018b:152).

These valuable efforts to identify sources of disaster-based displacement and link them to established traditions in environmental and urban sociology, however, also suggest a need to better integrate a more holistic time scale to disaster-focused research. They tend to analyze the recovery to the exclusion of the planning period. In some ways this makes sense: disasters tend to illuminate latent social conditions and focus public attention (Birkland 1996; Tierney 2007); and examples abound of post-disaster opportunism when people are most desperate (Tierney 2007, 2015; Pais and Elliott 2008; Gould and Lewis

protected waterfront property and the costs associated with protective projects (Gould and Lewis 2018a). This paper builds on this type of research to develop a more concise understanding of some of the mechanisms by which the disaster analog of green gentrification may come to pass, extending it beyond the realm of housing costs to include elements of trauma, bureaucracy, and administrative stress.

2016; Klein 2018). What they omit, however, are the ways that disaster preparedness and resilience regimes themselves may create displacement that occurs in anticipation of a hazard. Building upon the redevelopment treadmill and initial forays into resilience gentrification (Anguelovski et al. 2016; Gould and Lewis 2016, 2018a), I call this the predevelopment treadmill.

Coupled with post-disaster explanations of opportunism such as the recovery growth machine and the redevelopment treadmill, through the predevelopment treadmill I seek to describe the mechanisms of the production of disaster space. That is, to emphasize the material effects of disaster that are created by resilience and other planning initiatives both before and after the occurrence of a hazard event. The production of space is an ongoing sociospatial project (Lefebvre 1991) that in disaster zones is punctuated by moments of environmental shock and destruction (in addition to the ongoing impacts of slower-moving environmental stress). According to Lefebvre (1991, 2003) space is produced by social structures, priorities, and inequalities. In turn, the form of space helps to structure the reproduction of social systems, including inequalities. While Lefebvre used the term "social space" to refer to spaces of lived, practical experience, the term abstract space "is constituted by the intersection of knowledge and power [as]…the hierarchical space that is pertinent to those who wish to control social organization, such as political rulers, economic interests, and planners" (Gottdeiner 1993:131; Lefebvre 1991). It is within this abstract space that social use value of land and real estate is replaced by exchange value, and within the space that buildings are constructed in ways that (re)produce inequality (Logan and Molotch 1987; Lefebvre 1991).

Of course, the construction of these spaces—and how the production of space is practiced—is actually accomplished by humans based on their mental images and more formal conceptions of space. These are dependent upon the material and cognitive substance of discrete historical moments (Lefebvre 1991; Gottdeiner 1993). In this way the Lefebvrian approach to the co-production of space and society joins political economic imperatives with how we feel about space, the world, and each other. Space is valued for a variety of reasons, including how its form reflects meaningful aspects of place, including relationships with among people, society, and landscapes (Greider and Garkovich 1994; Gieryn 2000). Moreover, Lefebvre (1991) is explicit about the variety of actors across levels of society that influence the precise form of built environments, from designers and architects, to owners, to planners, to financiers. Yet he is clear that even those who believe that spatial design is an individual aesthetic project are beholden to systems of power (Lefebvre 1991, 2003). Put simply, in this view the production of space is primarily a political economic project, but one that is integrated with the emotional content and meaning of our built environment.

While the spaces that are designed and built within a disaster zone are subject to many of the same political economic forces as spaces elsewhere, they are distinctive because of the risk of periodic external destruction. Eventually, the bad star from which the term disaster (*dis* + *astro*) derives (Freudenburg 1997) will rise again. Thus the elements of social control typical of abstract space found in disaster zones may involve the criteria of construction and reconstruction itself, promoted by the tendency of disasters to invite repair and replacement. For those who wish to convert the built environment and its attendant social organization to financial gain, however, this risk may be viewed less as a

liability and more as an opportunity. This is precisely how disaster capitalism—intentional or unintentional opportunism that exploits the adverse conditions or fear surrounding disaster (Klein 2007, 2018)—comes to exist.

The production of disaster space, therefore, may inhere an independent logic of environmental stress and shock avoidance. This is similar to the urban greening treadmill in that it operates at all times (i.e. both before and after a disaster event) through initiatives ostensibly focused on environmental improvement that in fact result in conversion of public readiness and resilience funds to private wealth accumulation. It differs, however, both because it has an independent and traumatic point of catalysis and because its guiding logic and discourses—whether sincere or disingenuous—are less focused on protection *of* the environment and more focused on protection *from* the environment (bearing in mind, of course, that climate change and development in disaster areas are human, not natural, accomplishments).

In this way it can justify a different set and sort of infrastructural improvements than are typically associated with green gentrification, including the wholesale reimagining of what is appropriate housing. While like resilience gentrification it certainly involves an assessment of the effects of structural mitigation approaches and real estate capital accumulation (Gould and Lewis 2018a), it also admits others forms of disaster planning as well as considerations of mental landscapes. Additionally, disasters themselves can clear pre-existing structures without an assignment of blame to any culpable human. When nature operates the bulldozer, the consequences that flow from the destruction can likewise seem natural, even if the resulting disaster space is produced by the logic of abstract space (Lefebvre 1991).

In this way the predevelopment treadmill is similar to approaches that focus on the cumulative effects of concatenated crises (e.g. Gotham and Greenberg 2014) but adds to these through an explicit focus on disaster expectation in addition to disaster response. In other words, there is no requirement of a crisis to get the ball rolling: disaster space may be produced based only on anticipation of a future event. With the number of resilience programs (and their funding) rapidly expanding due to recognition of the dangers of climate change (Colker 2020), financial market acceptance of the existence of climate risk even in the face of intransigence or denial at some levels of government (Omstedt 2019), and economic estimates that every dollar spent on infrastructural preparedness in the form of model building codes saves eleven dollars over time (Colker 2020), pre-event initiatives are of the moment. So are critical approaches to preparedness and planning that analyze whether their golden reputation is fully deserved.

I recognize that this critical approach tends to interfere with a point of hope that may be useful to those who have suffered a disaster, yet it operates in a tradition known for this sort of thing. "Even within the academy" Gould, Pellow, and Schnaiberg (2004:312) wrote over 15 years ago, "the treadmill model is more often critiqued as 'depressing' than inaccurate, reflecting the model's utility in debunking environmental myths surrounding nonstructural paths to socioecologically sustainable development trajectories." One of these myths may be the belief in the win-win nature of resilience and preparedness measures (e.g., Colker 2020), even (and perhaps especially) if they do not account for the potential for the reproduction of inequality. Yet interrogation of this type of myth also provides an opportunity: since many municipal resilience efforts are in their early stages and there are incentives for municipalities to get on board (e.g., Moody's 2017, 2019;

Omstedt 2019), it may be instructive to build considerations of inequality into early planning regimes.

Collective and Cultural Trauma, Housing, and Mental States

One way to assess the relative success of disaster planning is through the avoidance of collective or cultural trauma in recovery. This implies a focus on the aftermath of disaster, as well as its pre-disaster roots (Erickson 1991, 1994). Collective trauma is distinguishable from individual trauma because rather than a "blow to the psyche" it derives from "a blow to the basic tissues of social life that damages the bonds attaching people together and impairs the prevailing sense of communality" (Erickson 1991:459-460).[22] While individual trauma may result from exposure to the devastation of disaster, collective or cultural trauma may develop from the loss of a sense of community or official support, and critically may impact even those who did not experience the disaster firsthand but were subjected to its aftermath (Erickson 1991, 1994; Eyerman 2015).

For example, as observed by Eyerman (2015) about the devastatingly ineffective federal response to Hurricane Katrina in New Orleans: "[T]he hurricane in itself did not cause cultural trauma; what did was the failure of those charged with collective responsibility, the upholders of the covenant, to act accordingly" (Eyerman 2015:7). In order to best appreciate the development of trauma, it is therefore important to focus on the aftermath and official response: what happens in the months and years after a disaster that catalyzes the possibly unavoidable to the avoidable. Importantly, its focus on response

[22] Although it is subtle difference, collective trauma results from the destruction of communal bonds and community, whereas cultural trauma results from an offense to a sense of identity within a community. In the case of a hurricane collective trauma may result from dislocation or destruction of community resources, whereas cultural trauma may develop from a failure in response that causes people to question the assumption that their society values them sufficiently to provide aid in their time of need (Alexander and Breese 2011; Eyerman 2015). For present purposes, however, they are used in tandem to represent the traumatic effects of failures in disaster response and recovery, as opposed to the trauma of experiencing a disaster itself.

requires identification of conditions in the pre-disaster period that have post-disaster consequences. Notwithstanding its roots in the constructionist cultural sociology of emotion (Alexander and Breese 2011; Eyerman 2015), trauma involves both emotional and material content. Erickson (1991, 1994), in his appraisal of the Buffalo Creek disaster, and Eyerman (2015), in his appraisal of the aftermath of Hurricane Katrina, certainly would recognize that during these events emotional trauma resulted from material, political economic forces and helped to set the stage for post-event repression and resistance. Moreover, because space and social relations influence each other (Lefebvre 1991) and trauma is derived from failures in institutional response (Eyerman 2015), it is reasonable to expect that trauma both results from, and contributes to, the production of disaster space.

Disasters, Inequality Formation, and Housing.

Having elevated the importance of the full sweep of the disaster cycle to the political economic development of disaster space, and having introduced trauma as a potential mechanism of the production of space, I turn to the question of the effects of disasters on the development of housing and residential inequality. There is considerable evidence from quantitative national studies that disasters influence the production of space and inequality. Landscape development, unequal accumulation of wealth, and residential instability all are associated with disasters, on average (Elliott 2015; Elliott and Clement 2017; Elliott and Howell 2017; Howell and Elliott 2019). Yet the mechanisms of inequality production suggested by these national studies have not been adequately explored. This is unfortunate, in part because of the severe consequences of displacement and housing loss by legal or extra-legal mechanisms, especially among already-marginalized communities (Desmond 2012; Sullivan 2018). Some of their findings, including that some privileged groups

actually gain wealth on average after disaster (Howell and Elliott 2019), hint that fundamental questions remain about the relationship between disaster and inequality formation (Pellow 2000; Pellow 2018).

Beyond the well-established proposition that disaster response may lead to opportunism and inequality (Klein 2007, 2018; Tierney 2007, 2015) questions likewise remain about how disaster preparedness and relief efforts fuel these processes. Environmental inequality formation departs from earlier understandings of environmental inequality and justice by encouraging a process-based socio-historical view that opened a forum for the analysis of legislative, bureaucratic, and development practice over time (Pellow 2000). In this way it dovetails nicely with the perspective that concatenated disasters may have a cumulative effect over time on political economic systems and landscapes (Gotham and Greenberg 2014; Dawson 2017).

Critical environmental justice studies represents a more recent evolution of the study of environmental inequality formation, partially because it represents a vision of a more just future as well as a way to document past injustice (Pellow 2018). It encourages analysis of environmental injustice and inequality across spatial and temporal scales and promotes a reevaluation of the role of the state in their development, questioning the assumption that the state is necessarily an environmental justice ally (Pellow 2018). Finally, it focuses on the concept of indispensability, arguing that all beings, regardless of race, class, or other identities or group affiliations, are "indispensible to our collective futures" (Pellow 2018:26). Rather than an embrace of anachronistic functionalism, indispensability in Pellow's (2018) view involves a right to inclusion and environmental protection that is

independent of whether a person or group is deemed "useful" to society or those holding power.

Displacement, even that which occurs in the middle of the volitional continuum (Fussell and Elliott 2008), is implicated in each approach to environmental justice. First, disaster-based displacement threatens the notion of individual and community indispensability because it involves a relocation that is not fully voluntary in most cases. Second, it dovetails with critical analysis of state action, including any seemingly neutral or pro-social action that threaten to work injustice or create inequality in the long run, because it also implies (at the very least) that insufficient support was provided by the state. Third, it focuses not only on the production and development of space, but also on temporal contexts stretching from the distant past to the future (Pellow 2000, 2018). Folding in the idea that collective disaster trauma may result from disappointed expectations about recovery rather than from the storm experience itself (Eyerman 2015), this view emphasizes the importance of thinking across time and space, and supports reconsideration of a variety of programs from an environmental justice perspective, including state-sponsored and private resilience and preparedness initiatives.

METHODS

In order to understand the intersection between the production of disaster space, political economy, disaster trauma, and housing injustice, I draw upon my experience with real estate law and regulation as well as theory developed within environmental and urban sociology. Using the lower Florida Keys as a case study (Yin 1994, 2003) I analyze how repeated disasters and crises influenced the development of the local built environment, and how legal and design elements of the built environment mediated residents' experience

with Hurricane Irma. My data collection strategy was inspired by both contemporary grounded theory (i.e. Charmaz 2006) as well as elements of Burawoy's (1998) extended case study method that focus on theoretical reevaluation and reconstruction over time.

The central element of this data stream was twenty-two in-depth interviews conducted between 2018 and 2019 with residents of a variety of six separate islands in the lower Florida Keys ranging from Key West to the southwest to Big Pine Key to the northeast. Every participant lived in the Keys prior to Hurricane Irma and at the time of their interview had lived in the Keys between five and 48 years. The participant pool featured members who were retired, actively working, year round residents, seasonal residents (or "snowbirds"), at least seven who were dispossessed from their house for more than a year and a half, three who no longer lived in the Keys because of Irma, and a few others who at the time of our conversation were still considering leaving. The participant pool was evenly split between men and women, with ages ranging from 31 to 87 with a mean of 56 and a median of 54.5.

Housing experiences in this group also varied significantly; while everyone reported being affected by Irma in some way, some only suffered superficial damage to their residence while others returned to find complete destruction. With one exception these interviews were all an hour or more, with some exceeding two hours. The questions were open-ended and intentionally vague in many cases, which allowed participants to answer them as generally or specifically as they desired. This allowed them to provide their own definitions for concepts as diverse as their community or communities, environmental change, and expectations for the future. In this way it tested salience of ideas and concepts and promoted ideational and thematic development, allowing participants to highlight

issues and stories that they felt were most relevant, rather than limiting its scope to a predefined list of research topics.

One result of this is that many participants chose to frame their responses in the form of pre-Irma and post-Irma observations, experiences, and opinions. This lent support to the idea that Irma served as a catalytic moment, in which a variety of social and environmental contexts changed. Another important result of open-ended and vague questions is a central pivot in research topic, from one focused on the material roots of displacement to one that also embraced mental health and trauma, as well as their relationship to housing, building codes, bureaucracy, and insurance.

Participants were initially recruited through community service organizations and snowball sampling. From the outset, I suspected that the relationships between housing and population displacement would be the primary sociologically interesting issue and much of the interviews focused on these topics. Being conscious of the somewhat unique relationships that Keys residents have with place, I also asked a variety of questions about meanings of place in order to understand the potential effects of displacement. The interviews were transcribed in full and coded by the author. During the coding process attention was paid to the development of coding categories, as well as general content of each category and stories that might represent potential outliers. While originally about 14 coding categories were contemplated, by the end of the coding and recoding process 20 often-overlapping categories were established.

To be clear, I doubt that these codes represent a full inventory of every factor that is play at this community, or every opinion held by local residents. Moreover, it would be absurd to presume that a study focused on the relatively unique environment of the lower

Florida Keys would inventory every concern held by the diverse array of communities that are presently preparing for hurricanes and other climate related disasters. As Burawoy (1998, 17) writes, "most communities are so riven by conflicts that it is impossible to navigate them to everyone's satisfaction no matter how careful the observer." However, by using the case study method and drawing on a variety of data sources, I have taken a broad-spectrum approach that captures a variety of thematic elements relevant to local recovery. Additional details about data sources, as well as methodological concerns and choices, are presented in Appendix A.

RESULTS AND DISCUSSION

After a brief discussion of place in the lower Keys and how that informed participant opinion, this section proceeds in a series of parts. First, I outline some of the many instances of Irma related trauma reported by study participants, ordering them chronologically to emphasize that more significant cases of trauma originate not with the storm but with the management of its aftermath (Eyerman 2015). Importantly, in this section I illustrate the linkages between trauma and housing. This broadens the approach to collective and cultural disaster trauma from their non-materialist roots (i.e. Eyerman 2015; Erickson 1991, 1994) to identify points of connection with political economy and environmental justice.

I then build upon this foundation to argue that, in addition to the well-known displacement that occurs immediately after a storm, there may be a brand of displacement that occurs over long timeframes as local residents are worn down by bureaucratic disappointment. Over time and with cumulative storm experiences, this suggests a new model of displacement in which less affluent community members experience a death by a thousand cuts, while wealthier people can pay for convenience as they build back bigger.

In turn, this convinces some dedicated community members to leave their community and for others creates significant questions about whether they would be willing to suffer through another recovery. From trauma, this form of class-related cumulative disadvantage arises partially as uneven development and partially as overdevelopment.

This is followed by a discussion of the ongoing process of real estate speculation that is believed to have accelerated following Hurricane Irma, intensifying building development overall and especially that serving tourism and temporary rentals. This connects local issues to real estate speculation and capital, and illustrates that seemingly neutral investment decisions may, in the aggregate, contribute both directly to displacement through housing costs but also less directly by changing associations with place and community. While disaster trauma is independently worthy of study, here the focus pivots to how real estate speculation is believed to be a source of trauma and may benefit from trauma. By connecting political economy and emotion, I identify how long-term trauma can serve real estate investment to the detriment of less affluent community members.

Finally, I present two discrete examples of housing regulation and bureaucracy: the 50% Rule, which is part of a complex of hurricane-resistant building codes; and the Rate of Growth Ordinance (ROGO), which seeks to limit growth to ensure effective evacuation of the islands in the event of a hurricane. These emphasize not only the centrality of bureaucracy and housing to disaster trauma, disruptive real estate speculation, and potential displacement, but also the centrality of contributions of rules and regulations specifically focused on hurricane preparedness, resilience, and public safety. This is not to imply that support exists among participants for a *laissez faire* housing free for all, without building codes or enforcement. Unsurprisingly, people who have seen a hurricane the size and

strength of Irma up close tend to strongly support the strengthening of housing stock and effective evacuation plans.

Participants were less enthusiastic, however, about the effects of institutional resilience bureaucracies on their community: the practice of these rules was the issue, rather than the wisdom of the rules themselves. This suggests that the production of disaster space engenders multiple competing demands that, in this case at least, must fretfully coexist under the logic of resilience and public safety. They may also result from laws passed years or even decades before. On the other hand, it also provides opportunities for the reform of resilience and preparation regimes that recognize both physical and social climate and disaster risks. Inequality formation in recovery and redevelopment, therefore, has roots in pre-disaster planning that naturally flow from both past storm experiences and concerns for future storms: this "predevelopment treadmill" drives the production of disaster space, which in turn primes class-based housing inequality.

The Lower Florida Keys: Place and Precarity.

Before turning to the specific effects of Hurricane Irma, it may be useful to frame a few details of participants relationships to place, as well as overriding concerns about threats to place derived from real estate development that predated the storm but seemed to have intensified afterwards. Participants nearly universally liked their birth or—much more often—adopted home in the lower Keys. Most participants reported that they had been attracted to the Keys due to some combination of sun, ocean, and recreational activities. An extremely common story among participants is that they came to the Keys on vacation, fell in love with its unique amenities and environment, and then decided to move down.

Participants also cited the cost of living and inconvenience as the trade-offs for living in the Keys. The Keys are expensive and are becoming increasingly so. This is symbolized by the number of local "and bartenders" I encountered: the teacher and bartender; the librarian and bartender; the consultant and bartender; and so on. Second jobs and side hustles seem to be the norm for younger working people, and even some retirees reported taking on extra work as an income supplement to make ends meet in their golden years. Many make the connection between this trade-off, real estate investment, and community changes. In the words of Jennifer,[23] who reported moonlighting as a bartender to supplement the income she receives from her full-time consultant job:

> [The Keys are] changing. It'll be interesting to watch. Real estate is being snapped up at exorbitant prices. So we're losing some of that small town feel here. Especially the last couple of years and even more so since the hurricane last year. A lot of people that have lived here for generations are getting pushed out because they can't afford to be here any longer….I mean, it's being developed so quickly. More hotels, more condos, more second homes or third or fourth or fifth homes, in all of the lower Keys—or probably all the Florida Keys—but especially the lower Keys, that I think in another 10 years, there will have been some sort of major shift. There's no workforce anymore. People here have to work two or three jobs. So I think that that's already starting have a major impact.

Most participants reported strong satisfaction with their community. It was nearly universally described as laid back and very often described as featuring people who were friendly, caring, and willing to lend a hand. Many participants analogized the Keys—or more specifically the island or area where they lived—to a small town. Yet this was countenanced by concerns about long-term trends of development, as well as the conversion from a small town residential model to a tourism and vacation rental economy that detracts from neighborliness and a sense of community. This was sometimes likened

[23] All participant names used herein are pseudonyms. In addition, some identifying information is intentionally vague to prevent identification in the small-community context.

to urbanization. Because most participants—including the few who were more positive about the effects of continued and rapid development—also recognized that tourism was the economic engine of the Keys, members of these communities seem to be presented with a sort of Hobson's choice: accept tourism and its attendant development or risk losing the businesses and jobs upon which the community relies.

In the words of Diane, a retired businesswoman and snowbird who split her time between a home up north and one in the Keys:

> [The] most important things [in local history] are bad things that happen. They're mostly the tourist development. And it's just too fast and too much and too much money. And I guess that happens in every coastal community. We once had a home [up north] and it's the same thing: the little cottages and the farms get bought up by people with more money than they knew what to do with and…because your taxes went up so high, you can't keep your farm and you sell out to somebody that builds a McMansion that they live in two weeks out of the year and…the whole character…changed…..And of course after the hurricane that's worse [and it's] just overall overpopulated way too much, way too soon and now with the destruction and the opportunities for more development I think it's going to get worse.

Part of Diane's dismay about these changes seemed to be related to her strong sense of community: her house was completely destroyed by the storm and she appreciated the sense of community she discovered thereafter, with neighbors stepping up to help as she tried to rebuild. Like Jennifer, she expresses the pervasive fear of change and its local impacts. This includes the common theme of concern about whether the Keys and its housing stock can sustain the workforce necessary to provide public and private services:

> I'm afraid that it is going to be more occupied by more developers and more the people that are only interested in making money off what is dumped there and not providing homes. For the people that actually live there, they're not going to have any service community left because you know, even 10 years ago, people couldn't afford to, to work and live there, and now their rental homes are gone, and the trailer parks were low income. I mean, whoever thinks $1,500 a month is low-income rental when they pay eight bucks an hour. What is wrong with these people?

While these tensions over housing, cost, and the changes that they might occasion were common to long-term residents as well as new arrivals, the ongoing battle over what the character of the Keys extends beyond housing. Rather, a conflict over the basic sense that the lower Keys is a laid-back and tolerant yet hard-working place where elements of its uniqueness are cherished is exemplified by the so-called "chicken war." Karen, a retiree who has lived in the Keys for over four decades (almost all of her adult life), describes it as follows:

> Well there's wild Caribbean fowl around town—I mean we have them in the Winn Dixie [supermarket] parking lot too—but somebody was like we need to get rid of these chickens. And the locals were like, 'Who are you to come in our town and tell us what to get rid of? We like our chickens.' And so I guess they were hiring somebody with traps to trap them. And somebody was going around at night, locals, and they were, I don't know if they were breaking the traps but they were setting the chickens free.

George, a young father who was born in the Keys and is now raising a family there while working in fishing, elaborated on the depth of feelings about the chicken war: "there was lots of death threats." Mary, an entrepreneur, mother, and local volunteer helped to explain that, like many local disputes, the chicken war was not about chickens *per se* but about community transition and conversion, as well as resistance: "I think it was symbolic almost, like you people…come in here and all this stuff you're doing, *who are you*?"

In short, according to this pool of participants two accounts of the Keys exist in tension: the more egalitarian version in which its amenities are considered sufficiently worthwhile to justify inconvenience and expense; and a more exclusive version in which tourist resorts, vacation rentals, and expensive second homes exist for a wealthy, transient population that expects sanitized comfort. In turn, this provokes concerns about both

community and the availability of a workforce to provide those comforts to others for wages that may be inadequate to provide for their own comfort locally.

To be clear, a minority of participants disagreed. They saw tourism development as the natural and beneficial outcome of the growth trajectory of the Keys. Janet, who worked in real estate and was active in both the local Chamber of Commerce and the Tourism Development Council (TDC), explained her view:

> Yes they were trying to do a lot, mainly tourism…The TDC back then, they were trying to do a lot of tourism, to draw tourism, to keep the Keys stable financially. Because it is truly the tourism [that] pretty much runs the economy there and without the tourists coming it's a domino effect….If they don't have the tourists they don't have the people to run the restaurants and stores and shops and if we don't have that, then the people have to leave because they can't get good jobs….The majority of my sales came from people who were tourists just like we [were originally], we came, we loved it, we couldn't live without it and I sold the majority of my homes to the same people: they came, they loved it, they just had to have it, so the tourism was extremely important to me too for that reason.

That Janet lost her home to Irma underscores the complexity of the relationships that participants had with tourism and development. While it is safe to say that most people expressed concerns about the accelerating rate of development as well as the type of intensive development they believe was occurring, many of these same people either came to the Keys as tourists or were wholly or partially dependent on tourism for their livelihoods. The key to the analysis is that it is less about whether tourism should continue and more about how tourism manifests in terms of cost of living and housing and how symbolic battles about tourism reflect the greater political economic context of the "who are the Keys for?" This sense of precarity that had existed for at least a decade was intensified due to Hurricane Irma, as the process of place conversion went into overdrive.

The Trauma Machine: the Storm Aftermath, Housing, and Rebuilding.

All participants spoke about the trauma experienced during and after the storm, either personally or by reference to others. In nearly every case it was related to housing, bureaucracy, and the stress of rebuilding. Yet there was a qualitative difference between the trauma connected to the storm and the immediate aftermath, and the more severe trauma reported later. The causes of trauma in these periods also morphed from the storm's destruction to the long grind of dealing with administrative bureaucracy.

Stage 1: Evacuation, the Storm, and First Returns.

The first discrete moment of stress described by many participants arose as Irma approached, things began to shut down, and the evacuation order was issued. Many participants recounted their struggle finding a place to go. The difficulties of trying to evacuate much of the state of Florida were on display. One parent reported driving the family north and being unable to find toilet paper at a rest stop until they reached the Washington, D.C. area. This emphasizes the incredible inconvenience of evacuation, but the ways that these stories were told was generally jovial. There seemed to be little continuing trauma from the process of evacuation itself. Many participants admitted that hurricanes were just part of life if you live in the Keys and, inconvenience notwithstanding, there was little attendant trauma absent extenuating circumstances.

The experience of watching the storm approach did result in some psychological effects. In response to a general question about the source of feelings of future local uncertainty one participant who evacuated and returned to significant damage to their house said:

> [The sense of uncertainty] definitely has to do with Irma. Status is gun shy now. Right? Like if you notice when you walked in, I had the Weather Channel on and I

didn't have it on for you, but I first thing I do when I wake up in the mornings is put the Weather Channel on like this, you with the car with the phobia,[24] like I have that too like when my cell phone goes off [for the] notification [of] radar I run to it. I want to know which direction the rain's coming from….It's kind of like a tiny phobia I have….

This feeling was related to the uncertainty inherent in storm prediction, which was magnified due to the uncertainty about where the storm would land. Another participant commented on the spaghetti models that are often used to visualize likely hurricane paths: from a diffuse sense of risk that this visualization method promotes, her Irma experience now prompts a fear that one of the many computer-modeled lines could be headed for her. Others reported understandable hyper-attention to the Keys during the evacuation, in which they were transfixed by satellite maps, news reports, and any other sort of available information to understand what they might be coming back to.

Yet like the continuing heightened attention or phobia reported by a few, most accounts of the storm itself or the process of evacuation were factual in nature and to the extent they involved stress this tended to focus on more mundane issues like the desire to not impose as a long-term houseguest or finding fuel or lodging on the road. This is not to say that these decisions were easy, but there was a significantly more positive attitude in how they were described compared to the stories that came later. For long-term residents, part of this seems related to past experiences with Hurricanes Georges and Wilma, which were much milder in effect than Irma and cultivated a hopeful sense that Irma would be more inconvenience than tragedy.[25]

[24] The author has a driving phobia and has not driven a car for years. This was discussed before the interview.

[25] Yet a different take on evacuation was reported among those with the longest range of experiential knowledge in the Keys. One participant reported that her husband had considered staying through the storm, a choice she vehemently opposed. A friend asked if he worked with the Bubbas, a colloquial term for members of multi-generational Keys-resident families that reflects something of the old boys club character of local governance. He did, and the friend advised her not to worry: they would set him straight. After

There was no lived precedent for the scale of destruction that participants encountered when they returned, and the tone of themes related to rebuilding turned quickly from jovial. Accounts of the moment of return and the aftermath become especially ominous in connection with mental health and well-being. As one participant who suffered minimal damage to his own residence but helped others with cleanup expressed:

> Before the hurricane, I was pretty much happy all the time. [The Keys were] uplifting and laid back and comfortable. I will tell you that since the hurricane it had a profound effect on my psyche….I'm a member of Alcoholics Anonymous. I've been sober for [many decades]. And right after the hurricane, I went to meetings twice a day for six weeks. Now, in normal time…I only go to AA meetings once or twice a week. But right after the hurricane, I needed structure in my life and I needed a place to go and be able to talk to people and commiserate and cry. Because it was utterly depressing. It was awful here for about six weeks. Right after the storm, and slowly but surely, we've been able to come out of that and turn this place around. The getting the trash out of here was a big deal. It took almost 120 days to get the majority of the debris that was torn down by the storm. They still have not cleaned out all of our canals…

Much of the debris that was piled up to 15 feet high on the roadsides consisted of the remnants of people's houses: a tangible reminder of the destruction was scattered across the landscape. Other participants commented on the filth and debris, both on land and in local waterways that before the storm had been a cherished part of the life. For example, one participant who away when the storm hit and whose house was largely spared serious damage recounted his drive down from the mainland about ten days after Irma:

> Driving down the Keys, [my] stomach just rolled over every mile. Seeing all the stuff that was laying beside the road, torn down houses, I saw more houses and stuff than I've ever seen before because all the trees were down. It was just a heartbreaker. And I was very, very, very lucky. I still got the roof, the house is still standing.

returning from work with the Bubbas he had changed his mind based on their advice and stories. They departed for the mainland shortly thereafter, emphasizing how lived experience with past storms can affect present experiences through the local vernacular of disaster.

From these accounts it is evident that even those who got lucky suffered a sort of shock based on the destruction around them and a sense of empathy for those worse off. For those who suffered significant housing damage accounts of the weeks and months immediately after the storm were focused more explicitly on housing and habitation. One homeowner in his 60's who lived in a camper outside of his house while repairing and cleaning up reported the formation of "Irma zombies" due to the overwhelming nature of what they encountered in his neighborhood upon return, and the realization of the long term, overwhelming nature of the path to recovery:

> Just the work that we put in right after the hurricane…cleaning up. I mean, it was just seven to seven, 12 hours a day and just working straight in the heat, and it was hot. It was just…people just kind of described…you hear people call it…Irma zombies, you're an Irma zombie because you're just kind of just don't know what to do. I mean there was just so much stuff to do that we couldn't do it all.

Another homeowner who returned to find her house destroyed summarized the experience in a way that demonstrates some of the difference between learning of the loss of a house, the moment it is witnessed firsthand, and the process of grappling with the work to come.

> [Her partner] says that was the biggest thing for him with the loss of our house was because it had so many memories in it. And now they're gone….I would have to say that it was a lot more devastating to either one of us than we expected. I think when we drove down, it's like okay, so we lost the house. We'll just build another one. You know, it's still going to be where we go. But then when we actually got there and you're in the midst of this mess it's just like, oh, wow, and all the little things begin to sink in….I'm not sure I can put my finger on [it]. It's just, for an analogy, and I don't know if you've ever been there or not, but you talk and you read and you hear about the Vietnam Wall. But when you go stand there, there's a physical reaction that you just do not expect. You don't expect that big black cloud of depression to come over you. And, and I think this was a similar thing, there was like a physiological reaction to the whole devastation that we did not anticipate, or at least I did not.

Elaborating on the experience and the depth of feelings encountered upon return, she was also clear that this sort of effect while grappling with the enormity of the disaster aftermath was not unique to her, nor was her reaction the worst among her neighbors:

> There was a lot of depression….There was a lady on our street who actually had to be institutionalized…. [Two neighbors] went to her house to check on her and she's just pacing up and down the floor, just pacing. And with this naked stare in her face saying, 'I don't know what I'm doing. I don't know what I'm doing. I don't know where I am. I don't know what.' And they ended up—her family was not around—and they ended up taking her to Key West to the hospital and getting her admitted to a psychiatric unit. And this was all a result, all the result of Irma. That was just more than she [could] cope with on her own: the decision making on what do I do next?

Stories of immediate post-disaster sadness, however, are typically mixed with praise for volunteer efforts and a sense of deep appreciation for the many charitable organizations and individuals who came to help. Accounts of the period immediately after the storm indicate a time that was hard and bewildering, but also inhered a sense of hope that moderated the feeling of trauma. What is most important about these accounts is that they provide a root for the later development of housing trauma: a backdrop upon which the long-term trajectory of collective trauma was already developing, and upon which cultural trauma would later manifest.

Stage 2: The Frustration of Recovery and Rebuilding Sink In.

In the first stage of hurricane experience—learning of the storm, evacuation for some and taking refuge for others, and the initial return—a few general themes reveal themselves. The first is that these are not emotionally neutral occurrences, and that personal housing experiences relate to the way people experienced the event. Based on common knowledge about disasters and other shocks, this should be wholly unsurprising. The next stage—grappling with an extended reality of disaster that persists long after government

and private relief has expired—sees the intensification of visceral reactions (i.e., Eyerman 2015; Erickson 1991). Critically, the centrality of housing to these accounts strengthens as time wears on.

As participants moved beyond the initial shock they began to identify culprits, including local government, banking and insurance entities, and various opportunists who they believe preyed on their economic and emotional vulnerability. This is in stark contrast to how participants tended to reflect on the official emergency response. Beyond small complaints about things like the long wait before they were allowed to return home, participants generally praised first responders who they understood had worked in less than ideal conditions. In short, it is important to read the accounts that follow not as the result of a blanket belief that government is worthless or as a condemnation of government workers or efforts, but rather pointed and detailed criticism of specific governmental practices that hindered recovery and caused trauma.

The central thematic element at the intersection of housing and trauma was disappointed long-term expectations of recovery. This often reflected a mismatch between the expected time and effort of recovery, and what it actually entailed. For many it was driven by the magnitude of the storm at first, but after a while this changed: it was no longer the storm but institutional decisions made about their housing. The gradual conversion—and the effects of people feeling like they were facing cleanup and repair on their own—is illustrated by this quote by a participant who began by noting his short-lived sense of relief when aerial photos of his island were finally were released.

> I looked down and there was a roof [on my house] and I said well there's something to come back to, and we were pretty excited to say, take a pressure washer, we'll wash out the house, we'll chuck the sheet rock and get started. But then when we walk in the house and inside the house were things that were my neighbors', that's

> when I was like wow, this is too much. I thought we'd just clean it up in a week or two. And I was pretty positive about the attitude but when you work ten days and you're only six feet in the door. And it was hot. Brutal….And you realized as you drove back and forth around town that everybody was all messed up in some way. It was pretty rough. It certainly, instantly went to depression after about four weeks, and then I think now looking back on it I think everybody on Big Pine has PTSD. I know I do….It's so frustrating that there's so many suicides happening, there's a lot.

Like the description of the Irma zombies, this underscores how the initial hopefulness of recovery turned to bewildered resignation over time.

Many participants recognized the mismatch between the expected and actual recovery times. For example, while describing the stress experienced by many who were returning to no place to live, no job or income, and possibly a fractured community, one participant commented about the three-month aid timeframe.

> Well, they knew they were coming back to nothing, right? And not only that, the worst part of it is for some reason, when you're in a disaster, their limit is three months, right? They give you three months of help, and then they think we're out of here. So everybody left, the churches left, the Salvation Army was out of here. They were here for the most intense part, which was just coming back in. But after three months, they felt there. Everybody left. The tents went down. Everything went out of here.

This feeling of abandonment included a feeling of being ignored and preyed upon. Participants bristled at they felt was a preference for the Key West tourism industry over the needs of residential areas, including a much faster cleanup response. Many complained about being treated as a spectacle as they tried to piece their lives and property back together, and one participant complained that scrappers from the mainland would root through their belongings, taking what they wanted and making a mess that residents would have to clean up or face fines. As the extent of the aftermath and recovery exceeded expectations, resentment about the involvement of the outside world began to grow. Cultural trauma was forming.

One participant gave this description of her neighborhood a little over three months after the hurricane made landfall, the same time that others notes that the aid organizations were departing. Like the others, it emphasizes the sense of despondency that can arise when the assumption is that things are back to normal when they are not.

> [I feel] sad that everything…happened like it did. Sad not only for us but a lot of other people who lost everything, who had no insurance whatsoever so they had nowhere to go. No money. No RV to stay in. There were people living in tents, people living in their cars. At Christmas, and this is really sad it makes me tear up every time, but there were people right around the corner from where we lived, living in tents, there were a bunch of appliances on the road that were ruined and they smelled horrible because like all [the] appliances…there was food left in them [and] we didn't have power for three weeks. And the little kids were Santa Claus age and they went out and decorated the appliances so Santa Claus could find them…because they were in tents they didn't think he would find them because the house was gone. It's really sad, my first thought sometimes of all of that.

Stage 3: The Long Slog Through Bureaucracy: Cumulative Trauma and Housing.

Why did trauma develop in this way among this group of participants? First, of course, is the exhausting reality of being displaced from home. Among this participant pool were many people who used or borrowed campers for temporary shelter, some who stayed with friends for an extended period, some who moved away, and many who were still experiencing housing uncertainty two years after Irma. Many of those who found a way to stay in the area and rebuild lived in substandard housing. One participant reported during our phone interview a year after Irma that he could see through the front and back walls of his house: he called this his air conditioning. This forced many people into temporary, trying, or illegal circumstances: another participant described his illegally parked trailer that lacked potable water or a working toilet as the one you get when FEMA rejects your request. He also feared that the county would discover and evict him, at which point he would likely have to leave the area. Time is fundamental here, as frustration developed

from delay after delay. Those who were displaced or living in a damaged structure commonly reported the traumatic effects of delays in the process of rebuilding and obtaining housing. There were a variety of reasons cited for these delays, each of which was sufficiently common among participants to suggest that a complex of interrelated and identifiable sources of frustration, disappointment, and fear arose well after the storm.

The first and most commonly cited theme involved frustration with local government; specifically with building codes and inspections. Recent scholarship has argued that building codes tend to be associated with higher housing costs, and it has been suggested that in the non-disaster context that "building code violations are likely to burden and punish poor homeowners who cannot afford the required repairs and to hurt poor renters who cannot afford the higher rental prices charged by landlords who pass on the costs" (Bartram 2019a:942). The literature likewise suggests that the aggregate impact of building code enforcement tends to support the interests of growth machine to the detriment of those less financially able to quickly remediate issues (Bartram 2019a, 2019b).

For some in the lower Keys a new, hurricane-resistant building code foreclosed the opportunity to rebuild. This is because the owner of a destroyed mobile or modest home must rebuild to the new code. For example, ground level homes must be elevated and this requires either making a soil mound or more commonly reinforced concrete stilts. For less affluent people without insurance this may be impossible. Moreover, even for those with insurance, the cost may significantly exceed the amount of available proceeds because those are keyed to the value of the destroyed home, or might be unavailable because of delays in the insurance adjustment process.

Building codes and disaster have co-evolved throughout western history: "building codes, as a general rule, followed disastrous fires, becoming more refined with each one" (Davis and Ryan 2020:212). From a fire in ancient Rome in 4 AD to responses to the transgressions of Mrs. O'Leary's infamous cow in the Chicago fire in 1871 and beyond, the model by which space may legally be produced is forged in the fire of disaster (Davis and Ryan 2020). Each of these disaster-responsive building code updates and innovations refined the ways that buildings were designed, constructed, and used, even in times of relative calm. Building codes therefore represent an element of the production of disaster space that regulate sociospatial trends both before and after disaster, demonstrating their reactive creation and formative nature.

Coupled with the pre-Irma antipathy towards county building code enforcement related by a number of participants due to what they view as overreach, there was an overwhelming sense that the manner of permitting and code enforcement after Irma was the central factor that exacerbated post-storm trauma. Compared to the studies of building code enforcement that Bartram (2019a, 2019b) conducted in Chicago absent a disaster, given the scope of destruction in the lower Keys, permitting—which bestows the right to legally rebuild—gained special significance. To illustrate the many stories that laid the cause of mental health issues at the feet of county bureaucracy, one participant related his astonishment at a well-known story of a murder-suicide.

> What you found that's strange in the Keys was, everyone was, we're in the Keys we're happy people, easy go lucky kind of personality down here and everyone takes everything in stride. People live down here without air conditioning and they're thrilled. They don't go 'woe is me.' They go 'look at me, I'm living the dream.' And for them to pull the trigger, is stunning. And the people who did it, you're like what the heck, they were doing good and on their way back to rebuilding and yeah, just got a new job and he killed his wife and himself. Holy crap.

When asked what might have contributed to this situation, he offered this long and detailed statement outlining the tenor of local bureaucracy, its associated inconveniences, and the dire consequences for those who are the least able to self-finance a recovery effort.

> I have an answer, personally for me it was permitting and [the county]. I lay it all on the desk of [the county]. Oh, absolutely. They have made it so difficult to rebuild, incredibly monumental incompetence in the [county] building department. Not by the inspectors, but the people who run the department are incredibly incompetent. And you have make seven trips up here, just to turn in an application, and each time you go you get told a totally different thing, that's a 45 minute drive, and some people have to work five days a week so they only get one shot at going up there. And then they get told if you didn't record this at the records office and we got to got to the records office and the records office says we don't need a copy of that, we need a copy of the other thing, and they send you back to them and they tell you sorry I meant to tell you this one, and then you gotta go back to the records office, back and forth, back and forth….
>
> And there's a lot of people that went to a meeting with the county when they came out and said they were going to hold a permit meeting: the…suicide, murder-suicide if you call it that. [County officials] came to Big Pine and said we're going to hold a meeting where you can come, get some help, get moving quicker. And we're all excited about 250, 300 people showed up to this thing at a church. And the first thing all they did was, spout about…here's the seven tables you need to go to, here's the one where if you've done illegal work, you can turn yourself in, here's the table where if you've got a permit, but…it's being reviewed you can talk to them about it, here's a table where if you want to fill out a permit we can help you fill out one. Of course, you know, 75 people in line for a four-hour process. You're not going to get it done in the next two hours. And the one guy who went to that meeting, felt hopeless and he went home and his wife had facial pain, from muscle spasms, special, some kind of disease, and she said I quit, and he said I quit, and shot her, and he shot the dog, and he killed himself.

While this is one of the more stunning and saddening accounts, this thematic concern was common among those with severe housing damage and recognized by many others who did not. Participant accounts like this were supported by media reports that the area's already remarkably high suicide rate doubled in the first half of 2018 (e.g., Klinenger 2018). In fact, a nursing professor and suicide expert who is quoted by Klinenger (2018)

remarks that after a disaster there is a honeymoon period in which the community comes together, but thereafter mental health issues begin to arise.

This participant, like others, is careful to not lay blame at the feet of any individual, instead focusing on the system through which decisions were made and the runaround that it created. Overall, most participants were charitable with individual public employees, even when they described personally frustrating interactions and systemic bureaucratic issues. Close to the surface of these accounts lies the tacit understanding that many of these frustrations do not apply to those with the means to hire someone to deal with the paperwork and other administrative requirements, especially if this is a second home and they have another place to live in the meanwhile. Many participants explained that it is wise to hire private insurance adjusters, building inspectors, or contractors who would deal with the county for a premium, assuming you have the means to do so.

For the rest, the requirement to conform to new building codes is similar to an observation made by Tierney (2015) on the connections between neoliberal ideologies and discourses of disaster relief and resilience in Hurricane Katrina. She argues, based in part on the work of Adams (2012) and Gotham (2015), that survivors were required to take an entrepreneurial approach to disaster relief, advocating for themselves as if they were consumer advocates in order to be considered "worthy" of relief efforts and aid that should be focused on helping all victims. While these examples of the neoliberal "privatization of recovery efforts" expose many flaws in the disaster recovery system that can lead to inequality (Tierney 2015:1338), opinions on bureaucracy in the lower Keys reveal another force that may likewise suborn the creation and reproduction of inequality.

I call this the requirement of "coming to the bureaucracy," which is less overtly entrepreneurial and less dependent on public-private partnerships than Tierney (2015) describes. Rather, it requires that individuals either hire professionals or operate as skilled bureaucrats, deftly navigating time-consuming, complicated, and frustrating administrative requirements that may have existed pre-disaster but only mature into their most trying form through disaster. The consequence for failure is homelessness or worse. This reflects the break—in this context—with some elements of contemporary neoliberalism like anti-regulatory tendencies and small government. Alternatively, it may reflect the long-term consequences of austerity such as underfunding and deferment of social programs (Peck 2012), along with a rule structure that rewards wealth (Tierney 2015). Some participants alleged intentionality in how permitting and code enforcement took place after Irma. They argued that the slow pace was intended to let houses rot so they would be easier to condemn and demolish, or that through these codes the county was expressing a preference for more substantial, and expensive, structures.

Intriguingly, participants almost universally expressed support for building back stronger, even while they decried the uneven nature of building code impacts. It is understandable that disaster experience would lead people to support solid construction, even though they appreciate the injustice that may result from a combination of building codes and bureaucracy. Yet the process of county permitting—the imposition of a bureaucratic structure—was a central factor in the development of collective and cultural trauma: the sense of the failure of those in positions of authority to uphold the covenant to protect the public (Eyerman 2015). People felt abandoned or, even worse, that there were active efforts to get rid of them by making a bad situation unbearable. In any case, they felt

dispensable (Pellow 2018). A perverse element of this is that some of rules that contributed to bureaucratic post-disaster trauma and inequality—like building codes—were specifically formulated to improve the disaster experience.

Notwithstanding variations in adoption and enforcement cultures among officials tasked with building code compliance, at least one modern infrastructural analysis of the intersection between resilience building codes emphasizes their public safety function and encourages the use of incentives rather than penalties (Davis and Ryan 2020). Following this path may have allowed a more productive and helpful interaction with code enforcement in the near term after Irma. This is especially important because of the risk of mold and the continued effects of exposure to the elements if repairs are not prosecuted quickly. Taking this a step further, it may be worthwhile to extend the public safety window to many months after disaster rather than just the moment of impact, as well as to pivot from an adversarial permitting relationship to one that specifically considers housing inequality formation (Pellow 2000; Bartam 2019a, 2019b).[26]

[26] This reflects what one prominent legal geographer refers to as "precariousness in property law," meaning "the work that [real] property does in structuring asymmetric relations of vulnerability and privilege" (Blomley 2020:5). This provides a potentially fruitful opportunity to link the geography of property ownership and its relationships—legal and otherwise—that help to structure our relationships with property and each other. It also emphasizes the universality of vulnerability and that all interests in property, including ownership, may quickly turn precarious due to a momentary social or financial crisis (Blomley 2020). In the case of disaster zones, reflections on the precarity of property should also include socio-environmental crises and the legal structures in place to contend with these, even in advance of an event. Another intriguing possibility for reform involves what the National Institute of Standards and Technology refers to as immediate occupancy building (Sattar et al. 2018). While this is a technological design approach that tends not to specifically integrate questions of inequality to any great extent, immediate occupancy building codes would partially shift the focus of codes to whether a building would have continued functionality after a disaster. This is particularly important due to the relationships between long-term displacement (even if it turns out to be temporary) and trauma, but would benefit from a more explicit focus on assisting marginalized or otherwise vulnerable segments of the population. It would also reflect a widely held opinion among participants that having more local people on the ground immediately after a disaster would assist with the recovery process.

While I will outline two specific elements of building codes and permitting—known as the 50% Rule and the Rate of Growth Ordinance (ROGO)—later, there are other ways that institutional impediments to recovery led to trauma. While participants typically were pleased with private, charitable efforts to assist, the same cannot be said about their interactions with insurers, financial institutions that held mortgages, and official or quasi-official organizations that were tasked with providing post-storm assistance. As hinted at previously, insurance factored into this equation, as did interactions with holders of mortgages, as well as assistance from FEMA. While each of these was cited less frequently than bureaucracy, they were fairly common and often thematically connected with trauma and displacement.

The first theme that arose within these fields was a complaint that FEMA and other official sources of aid offered, in the words of one participant, an "a false sense of security, a false sense of hope." Many participants related stories of waiting in the heat outside FEMA tents to apply for aid from it and other government agencies, faced with a litany of frustrations including: insufficiently trained aid workers; temporary housing being issued in a haphazard fashion or at great distance; and eventual assistance falling far short of what was promised and needed. Some participants considered the process of applying for aid a waste of time and said that if they experienced a future hurricane they would not bother even if they qualified. Importantly, these interactions stretched well beyond the immediate aid period, with many participants reporting protracted fights that resulted in denial or paltry amounts of aid.

With respect to insurance and mortgage holders, many participants cited delays and lack of communication between insurance and financial institutions as an additional source

of delay and frustration that was exacerbated by their living circumstances. The process of haggling, the denial of claims, and the time it took to resolve issues each became a central source of frustration for some of those who suffered the worst damage. For many residents, repairs could not begin without insurance and mortgage bank approval so they became symbols of traumatic inertia. These frustrations also include the inability to find licensed contractors who were available and able to work. Delays in insurance adjustment and payment meant that those who could afford to self-finance repairs were first in line for contractors. Those who depended on insurance often waited months and in some cases more than a year to simply *find* a contractor who would return their calls, even after any insurance issues had been resolved.

Some participants related how they had to prosecute repairs themselves—if they had relevant construction and building skills—or undertake extraordinary steps to obtain help given the lack of contractors and laborers. One participant went so far as to provide living space in her home for a local homeless man who happened to have needed building skills. Along with advertisements for law firms seeking clients who had suffered hurricane damage (presumably to sue insurers), billboards and smaller signs reminding the public that unlicensed contracting is a felony in Florida were ubiquitous after Irma. While there are many good reasons for contractor licensing including minimizing predatory behavior, they also contributed to the difficulties in finding necessary help. Another complicating factor for those with mortgages is that insurance proceeds were sometimes held by their financial institution until they demonstrated proof of repair (i.e. progress payments), adding additional time and headaches, and again giving contractors reason to prioritize those who could pay with cash in hand.

In total, the process that ground down homeowners started with the need to rebuild to the new, hurricane-resistant code. For some, that was end of the road: they were simply unable to repair based on a lack of funds and insurance. For others who struggled to rebuild, the bureaucracy was exacerbated by the need to obtain the insurance proceeds necessary to purchase materials or pay contractors, the need to satisfy the requirements of the mortgage bank, and the need for a contractor who would do the work in many cases on credit while competing with others who could offer cash in hand. This added additional steps, expense, and delay to the process of recovery; the disappointment of this process and its seeming absurdity led to one participant opining that "all insurance is a scam."

Some participants who suffered minor damage reported little friction with their insurance company and seemed pleased, while a few reported tactics to avoid contact with insurance such as not filing minor claims or hiring private adjusters. Another reminded me that it is nearly impossible to insure a mobile home for much, reflecting what Sullivan (2018) describes as a special state of precarity for manufactured home residents. This is because mobile homes are often treated under the law as personal property like automobiles, as opposed to real estate, and consequently are subject to different financing and insurance regimes (Sullivan 2018). Accordingly, there are portions of the population for which insurance that is adequate to rebuild to the new code is simply unavailable. According to residents, many others whose homes were paid off chose not to insure due to cost. Although opinions about the insurance and mortgage process differed among participants, it is clear that they combined with bureaucracy to develop an uneven terrain of recovery. While multi-faceted, this runaround is fundamentally an administrative

mismatch between what is required to rebuild and recover, and what is available to rebuild and recover.

There also was a general recognition among many participants that renters may have had a worse time in certain ways, notwithstanding that they did not have to deal with many of the frustrations that homeowners did. More to the point, this worse time was due to the same reason that they did not have to deal with these frustrations: because of their more precarious relationship to their residences (Blomley 2020; Desmond 2012) some renters returned to nothing and had no property-based reason to stay. For those who did return, a few stories offered by participants discussed issues with landlords. These include a landlord who used the storm as an excuse to throw the participant's friend's belongings on the street, and the story of a renter participant who described how her landlord over-promised and under-performed, leaving her family in extended limbo before they finally decided to seek alternative housing. Even assuming the best intentions—that this was the result of the landlord falling victim to the same disappointed post-storm expectations as other homeowners—these examples illustrate the special precarity that applies to renters, whether they fall victim to intentional misdeeds or the simple misunderstanding of landlords who find themselves in their own bewildering circumstance.

These themes represent a variety of factors that foster displacement in the immediate sense, may promote displacement over the months and years following storm, and caused participants to question whether they would have it in them to stay through another hurricane and recovery. This is an important element that few disaster studies capture: that exhausting, disappointing, and unfulfilling recoveries may fracture the desire to stay during the rebuilding process. Like metal that has been fatigued by twisting in the wind, these

fractures may only mature into a break with the arrival of the next severe gust. Having lived through the stress of one recovery, some participants explained that they may give up the next time rather than experience it again. This suggests that the study of disaster displacement may benefit from a long-term view that considers trends across multiple events in addition to linking them to other local sociospatial processes. It also suggests that the onerous rules and regulations put in place of expectation of disaster may serve the purposes of real estate investors and speculators to the detriment of existing residents.

Connections to Capital: Speculation, Investment, and Displacement.

Complex Displacement and Speculative Investment.

It should come as little surprise that hurricanes and their aftermaths are traumatic. What may be surprising is that in the context of the lower Keys the cumulative effect of a complex of administrative, bureaucratic, and financial elements seemed to drive trauma to a greater extent than the experience of the storm. While participants expressed some reservations and fear that developed from the storm itself—and every participant said that they would follow the next evacuation order—it was the grinding weeks, months, and in some cases years of cleanup, uncertainty, rebuilding, and precarity that morphed into the greatest sense of trauma.

In this section, I will build upon these observations to explore how these delays and their human cost may be related to real estate speculation and circuits of capital, and how together these lead to displacement through a combination of increased cost of living and decreased will (or ability) to stay. This thematic element was originally developed in interviews: it was described or alluded to by many participants, especially those whose residences suffered the most damage. Triangulating their accounts with legal and media

research—particularly into county explanatory documents, local newspapers, and conversations with local experts—I develop some of the roots of longer term displacement that illustrate how post-storm trauma may both be the result of, and support, the interests of speculative investment.

The model of displacement observed in the lower Keys deserves some attention. A couple of participants were forced to leave the Keys, many more were still unsettled nearly two years after Irma, and at least half of the participants had been displaced from their residence for many months after the storm. This suggests that rather than a linear "great climate migration" model that is visualized as a linear process of migration out of the area, the post-Irma experience is better understood as out-migration, in-migration, and a significant but underexplored process of migration within the area: local population churn (Fussell and Elliott 2009; Curtis et al. 2015; Gould and Lewis 2017, 2018a). It also suggests that population dynamics and housing dynamics are closely related: housing precarity and instability may result in the undercounting of the number of people actually displaced as people find shelter with friends and relatives, live in temporary trailers or campers, or in tents or outdoors.

These observations help to explain the wildly different estimates produced by University of Florida demographers that were widely quoted in the media (i.e. Associated Press 2018; Goodhue 2018; Rayer and Wang 2018) and participants. When asked what she thought about the estimate of a population loss between 3-4% suggested by these reports, long-time Big Pine Key resident Sarah simply responded "Lies. Yeah. I think that's a lie. Now when they're talking about Key West, 4% maybe." The demographers were measuring population loss from the county as a whole, including more affluent and less

damaged areas, and evidently did not account for replacement.[27] Although the study did differentiate between some incorporated towns and their population loss, local media reported no specific estimates for Big Pine, Cudjoe, and the other hardest hit areas (e.g., O'Hara 2018). What participants seemed to be observing were shifts in the composition of their communities in real time. This includes people in substandard housing or no housing at all, people who moved elsewhere in the Keys, people who left the Keys, and the many new people who moved in to replace them.

Taking their diverse observations in total, the teachers who I purposively sampled to help with the question of localized displacement supported these conclusions. With no statistical data available and strong variation in estimates of population loss among from academic sources, local media, and participants, I thought that educators could provide insight into what had happened to local working families, or at least those with school age children. Moreover, media reports suggested that that overall enrollment in local schools had dropped, but that that drop was concentrated in Key West and Stock Island, which suffered relatively mild Irma impacts compared to the areas hardest hit up the island chain (O'Hara 2018). These puzzling results, coupled with observations of the teachers about their class composition tend to support the idea of complex migration and churn. Unfortunately, they raise more questions than they answer.[28] In the words of an elementary school teacher, when asked if her school had lost students after Irma:

> It was funny. We didn't notice a lot of [that], and I was thinking about this earlier…we kept *getting* students. And so in my mind, with us not being able to

[27] This is not to suggest that 4% population loss due to a natural disaster is minor in any way. To put it in perspective, one study (Meléndez and Hinojosa 2017) estimated that the first-year population loss in Puerto Rico due to Hurricane Maria would be between 2% and 4% overall.

[28] An additional line of inquiry, about the intersection of paid care work and disaster, also arose during my interviews with educators. While this is not included in this chapter for the sake of parsimony, some preliminary observations are included in Appendix B.

> find a place ourselves to afford I kept thinking, where are these people living? Why are they moving here after we just went through a hurricane like, where are they finding a place to live? Right? So I personally noticed a slight influx. But it was like [the] new parents [had] a much higher income level. So I don't know if they just could afford to buy in and bought but I personally noticed an influx and I said, I remember thinking more than once, I was so frustrated where are they living? How are they finding a place to live?

Her observations are telling: she noticed people coming in from out of state immediately after the hurricane, and they tended to be in a higher income bracket. Another teacher estimated that she lost about 15% of her students for the school year after Irma but the next year about half of those who had left had returned. In short, the results overall hint at a series of population flows within the Keys that occurred between islands and in stages over time. One of these may have been a flow out of Key West and Stock Island, which suffered milder storm impacts but already had the highest housing costs. More affluent people from these areas may have moved up the Keys to previously affordable areas, displacing less affluent people in a process akin to neighborhood gentrification within a city. Another flow may have been people moving in from the mainland. While available information is too thin to hypothesize any concrete typology for post-Irma migration, it is intriguing to consider from the whole of the collected data and reports that there may be a classed patterns of out-migration, in-migration, and internal migration that would not be captured by county-level or even city-level statistics. The participant statement that official estimates of migration were "lies" may be an offshoot of a generalized sense of frustration that arises from a mismatch between experiential units of analysis and those used by academics.

Whatever their precise form, displacement and cost of living in the lower Keys reflect an overall development trajectory towards wealth and tourism that seemed to

intensify after a hurricane. Much like the 1935 hurricane and the New Deal response quite literally paved the way for automobile traffic by destroying the railroad causeway to Key West, the 2017 hurricane and the official response seem to many to have set the course for reconfiguration and intensification of land use. Yet in some ways this course was set decades before the storm by preparedness and resilience initiatives. These include a change to the building codes colloquially called the 50% Rule, which says that if your property is more than 50% damaged (by value and repair cost) for any reason (disaster, house fire, termites, or otherwise), you must rebuild to the new hurricane resistant code. They also include a development limitation called the Rate of Growth Ordinance, which was passed decades before Hurricane Irma to limit development to ensure a safe evacuation of the islands.

Each of these was developed well in advance of Hurricane Irma for the purpose of ensuring public safety through what I would describe as the production of disaster space. The production of space that is regulated by these rules occurs within the planning phase and the consequences may be felt both before and after disaster and tend to encourage capital intensification and accumulation. They also have their distinctive logic: in addition to have an independent public safety justification, they rely on the logic of protection from nature rather than protection of nature.[29] They also reveal how the production of disaster space may deviate from key assumptions about the operation of neoliberal markets and the state, such as limited public regulation and market-based solutions (Peck 2012). Because they certainly conform to some other assumptions of the neoliberal ideological frame—

[29] Moreover, if building codes and building limitations may be analogized to a property tax that increases private cost for some public benefit (i.e. public protection from extreme events), they may connect with scholarship on how property taxes sometimes operate as drivers of sociospatial inequality (i.e. Martin 2019; Tapp and Kay 2019).

notably the preference for market-based property valuation after a storm, an acceptance of a globalized approach to capital, and imposition of requirements that only the wealthy may be able to satisfy (Tierney 2015)—it does not represent a full break from neoliberalism but rather a modification that may be necessary to understand the disaster experience across time.

"*Geography and Money*"*: Mechanisms of Speculation and Displacement*.

A substantial majority of participants expressed concerns about the intensification of development after Irma, the loss of affordable housing (or in the local parlance "workforce housing"), and the impact of speculative investment on each. While the specifics of population displacement may be somewhat unclear, there was broad general agreement that it was occurring and about its roots: real estate speculation that preyed on the precarity and trauma of the process of rebuilding and recovery and priced out residents. After discussing the loss of working professionals from the area, one participant described the mechanism by which housing is removed from the market.

> And…that's the workforce housing shortage is, [when they] leave someone buys up the lot no matter what the condition of the house is. They just pay whatever price it is. They'll come in from Brazil and buy six of them, they don't care. They're just trying to get money out of Brazil and buy it in America. So now that lot is no longer rentable or buildable, and…you can't live there. So the number of homes that people can compete for, to live in, is getting smaller and the prices are going up because of supply and demand. When there's a shortage the prices go up. So now you have vacationers coming down, who want to come down for six months and they rent the house for six months and pay four grand a month. The local person wants to rent it for $1,800 and can't afford it. So now they have to leave.

Other participants reflected this sentiment in a variety of ways, including how it has accelerated since Irma. In the words of a different participant:

> Now I think just like I said, I wish they had better control over the overdevelopment….I mean, growth is not a bad thing. You have to have growth, but a good pace would be better. I think that the hurricane itself, like I said, has

> opened the way for opportunists. There are a lot of people that are manipulating the system to work in their favor.

The battle over development also manifests in perceptions of official involvement. Each of the accounts related here reflects the continued concern over local development trajectories that began well before Irma and acknowledges that the hurricane opened the door to a different kind and intensity of opportunism. Similarly, other accounts link the overall frustration with the county and a perceived preference for large-scale tourism and resort development with the long-term processes of displacement. In the words of one participant who had suffered a complete loss of her home and business but was trying to start over and rebuild in the Keys nearly two years after Irma:

> Well, I've seen the continued proliferation of bad money winning out with development. You know, you can buy your way through things. I've seen it on my own street, and I've seen it, it's very public, a lot of times [when it happens to others] it's just like…you know, move on, nothing happens. I have been at the mercy of the other end of it where…government goes for the low hanging fruit. Well, they got to do something and my…those people over there…they're easy pickings over there. Let's see what they got going on their property.

Others used this frame of reference as a way to explain the difference in recovery for those in different socioeconomic situations. A different participant who had lost her home and business and was still in the process of rebuilding nearly two years later described this comparison.

> A lot of them were able to use the extra money that they had while we were waiting for insurance monies to rebuild our homes. And they were able to get to the contractors first because they had cash where we were still waiting for our settlements and it kind of, you started watching these houses come up and rise from the ashes and you're still sitting in shit.

When asked for the reason for skyrocketing prices, she agreed that it was because of speculation, which helped to explain why there were no bargain properties available when she checked shortly after Irma, notwithstanding the number of people that had departed

and the terrifying nature of the hurricane. Overall, the gist was that outside speculators were buying every lot they could for inflated prices and they, along with wealthy locals, were able to overcome housing issues less stressfully than the average pre-Irma resident. Another participant who had also lost her home—this time a rental residence—and had to live with friends after the storm for nearly a year put it this way:

> Housing became ridiculous. People were ending leases just to take advantage of [that] fact…and they were doubling rent almost. So it made it impossible to afford anything. I mean, for us to rent a house it was, the minimum was $3,000. More than one whole paycheck for me…but they did it to everybody. So…that was really frustrating. Or people were trying to sell homes…as is for $300,000 and half the house is missing. I mean, because there was nowhere to live like, you know, so just to see people trying to take advantage of that situation.

Importantly, in this description "half the house is missing" implies that the house is so damaged that in addition to the lot price, using the property for housing would require demolition and removal of the remaining half, and then construction of a wholly new building that is in compliance with the new building code. This is an expensive and time-consuming process, and one that is likely beyond the means of many working-class residents. Although she mentioned supply and demand as a precipitating factor immediately after the storm, when asked who she thought was trying to take advantage, she offered that it was likely that seasonal residents and possibly local realtors were to blame.

Many participants drew connections between this speculative conversion, the long-term pressures on those who wanted to rebuild, and mental trauma. One participant who was concerned with the loss of her community and the long-term mental health effects chalked these up to the pressures of the real estate market.

> There was some help. But it was…a very fearful thing when you don't know if somebody is going to all of a sudden take your property away from you. You know,

> we live very simply down here and most of the people were…retirement age. You just keep going. A lot of it seems to me that there are a lot of situations could have been reconstructed very easily without too much money and it seemed like they were coming in with…people thinking that they were going to get some financial help from the different agencies, but instead they condemned things. Instead of saying, 'well, this is really not as bad…maybe we could give you a little money'….Instead of that it was 'off with their heads'…and that's when people started to get really mentally sick from it.

She also was careful to trace the route of changes that she has seen and expects in the area to broader socio-political trends that were catalyzed be the storm:

> It's all the politics. It's always that way. I think that the commissioners, previous commissioners felt that this was going to be an area for the very rich, that they were going to make this scenario for the very rich….But they were not interested in preserving it, they were interested in making money with it. And I've sat through a lot of county commission meetings….There's no housing for people, then we have no idea what's going to happen to the community until they have affordable housing. And the community is made up of people who are only temporarily here for short times…second and third homes. I live in an area…that's all working class and it was saved in the storm. It wasn't hit as badly as Big Pine and those houses. If…somebody owned the house there, the price of my house probably doubled in value in through a tragedy.

Whether or not the county commissioners or other local officials have these designs on the area is, of course, unknown to anyone but them. But the impacts of various efforts were summarized by one participant when asked about what led to differences in disaster experience: "geography and money." Pressures on housing got so bad that while I was in the Keys a primary topic of conversation—perhaps *the* primary topic of conversation—was the fear that after Hurricane Irma there were not enough workers to provide public services and work in tourism. What might be known as affordable housing elsewhere is, in this area, usually referred to as workforce housing.

Discussions of affordable or workforce housing very often turned to the problem of keeping workers in the Keys, rather than having to bus down resort workers from the mainland or simply doing without. The overwhelming use of the term workforce housing

in many participant interviews, as well as in the media and government communications, suggests a certain working class precarity: that rather than being indispensable (Pellow 2018) less affluent inhabitants of the Keys are expected to serve some broader economic purpose in order to stay. Recognition of the lack of affordable housing due to cost of living and the resulting labor shortage illustrates another dominant theme in the lower Keys. This is the concern that the amenities presented by the area may, through cost of living and environmental degradation, threaten the long-term residential viability of the area.

Hurricanes are commonly recognized as contributors to the conversion of housing into a form that the workforce simply cannot afford on prevailing wages, even for relatively well-paid professionals like civil servants. They also contribute to the development of trauma that over the course of one storm, or many, may encourage the less affluent to leave. Yet hurricane preparedness initiatives typically do not foreground this class-based consequence of disaster. In fact, in some cases they appear to accomplish the opposite as they incentivize land use intensification, liquidity, and speculation. Two of these that exist for the purpose of disaster preparedness are the 50% Rule and the Rate of Growth Ordinance.

Example 1: The 50% Rule.

The 50% Rule is the colloquial term for a feared regulation that requires that buildings that are substantially damaged must be brought into compliance with new hurricane resistant building codes, including elevating the structure to a height specified by its location on flood maps. While old buildings are grandfathered and do not have to be renovated to the new code, this changes if they are substantially damaged. Substantially damaged means, at the risk of oversimplification, that repair costs would exceed 50% of

the market value of the structure before the damage occurred. Beyond its topography and weather, one of the more unique things about the Keys is that a significant portion of the population seems familiar with the minutiae of building codes and regulations. Everyone knows the 50% Rule.

While the county independently had adopted this rule as part of its building and permitting code, in its published communications officials are careful to state that its purpose is to ensure future flood insurance in the area from the National Flood Insurance Program (NFIP) (Monroe County n.d.b). This indicates two things: first, although the county is often derided as the source of this rule because it is the forward facing enforcement entity, the rule is actually derived from NFIP and FEMA and accordingly may broadly apply to coastal hurricane zones; and second, that over time it is likely that more coastal areas will fall under this or similar rules due to the effects of climate change and because more counties and localities are taking disaster planning seriously. Also, that the county is taking the portion of the NFIP that requires flood improvements seriously would normally be considered a positive sign, especially given historical difficulties in obtaining local compliance with the portion of the NFIP meant to scale back at-risk development in flood zones (Adler et al. 2019).

As previously mentioned, the 50% Rule can be especially destructive to those living in ground level homes, especially mobile homes. Sullivan (2018) describes how in many cases “mobile” homes are a misnomer. This is because mobile homes deteriorate over time and older homes may be impossible to move without breaking apart. Additionally, it is because homeowners may not have the many thousands of dollars necessary to move the structure by flatbed truck. While in many cases residents own the home itself, they often

rent the pad on which it sits. When a mobile home park closes, for example, relocation may be impossible due to issues of structural integrity and affordability. Residents may therefore lose their homes and all that was invested in them based on a decision of the mobile home park owner (Sullivan 2018).

Participants described a similar process for mobile or modest ground level homes that were damaged in Irma. Because of their limited value and the high cost of construction after the storm due to lack of licensed contractors, limited availability of construction workers, and a high cost of materials, it is easy for the cost of repair to exceed half the low market value of these homes. This can trigger the 50% Rule. Yet building to the new code may be impossible for those without insurance or substantial savings. Even for those with insurance, the funds may be wholly insufficient to rebuild because insurance is keyed to the value of the damaged or destroyed home and reconstruction has to take the form dictated by the new building code.

There were many stories of this process forcing the working class inhabitants of these homes to sell their lot for whatever they could get due to the financial inability to rebuild, which primed the pump for speculative interests to buy any sort of buildable lot for development into vacation or tourism rentals, or second or third homes. Built into this element of the building code, therefore, is a system that promotes population displacement and an intensification of construction in a hurricane zone. Moreover, there seems to be little way to insure over this problem. To be clear, while the effects of the 50% Rule usually apply to more modest houses, this is not always the case. One participant, a successful entrepreneur who lived in an enviable home adjacent to the water, reported that she was forced to leave the Keys after her house fell under the 50% Rule and her insurance refused

to pay the full rebuilding cost. Part of the issue, she reported, was the cumulative effects of fighting and struggling to hold on through disappointment after disappointment: when the insufficient insurance check arrived after over a year of struggle it was the final straw. She could have continued fighting but reported being too worn down.

What develops from this is likely a contributing factor both to local displacement and to environmental degradation: loving the lower Keys' communities and environment to death by creating a system that indirectly incentivizes the replacement of modest, affordable structures for residential use with more expensive structures for vacation use. This illustrates a mechanism by which the production of disaster space reflects systems of power and hierarchy through disaster preparedness. It does so by using the logic of protection from nature and suggests one element of why development may accelerate after disaster (Elliott and Clement 2017). Moreover, because this is a local rule based in compliance with NFIP regulations and standards, it could conceivably apply to any coastline with flooding risk. In addition to the beginning of America's Great Climate Exodus (Gopal 2019), the use of this rule in the Keys may be a test case that will soon apply elsewhere. Although hurricanes might cause unusual levels of concentrated damage, it is also important to remember that the hurricane resistant building codes and the 50% Rule apply to any new construction or repairs arising for any reason. So while their effects may be most visible in the aftermath of a hurricane, the impacts of the code on affordable housing operate both before and after storms.

Example 2: The Rate of Growth Ordinance.

The Rate of Growth Ordinance (ROGO) traces its lineage to a statute passed in 1972 to limit development in the Florida Keys, and informed the 1986 Monroe County

Comprehensive Plan (Monroe County n.d.a). A limitation of building rights—ROGO rights are required to build new residential or tourist structures—its purpose is to restrict population growth to ensure timely hurricane evacuation. Its allocation formula uses a complicated system of tiers with their own structure, as well as a scoring system that accounts for land dedicated to the county, aggregation of plots, and donation of funds to retire existing development rights (each of these is intended to reduce overall development pressure). The county admits that approval for one of the limited allocations may take years, and its internal structure indicates that it may prioritize those with the means to buy multiple plots for aggregation or dedication, or to donate cash (Monroe County n.d.a).

Based on a number of participant interviews and a historical review of local media and Florida law, an important but overlooked element of the ROGO system became apparent. Like the 50% Rule, it may provides incentives for the conversion of affordable housing to expensive housing and resort development, and this may be exacerbated by hurricanes. This is because the ROGO development rights attach to plots of land but are also tradable, meaning that the owner of a plot can sell them to another owner and then they attach to the purchaser's choice of land. This means that rights that are attached to affordable housing may be sold for resort development. In the words of a Big Pine resident:

> In the past there was housing, more housing available to the lower class. And that lower class also…work the Winn Dixie [supermarket] and you know, places like that…that needed…low-income jobs and so they supplied those. Like the trailer park, the Sea Horse on Big Pine Key, which…three years ago now, three and a half years ago it was destroyed, which was basically about 150 trailers which was affordable housing that were destroyed there. They came in with a with a bulldozer and bulldozed all the trailers down and people either got given a bus ticket to get out of the Keys [or] some of them were really relocated. And…these development rights went to a condo that they were building in Stock Island [just outside of Key West]. So, you know, those type of things keep happening where…these low-income transient rentals' [ROGO rights] are being bought up and moved. And hence, housing…was lost for the lower class. And then Irma basically took it to

> another level because a lot of these again, a lot of these other trailers had enough damage that they could not be repaired and they would have to be replaced by a single family residence….So that's…out of the price range for many of these people.

The combined effect of the ROGO system and the 50% Rule therefore results in a conversion of the availability of working class housing to more expensive forms, even though technically the ROGO statute does address affordable housing at least conceptually. It also represents the conversion, to a degree, of the ability to remain post-disaster into tradable real estate investment. While this process did not begin with Irma, it is believed to have accelerated after. It also reflects concerns about the bureaucratic grind that residents had to endure. If unrepaired, a significantly damaged structure and its lot might be condemned and condemnation threatens a loss of the property's ROGO. One retired homeowner who two years after Irma was still trying to rebuild described the fear of losing ROGO rights:

> Well, there were seven separate documents that she had to have notarized in order to apply for a permit to tear the house down. We spent days traveling back and forth…getting you know documents notarized and going to the county and at one point, there was a special thing that you had to file that if you didn't file it, as a possibility you could lose your ROGO points. So that when it came time…to get a building permit you couldn't get one because you had no ROGO points. To rebuild a house that was already there. Well, we did it right. We do have our ROGO points we can rebuild but…getting the building permits is going to be another nightmare.

The ROGO system represents another well-meaning regulation that was enacted for the purpose of hurricane safety. The popular and economic appeal of these sorts of rules is emphasized, if by nothing else, than by the fact that the entire participant pool—even those most critical of the official response and were most conscious of the development of environmental inequality—supported official intervention to help ensure public safety in this disaster zone. Yet like building codes, the 50% Rule, and the related bureaucratic

morass, the ROGO system also has the potential to impact the existence of workforce housing, even though its original motivation had little to say about housing policy beyond limiting development.

Moreover, the lower Keys are peppered with so-called unbuildable lots: plots of land that do not have ROGO rights attached. A recent article in the *Miami Herald* (Goodhue 2019) describes how the state of Florida is preparing to be sued in 2023 as the issuance of new ROGOs is phased out in the Keys. The logic of the expected lawsuits is that the unavailability of new ROGOs essentially renders these plots permanently unbuildable, and owners of these plots are expected to claim a regulatory taking (a type of eminent domain) (Goodhue 2019). Although there is no guarantee that the moratorium on ROGO rights will actually occur, this dispute suggests that the effects of ROGO restrictions may get worse in the future as the only way to get one will be to buy it from a property owner.

CONCLUSION

This chapter represents a new way of examining the relationships between disaster and housing. After a disaster, cultural trauma develops over long timeframes from failures of bureaucracy and disaster planning regulations to serve community needs. Over time, this wears down elements of the population, rendering the community more susceptible to real estate speculation and opportunism. In turn, over long timescales this suggests that disaster experiences may have an additive effect on population displacement, as those who have lived through the trials of one recovery may avoid the next. Yet we should not conclude that concerns about affordable housing are completely missing from the lower Keys, or that the county and its public servants do not care.

Recovery, after all is said and done, continues. In January 2020, the State of Florida awarded $38 million to improve a desalination and sewage plant damaged by Irma, which is part of $84 million set aside for continued Irma recovery (Filosa 2020). Concurrently, however, for the first time Monroe County acknowledged that there would be part of the lower Keys that they could not protect from climate change due to infrastructural cost (Flavelle and Mazzei 2019). This is distinct from managed retreat (Koslov 2016), in which a community decides to abandon their area and recruits government to assist and finance the process. Here, they simply indicated that it would not be economical to raise certain roads serving small areas (Flavelle and Mazzei 2019).

Attention has also remained focused on the subject of workforce housing. In 2018 contractors broke ground for a new 208-unit affordable housing complex just outside of Key West, for the express purpose of maintaining the local workforce (Wadlow 2018a, 2018b; Florida Housing Finance Corporation 2018). Although it may appear to be an attempt to alleviate post-Irma housing pressures, it was in the works before Irma and its affordable rental structure is far more focused on the middle class than working class communities. Only five percent of units are reserved for those making less than 28% of the local median income (extremely low income, presently $23,900 annually for a family of four). Announced rental maximums for these 12 lowest income units are $621 per month, rent for many of the remaining 200 units rises to a maximum of $2,983 per month for a three-bedroom apartment (Monroe County 2019). Affordable is, after all, a relative term.[30]

[30] This workforce housing that replaces lost affordable houses hints of functional usefulness—providing for a workforce to maintain services—that at odds with contemporary understanding of indispensability (Pellow 2018). In the present day, when recognition of "essential" workers is deepening due to COVID-19, it is intriguing to consider that in the lower Keys the need for affordable housing is often couched in the usefulness of individuals to the economic system. Moreover, these elements taken together support the challenge presented by critical environmental justice studies to critically examine the role of the state, even when its purpose is disaster safety (Pellow 2000, 2018).

The production of disaster space factors heavily in both the present need for workforce housing and the conversion from truly low-cost mobile homes to comparatively expensive affordable housing. Elements of the building code such as the 50% Rule that are responsive to hurricane design concerns essentially remove low income housing from the market when a hurricane hits, leading to speculation and consequent inequality. Likewise, the Rate of Growth Ordinance was passed in anticipation of a future hurricane, and similarly it provides an incentive to remove truly affordable housing from the market. Taken together, these and other socio-legal structures like enforcement regimes tend to enforce an exclusive vision of the lower Keys, in which only those with sufficient wealth to withstand a hurricane will remain (along with those needed to provide services).

This vision takes shape, however, through structural pressures imposed upon design and construction for hurricane preparedness, illustrating how the predevelopment treadmill can inform the production of disaster space and inequality. Although in different ways, each of these mechanisms promotes the development of bigger, fancier, more expensive structures to house the wealthy or serve as vacation or investment properties. Whether or not this is intentional, they each contribute to the mental exhaustion and trauma cited by many participants that in turn provides opportunities for additional predatory speculation. These may become worse when public risk governance regimes like building codes mix with private risk governance regimes like insurance and mortgage covenants. Poorly executed, these bureaucracies foment collective and cultural trauma (Erickson 1991; Eyerman 2015). By so doing, they support the intensification of development in a way that might be predicted by those familiar with green gentrification (Gould and Lewis 2016, 2018a), yet for somewhat different reasons.

Where they are similar is that the creation of environmental amenities may lead to real estate speculation, valorization that drives out less affluent communities, and environmental inequality (Gould and Lewis 2016, 2018a). Where they differ is that the logic of predevelopment treadmill emplaces laws and structures before a disaster that, without adequate consideration of their social effects, may exacerbate inequality both before and after a disaster. Paradoxically, attempts to protect communities from the perceived aggression of nature instead subject them to the economic antagonism of real estate development. Additionally, while some of these measures reflect neoliberal ideology and priorities, they also differ in their internal logic in some key ways, including the imposition of regulation on private land use and market restrictions on land. The predevelopment treadmill and the production of disaster space do not fit neatly in the box of neoliberal ideology, even if they bear certain hallmarks of neoliberalism and achieve neoliberal-acceptable purposes like capital accumulation and consolidation.

Moreover, housing seems to be deeply linked to the emotional experience of disaster. Illouz (2007:5) describes the "contours of what [she] calls emotional capitalism," or "a culture in which emotional and economic discourses and practices mutually shape each other, thus producing…a broad, sweeping movement in which affect is made an essential aspect of economic behavior and in which emotional life follows the logic of economic relations and exchange." It is in this spirit that the connection between emotional trauma and speculative capital is drawn. I hope that this connection provides opportunities for reform in the future.

APPENDIX A: NOTES ON METHODS

This annex is intended to outline a number of methodological choices made in the development of research in the lower Florida Keys. This is for two reasons. First, I hope to preserve some of my experiences with this project in writing in a way that is typically not possible in a journal article or standard dissertation chapter. Second, because ethical disaster research has been increasingly recognized as a valuable goal worthy of independent study (Gaillard and Peek 2019) these observations may inform a responsive piece about the practical issues related to ethical disaster research, particularly in contexts where funding is limited.

Partially because of the recent, useful trend to view individual disasters and recovery as part of processes of concatenated, iterative events (Gotham and Greenberg 2014; Dawson 2017), I felt that a case study approach was appropriate overall (Yin 1994, 2003). This is because "case studies are appropriate when 'how' or 'why' questions are being proposed, when the investigator has little control over events, and when the focus is a contemporary phenomenon within some real life context" (Yin 1994:1). The focus on "how" and "why" emphasizes the utility of case studies to understand complex, contingent events where the "boundaries between phenomena and context are not clearly evident" (Yin 1994:13). By their nature, these tend to involve a variety of plausible yet contested explanations. Because disasters are almost by definition contingent events that result when a natural hazard matures in proximity to people, and because they are often stunningly complex collisions of social and environmental systems, the case study approach makes sense.

Data collection and analysis was guided by three elements of case study inquiry. First, case studies like this "cope with the technically distinctive situation in which there will be many more variables of interest than data points." Second, because of this diversity of potential data points it requires "multiple sources of evidence, with data needing to converge in a triangulating fashion." Third, while the goal is to challenge and possibly reconfigure existing theory, the case study method "benefits from the prior development of theoretical propositions to guide data collection and analysis" (Yin 1994:13). Additionally, this approach deviates from the thick description approach preferred in more formal ethnography, developing data collection for the purpose of something akin to an "analytic highlight reel approach" to participant's meaning making that "isolate[s] thematic highlights from the data" (Brekhus 2007:453).

As the nexus among disaster, housing, collective or cultural trauma, and population displacement emerged from early interviews, I began to purposively recruit local teachers. This was for two related reasons. First, although a University of Florida study of population displacement from the Keys estimated population loss of around 3-4% (Associated Press 2018; Goodhue 2018; Rayer and Wang 2018), participants reported the out-migration of far higher proportions of their communities after the storm. The central demographic study that was conducted after the storm included a number of methodological choices that hinted that it might have underestimated population loss for the lower Keys and especially those islands that suffered the greatest damage like Big Pine. These include estimating the island chain as a whole as well as lumping all of the unincorporated areas together, which included less affected areas nearer to the mainland. Additionally, they did not account for complementary out-migration and in-migration, or the replacement of people with different

people (Associated Press 2018; Goodhue 2018; Rayer and Wang 2018). By this time, as well, a focus on the particular stresses faced by working families had also become clear. Due to the need for some proxy for demographic information on this subset of the lower Keys, I suspected that teachers could provide insight because from their professional vantage point and observations about changes in enrollment that might reflect changes in local communities.

Second, teachers are in a unique position of providing both education and care for students, as well as for their own social and family circles. I believed that their awareness of the collective circumstances of many working families could help me to both ground truth the expressed experiences of my overall participant pool and open up new avenues of thematic development. By the end of data collection this resulted in the recruitment of seven professional educators, each of whom had also been personally impacted by Hurricane Irma in some way.

Supplementing these formal interviews were a number of other data collection strategies that occurred on-site in the Keys during my visits there, as well as remotely using online resources. These efforts were intended to elaborate upon and better understand topics and concepts that were discovered in interviews. As a result, I could triangulate various data sources to better identify and describe thematic elements as they were discovered. For example, as various elements of local law and administrative procedure were revealed in interviews and through research on media sources, I researched the applicable laws and regulations to ensure that participant impressions were correct. Correcting for the use of lay terminology, in this community I generally found a highly accurate appreciation of the details of development and building rules, including complex

or obscure elements. I doubt this is especially common among communities in other parts of the country, so I was initially hesitant to accept accounts as true without independent verification. Because they were aware that I am a both a lawyer and researcher, some participants told me during interviews that I should look up the details in order to ensure that the details of their accounts were correct.

Another path was research into local newspapers, first accomplished in the Monroe County Library's hurricane files, which cover hurricanes dating from the turn of the twentieth century. A second source was in the offices of the local newspaper on Big Pine Key, in which I copied and reviewed every article on housing dating back to 2014 (when their online version was suspended), as well as a variety of other media sources. The archives of this newspaper echo the disaster risk in this community: they are bundled in plastic wrap high in the rafters to protect against storm surge.

I also conducted a review of neighborhoods on foot or bicycle, checking street by street and lot by lot for notable evidence of hurricane damage or displacement, such as permit bags (the county requires all building permits to be on site and they are typically kept in a plastic bag that is visible on the front of the house), a hole in the building or other apparent damage, the metal roofs required by the new housing code that are a recognized symbol of rebuilding, empty mobile home pads that indicate the obliteration of a mobile home, and for sale signs. In order to avoid the appearance of being a real estate vulture or code enforcement agent, I avoided a clipboard and spoke quietly into a small microphone on headphones tied around my neck, dictating notes on what block I was on, house numbers where visible, and signs of Irma. For lack of a better way to say this, my goal was to look like a lost tourist enjoying a Keys morning. These efforts allowed me to gain an

appreciation of qualitative elements of real estate development, and moreover to experience how hot and inhospitable it must have been when people returned after Irma.

One example involves a traditionally working class neighborhood on Big Pine Key known as the Avenues, that was reputed to have suffered the worst of Irma as it is located on the windward side of the island directly in Irma's path. Riding down the streets around the coastline a pattern began to emerge. Relatively solid, recently constructed poured concrete or stilt homes occupied areas a few blocks from the water. As I approached the water there would be a block featuring some existing single-family homes mixed with many empty mobile home pads. At water's edge, these gave way to a few enormous seaside mansions, some with forbidding gates.

Observing these spatial damage patterns firsthand served two primary purposes. First, they provided a secondary source of data that combined with participant stories to provide a more robust appreciation of what happened. Much like how witness statements may provide better information about a crime scene when coupled with photographs, my understanding of the content of participant accounts benefitted from being on the ground and seeing the locations that they described firsthand. In the Avenues, it implies that mobile home pads were developed earliest in the most desirable areas near the water, which gave way to more robust homes as development moved inland over time, with the exception of the most desirable properties that have water access and oceanfront views. Concentrations of mobile homes in parks are towards the center of the island: because many of these are on higher ground this may have resulted in statistical analysis of the island overall that may have underemphasized the damage to mobile homes in this specific neighborhood through ecological fallacy (i.e. Xian et al. 2018). A preliminary review of public real estate

documents has lent some support to this suggestion, although formal statistical analysis has not yet been conducted. Second, it emphasized the gravitas of what happened. Every time I muttered "empty mobile pad" into my microphone it was a reminder that at one point in the recent past that may have been someone's home.

Importantly, I also had a number of off the record conversations with local notables, including activists, first responders, politicians, journalists, business owners, and volunteers. These happened in a variety of places including over dinner, in county administrative offices, clearing Irma debris out of a mangrove swamp, in various offices around town, sitting around a table at the cheapest hotel in Keys West, and while replacing a hydraulic line on a piece of heavy equipment. While all of these individuals were more than willing to offer their opinions, some were hesitant to do so on the record, either expressly or impliedly when they changed the subject or failed to respond to my more formal requests for an interview.

I strongly suspect that this was partially the result of the small town feel of the lower Keys, in which everyone tends to know everyone and notable local figures may be hesitant to speak on the record about issues as locally contentious as Hurricane Irma and housing. One participant related that since moving to the area she has to be careful whom she talks about in public spaces like the supermarket because it is likely that someone who knows them may overhear. The local grapevine is so well known it has its own name: the Coconut Telegraph, based on the Jimmy Buffett song of the same name. Another possible reason is the reasonable reluctance of people to revisit what may have been the worst day of their lives. For many, Hurricane Irma was traumatic and it is understandable why those who experienced it firsthand might not want to relive it. A third and final reason was that some

participants expressed a sort of hurricane fatigue, or a generalized sense of frustration with the exploitation of survivors by governmental agencies, other sources of charitable aid that they felt did not live up to their lofty promises, scrappers who they watched picking over their ruined belongings for metal while not helping in relief efforts, and real estate vultures and opportunists. After hearing these stories, I did not want to contribute to this sense of frustration, nor did I desire to become the subject of such stories in the future.

If potential participants seemed hesitant to sit for an interview I did not push or pry, nor did I ask again save for a short follow-up email. This follows recent entreaties to foreground ethical practice in post-disaster studies due to the past use of insensitive data collection methods, imposition of research questions considered irrelevant locally, leaking of premature "expert" opinions, and other examples of poor behavior by researchers working with disaster survivors (Gaillard and Peek 2019). Moreover, while trauma was not originally contemplated as a central feature of this study, interview responses later directed its inclusion as a primary thematic category. The study of trauma, while identified as the feature of post-disaster experience that is sometimes considered most locally relevant also may require special care (Gaillard and Peek 2019). The emotional content of my interviews was palpable, with three participants crying (two out of sadness over loss, one out of appreciation for those who came to help) and many more requiring moments to collect themselves before continuing.

Notwithstanding that I was disappointed in many cases that I could not include what I learned in these informal conversations as data in this study, they still served as opportunities to listen to and obtain feedback on my thinking from a wider group while honoring the wishes of those who for whatever reason were reluctant to formally

participate. These conversations therefore served an important purpose as I periodically checked my work, and no serious discrepancies were revealed between those who agreed to participate in the study and those who declined. This comports with the spirit of reflexive and iterative co-development of data encouraged by proponents of grounded theory (i.e. Charmaz 2006) and the extended case method (i.e. Burawoy 1998).

In addition to requiring ethical data collection, qualitative case studies about complex socio-environmental issues may generate questions about how much data is enough. Rather than try to isolate every factor germane to housing, displacement, and later trauma to judge sampling adequacy, I relied on a type of theoretical saturation known as thematic saturation (Hyde 2003; Bowen 2008; Saunders et al. 2018). Orthodox theoretical saturation refers to the "point [in the data collection process] at which no new insights are obtained, no new themes are identified, and no new issues arise regarding a category of data" (Bowen 2008:140; Strauss and Corbin 1990). It is focused less on sample size and more on sampling adequacy, and recommends careful and directed purposive sampling, multiple forms of data gathering, and triangulation among these data sources. "Sampling adequacy…is evidenced by saturation and replication, meaning that sufficient data to account for all aspects of the phenomenon have been obtained" (Bowen 2008:141, internal citations omitted). In the case of theme saturation, it "means that no new data are added because that category has been adequately explained" (Hyde 2003:48).

Of course, the goal of perfectly complete data collection about an ongoing experience is likely impossible: some participants related stories that were still developing, as well as expectations for the future. At the very least, however, this method requires that analyses account for participants who remain in unsettled circumstances at the time of

interview rather than assuming stasis. In turn, this requires sensitivity to the fact that processes of recovery, rebuilding, and trauma development may take a surprisingly long time. Ideally, these processes would be captured chronologically with attention to how stages of recovery play out in different contexts, as I have tried to do here.

Near the end of the interview and visit process felt I was not learning much that was new in each thematic category: a strong sign of thematic saturation and sampling adequacy. In fact, I sensed in many of the later interviews that I could accurately predict responses to later questions based solely on a participant's description of what happened to their house during Irma and its aftermath. Rather than being an indicator that these interviews were a waste of time, this familiarity proved useful. I was able to quickly identify outliers and to explore what conditions or circumstances led to these experiences and opinions being so different from the rest. In addition to promoting sampling adequacy, open-ended and in many cases long interviews provided a forum to explain differences in experience.

For example, in one case a participant recounted a mind-bogglingly easy post-Irma experience with housing reconstruction, given the level of damage her home experienced. Although she initially attributed this to a positive outlook on life and that she was a well-organized and powerful self-advocate (each of which seemed likely to be true), reconsideration of the question revealed a unique cascade of circumstances. These included that by coincidence her street was one of the first on which electricity was restored, that her house had no mortgage because it had been a gift from a family member, that because there was no mortgage a laborious step in the insurance claims process was removed, that she chose to immediately settle and not litigate with her insurance company even though she suspected their offer was a lowball (avoiding what Picou et al. (2004) and Freudenburg

(1997) might suggest is the central element of community corrosion after disaster), that due to the likelihood of a quick insurance turnaround she found a contractor who was willing to work on credit, and that because she found a contractor within days of the storm she beat the rush that led to delays of over a year in finding contractors for other people.

Perhaps most critically, however, a relative had a sort of local first responder status and was therefore able to return to their house two days after the storm to open it up and dry it out, preventing the occurrence of mold that was so common elsewhere. In other words, what might be chalked up to an individual fulfilling the role of effective self-advocate due to matters of personality and personal organization—what Tierney (2015) might call the disaster survivor playing the role of neoliberal subject—upon deeper examination revealed that it was at least partially the result of material circumstances and a sort of housing-based privilege. Important for the question of saturation was that while meeting with his participant I strongly suspected that there were unique circumstances at play well before they were revealed later in the interview.

As a final note, special ethical considerations may be at play in disaster research, especially in the context of open-ended projects where the research agenda may shift over time (i.e., Charmaz 2006). In the lower Florida Keys I had little expectation that my research would eventually focus on trauma, notwithstanding that disasters are often traumatic. As the focus shifted from the political economy of housing in disasters to how political economic interests intersect with trauma, I felt that special ethical attention should be paid to participant accounts that describe severe trauma or mental illness. Due to the depth of emotion and the sensitive subject matter in those sections I use a bare minimum of identifying information about some participants, focusing only on the relations between

these stories, housing, and housing-related concerns. Part of this was removing references to employment or other elements of their story, and omitting cross-references to other quotations from that participant that may include potentially revealing information about their identity. While this choice may result in a loss of some detail for readers, I felt it was sufficiently important to make.

Finally, in these contexts I felt a change in how I triangulated data was necessary. Besides taking people at their word about personal accounts of mental illness, I decided to not investigate the many stories of suicide I heard. Instead, I trusted that people would not lie about this important element of their own experience and relied on media accounts to establish that the spike in the suicide rate reported by participants was true (e.g., Klinenger 2018). I was unsure for some time whether the murder-suicide reported by many participants was a single occurrence, multiple occurrences, or whether it was indicative of a change in local suicide rate overall, but I felt that it would be inappropriate to reveal other participant accounts of this event or dig deeper by purposive sampling. The tension between sensitive, ethical research and holistic research was eventually resolved through media accounts, but it is worth remembering that a search for "perfect" data in these contexts may be misguided. In other contexts, like those related to legal or housing issues, I tried to revisit whether a participant's impression was correct by consulting legal guides or asking later questions about the process of, for example, obtaining building codes. In the context of many accounts of mental illness that would be insensitive at best. Especially in contexts like small towns where people tend to know each other's business, special care should be taken in discussions about disaster mental illness so as to not reveal information

about participants to each other, nor to reveal each other's impressions about sensitive, personal issues.

APPENDIX B: PAID CARE WORK AND DISASTERS.

There is another cumulative element of disaster that also might not be captured by many disaster research approaches: the cumulative effects of professional care work and the personal impacts of a storm. Originally, I employed purposive sampling of teachers to try to learn more about patterns of population displacement and other effects of Hurricane Irma on local communities. However, their stories often focused on their dual professional role of educators and caregivers, coupled with their experiences as working residents of a hurricane zone. A non-teacher participant related a similar story of a friend who works as a nurse and suffered severe burnout after Irma. She also emphasized her view that gender issues were an underexplored element of the effects of Irma, which resonates with existing research into disasters, gender, and care work (e.g., Picou and Hudson 2010; Adeola and Picou 2012; Nagel 2012, 2015; O'Toole 2018). Combined with the potential for impacts on children from families that were temporarily or permanently displaced, this indicates that while it was a not initially a central focus and in no way do I want to reify the proposition that care work *should* be gendered, a brief detour into the field of care work and gender may be merited.

The teachers each took pride in their dual post-disaster role; no one complained about having to serve as an advocate for students or families. One story revolves around a science fair that was scheduled for shortly after school reopened after Irma. It is no secret that science fair projects often involve considerable parental involvement, and the teachers advocated for cancelling the science fair because so many families may be contending with homelessness or other precarity. In other cases educators described their mission to present a sense of normalcy in abnormal circumstances. One career teacher related his fear that

students would experience Irma trauma similarly to students had residual effects of past hurricanes. In heavy rainfall, for example, he had observed that students who experienced the worst of Hurricane Wilma would get nervous. The role of teachers in this hurricane zone, therefore, seems to include a sort of environmental emotional management.

While due to the relatively small number of teachers interviewed and the late development of this theme it is difficult to make any concrete claims, it is intriguing to consider that care work—and specifically gendered care work—may invoke special cumulative concerns about post-disaster trauma. Research has long recognized gendered elements of disaster, including how it may affect both the financial and material burdens of disaster, coping strategies, health strategies and outcomes, and participation in preparedness and healing activities (Picou and Hudson 2010; Adeola and Picou 2012; Nagel 2012; see also Tierney 2007 for a detailed summary of gender research in natural disaster, along with numerous citations).

Sociologists who study care work have described it as a sort of emotional management required by professional obligations. In some early formulations (i.e. Hochschild 1983) this implied a deleterious effect on the worker who was required to perform emotional labor. The relational approach preferred by some later scholars, however, distinguishes the mutual emotional connection between service providers and recipients (i.e. a teacher and student, or home health aide and patient) from emotional labor where the workers is expected to publicly present certain emotions but is less emotionally entangled (i.e. a bank teller who is required to be pleasant to a difficult customer). The relational approach, in this view "is central to understanding how paid care work can both

be personally fulfilling and also make workers vulnerable to burnout, emotional fatigue, or wage exploitation" (Duffy et al. 2015a:9).

Moreover, these scholars have noted that paid care work can have a cumulative or additive effect with care work in the home—including instances of work-family conflict due to long or irregular hours, or dual obligations of overlapping stress in each context—and that "inequalities related to race, class, gender, and citizenship status shape the hazards of paid care work" (Duffy et al. 2015b:80; Kurowski et al. 2015). In fact, one preliminary study suggests that the combined effects of paid and unpaid care work may have a cumulative mental health effect on care workers, and directs that future work should focus on care work settings, including for those with poor psychosocial environments (Kurowski et al. 2015). It is intriguing to consider that the study of disaster provides an opportunity to expand both the list of inequalities presented by Duffy et al. (2015b) and the work environments suggested by Kurowski et al. (2015) to poor home, neighborhood, and community environments in which both teachers and students are subjected to stress that is at least partially a function of their socioeconomic status.

One study in the field of social psychology that was conducted in the wake of the 2011 earthquake in Christchurch, New Zealand began by observing that "the personal impacts of a natural disaster occurring in a teacher's hometown are compounded by supporting students' psychosocial recovery, as well as coping with their own bereavement and grief, reduced home amenities or total loss of their home" (O'Toole 2018:1082). Building off of a detailed analysis of emotional labor at work (i.e. Hochschild 1983), O'Toole (2018:1084) outlines the difference between two forms of emotional management that teachers employ in front of a classroom: "surface acting involves pretending or faking

desired emotions and/or hiding unacceptable emotions. Deep acting involves a more genuine portrayal of the required emotions by sincerely feeling the optimal emotions. Emotional exhaustion in teachers is more likely to result from surface acting than deep acting." While she notes that there was strong individual variation among teachers, this study begins to develop a connection between personal situations—including housing precarity—and emotional exhaustion derived from the performance of their professional role (O'Toole 2018). Beyond emotional management and performance, it is intriguing to consider how the dual requirements of emotional management and student advocacy may develop into a cumulative impact, and how that accumulation intersects with the generalized frustrations expressed in relation to housing and bureaucracy. Moreover, it is interesting to consider how the development of trauma over time may intersect with the "acting" requirements of care work as the unsettling reality sinks in.

Despite some data that suggest a connection between post-disaster care work, emotional labor, emotional exhaustion, and burnout, I hesitate to enter too far into analysis of this issue. One reason is the limited data given the number of participants in care work professions who participated in this study. Another is that there are differences among care work professions: Duffy et al. (2015) discusses the class distinction between more highly paid professions like teaching and nursing and lower-paid professions like home health work. However, a few preliminary observations are worth making. Participants who were teachers and affiliated education professionals, regardless of gender, seemed to evince a sense of fulfillment and a sense of exhaustion from the dual performance of their roles as community members who in some cases suffered housing damage and personal precarity, and their professional role as educators and healers. I cannot recall a single complaint about

having to care for students, either in interviews or in the many informal conversations I had with teachers outside of interviews.

Instead, there was a broad sense of empathy for students and their families and a feeling of empowerment at being in a position so consequential for disaster recovery. This is not to say that their experiences were easy. Some teachers reported a sense of guilt about their status as victims—especially when they received aid—because in their view others had it so much worse off. Others were openly concerned about the combination of affordable housing, disaster, and cumulative trauma. This includes one who mentioned "[the Keys are] not somewhere I want to live the rest of my life after everything we went through with Irma." She continued:

> I've got tears in my eyes but it's part of it, I mean, what we went through and not just me so many other people, it's hard. You know, here you are a grown, grown adult. And you both have jobs and you know, you're homeless and you have to tell your kids that no we can't go back to the house and you don't want [them] to see it and it's like, as a parent that's really hard. And then you have to pull yourself together and be there for your students. And then you know…there's depression and, you know, I'm just gonna get diagnosed with depression. I got diagnosed with PTSD. I started having seizures. Seizures caused by stress. Oh, so, I mean, am I doing okay? I made it this far. Do I want to do it again? No, no.

One part of this mirrors O'Toole's (2018) description of surface acting but both at home and at work. Another part centers around an ongoing dispute about the displacement of affordable housing from the Keys: that affordable housing is locally known as "workforce housing" hints at its motivating vision and why housing loss might affect teachers and other working but not wealthy members of the community. The nearly constant complaint—and in many cases the first sign of displacement—was that the housing situation had led to a shortage of workers. Yet this also hints at a class-based design element that especially prejudices teachers and others in care work who also happen to be working class and who

also may have home situations that impose additional care obligations on them. Hayden (1984:226-227), writing at the intersection of home care work, urban and community planning, and home design, argues that "[h]ousing issues must include 'work' as well as 'home.' Better spatial planning and design requires concern for employment patterns and household work as the basic economic issues connected to residential neighborhoods."

While more work is needed to develop more precise contours and recommendations, to Hayden's observations we may want to add the care elements of paid employment. This would help ensure an adequate response to the needs of those who undertake public and private care work concurrently, especially in the wake of a disruptive environmental crisis that promotes the development of environmental inequality in housing. Especially because Hayden (1984) framed her work by describing how anachronistic gendered characterizations of work and home life motivated the form of Levittown, Pennsylvania and Vanport City, Oregon—two areas well known to scholars of urban and housing inequality—we would be wise to follow her suggestion that an important route to correction of emplaced inequality is through political economy. Similarly to how gendered assumptions about care drove some of the present suburban form, so too might assumptions about leaving your frustrations in the office (or at home) motivate housing responses after disaster.

REFERENCES CITED

Adams, Vincanne. 2012. *Markets of sorrow, labors of faith: New Orleans in the wake of Katrina*. Durham, North Carolina: Duke University Press.

Adelino, Manuel, Igor Cunha, and Miguel A. Ferreira. 2017. "The Economic Effects of Public Financing: Evidence from Municipal Bond Ratings Recalibration." *The Review of Financial Studies* 30(9): 3223–3268.

Adeola, Francis O., and J. Steven Picou. 2012. "Race, social capital, and the health impacts of Katrina: Evidence from the Louisiana and Mississippi Gulf Coast." *Human Ecology Review* 2014:10-24.

Adler, Dena, Michael Burger, Rob Moore, and Joel Scata. 2019. "Changing the National Flood Insurance Program for a Changing Climate." *Envtl. L. Rep. News & Analysis* 49:10320.

Alexander, David E. 2013. "Resilience and Disaster Risk Reduction: an Etymological Journey." *Natural Hazards and Earth System Sciences* 13(11):2707-2716.

Alexander, Jeffrey And Elizabeth Butler Breese. 2011. "On Social Suffering and Its Cultural Construction". Introduction in *Narrating Trauma: On the Impact of Collective Suffering*, edited by Ron Eyerman, Jeffrey C. Alexander, and Elizabeth Butler Breese. Boulder, Colorado: Paradigm Publishers.

Allen, Greg. 2017. "Nearly 25 Percent of Homes Destroyed In Florida Keys After Hurricane Irma." All Things Considered, National Public Radio. Retrieved February 7, 2020. (https://www.npr.org/2017/09/12/550492797/nearly-25-percent-of-homes-destroyed-in-florida-keys-after-hurricane-irma)

Alvarez, Maria Khristine and Kenneth Cardenas. 2019. "Evicting Slums, 'Building Back Better': Resiliency Revanchism in Disaster Risk Management in Manila." *International Journal of Urban and Regional Research* 43(2):227-249.

Ambrosio, Natalie, Yoon Hui Kim, Stacy Swann, and Ziyue Wang. 2020. "Addressing Fiancial Risk in Climate Decision Making." Chapter 7 in *Optimizing Community Infrastructure: Resilience in the Face of Shocks and Stresses*, edited by Ryan Colker. Cambridge, MA: Butterworth-Heineman.

Anderson, Ben. 2015. "What Kind of Thing is Resilience?" *Politics* 35(1):60-66.

Andresen, Silje Aurora. 2019. "RIP Resilience." *Fennia-International Journal of Geography* 197(1):168-170.

Angelo, Hillary and David Wachsmuth. 2014. "Urbanizing Urban Political Ecology: A Critique of Methodological Cityism." *International Journal of Urban and Regional Research* 39(1):16-27.

Anguelovski, Isabelle, Linda Shi, Eric Chu, Daniel Gallagher, Kian Goh, Zachary Lamb, Kara Reeve, and Hannah Teicher. 2016. "Equity impacts of urban land use planning for climate adaptation: Critical perspectives from the global north and south." *Journal of Planning Education and Research* 36(3):333-348.

Anguelovski, Isabelle, Clara Irazábal-Zurita, and James JT Connolly. 2019. "Grabbed urban landscapes: Socio-spatial tensions in green infrastructure planning in Medellín." *International Journal of Urban and Regional Research* 43(1):133-156.

Angus, Ian. 2016. *Facing the Anthropocene: Fossil Capitalism and the Crisis of the Earth System*. New York: NYU Press.

Associated Press. 2017. "The Latest: Irma regaining strength over bathtub warm water." Retrieved February 7, 2020. (https://apnews.com/6a748851a28043b3af1081a052df634b)

Associated Press. 2018. "Florida Keys population dropped after Hurricane Irma." *WPTV News 5 Online.* Retrieved February 7, 2020 (https://www.wptv.com/news/state/florida-keys-population-dropped-after-hurricane-irma)

Barnard, Anne. 2020. The $119 Billion Sea Wall That Could Defend New York…or Not. *New York Times*, January 17, 2020. Retrieved February 25, 2020 (https://www.nytimes.com/2020/01/17/nyregion/sea-wall-nyc.html)

Bartram, Robin. 2019a. "The Cost of Code Violations: How Building Codes Shape Residential Sales Prices and Rents." *Housing Policy Debate* 29(6):931-946.

Bartram, Robin. 2019b. "Going easy and going after: Building inspections and the selective allocation of code violations." *City & Community* 18(2):594-617.

Beatley, Timothy. 2009. *Planning for Coastal Resilience: Best Practices for Calamitous Times*. Washington, D.C.: Island Press.

Beck, Ulrich. 1992. *Risk Society: Towards a New Modernity*. London: Sage Publications.

Beck, Ulrich. 1996. "World Risk Society As Cosmopolitan Society? Ecological Questions in a Framework of Manufactured Uncertainties." *Theory, Culture, & Society*, 13(4):1-32.

Beck, Ulrich. 2008. *World At Risk.* Cambridge: Polity Press.

Benmelech, Efraim, and Jennifer Dlugosz. 2010. "The credit rating crisis." *NBER Macroeconomics Annual* 24(1):161-208.

Bennett, Benjamin, and Zexi Wang. 2019. "Costs of Natural Disasters in Public Financing." Fisher College of Business Working Paper 2019-03:009.

Besek, Jordan Fox and Daniel Shtob. 2019. "Breaking the Divide: Setting Environmental Precedent in the Chicago River." *Law & Policy* 41(4):387-410.

Bhatia, Neeraj. 2012. "Unsolicited Architecture; Critical Agency Without Denial." In *What Is Critical Spatial Practice?*, edited by Nikolaus Hirsch and Markus Miessen. Berlin: Sternberg Press.

Bigger, Patrick. 2017. "Measurement and the circulation of risk in green bonds." *Journal of Environmental Investing* 8(1):273-287.

Bigger, Patrick, and Nate Millington. 2019. "Getting soaked? Climate crisis, adaptation finance, and racialized austerity." Enviro*nment and Planning E: Nature and Space*. 2514848619876539.

Biggs, Duan, Reinette Biggs, Vasilis Dakos, Robert J. Scholes, and Michael Schoon. 2011. "Are we entering an era of concatenated global crises?" *Ecology and Society* 16(2).

Birkland, Thomas A. 1996. "Natural Disasters as Focusing Events: Policy Communities and Political Response." *International Journal of Mass Emergencies and Disasters*, 14(2):221-243.

Blomley, Nicholas. 2020. "Precarious Territory: Property Law, Housing, and the Socio-Spatial Order." *Antipode* 52(1):36-57.

Boehnert, Joanna. 2014. "Design vs. the Design Industry." *Design Philosophy Papers* 12(2):119-136.

Boehnert, Joanna. 2019. "Transition design and ecological thought." Retrieved March 1, 2020 (https://repository.lboro.ac.uk/articles/Transition_design_and_ecological_thought/9335390/1)

Bourbeau, Philippe. 2015. "Resilience and International Politics: Premises, Debates, Agenda." *International Studies Review* 17(3):374-395.

Bourbeau, Philippe. 2018. "A genealogy of resilience." *International Political Sociology* 12(1):19-35.

Bourdeau-Brien, Michael, and Lawrence Kryzanowski. 2019. "Municipal financing costs following disasters." *Global Finance Journal* 40:48-64.

Bowen, Glenn A. 2008. "Naturalistic inquiry and the saturation concept: a research note." *Qualitative Research* 8(1):137-152.

Brekhus, Wayne. 2007. "The Rutgers School: A Zerubavelian Culturalist Cognitive Sociology." *European Journal of Social Theory* 10(3):448-464.

Burawoy, Michael. 1998. "The Extended Case Method." *Sociological Theory* 16(1):4-33.

Cantor, Richard, and Frank Packer. 1995. "The credit rating industry." *The Journal of Fixed Income* 5(3):10-34.

Carruthers, Bruce G. 2013. "From uncertainty toward risk: the case of credit ratings." *Socio-Economic Review* 11:525–551

Carruthers, Bruce G. 2015. "Financialization and the institutional foundations of the new capitalism." *Socio-Economic Review* 13(2):379-398.

Carruthers, Bruce G., and Arthur L. Stinchcombe. 1999. "The social structure of liquidity: Flexibility, markets, and states." *Theory and Society* 28(3):353-382.

Carruthers, Bruce G., and Jeong-Chul Kim. 2011. "The Sociology of Finance." *Annual Review of Sociology* 37:239-259.

Catton, William R. 1994. "Foundations of Human Ecology." *Sociological Perspectives* 37(1):75-95.

Cavanagh, Connor Joseph. 2017. "Resilience, class, and the antifragility of capital." *Resilience* 5(2):110-128.

Chandler, David. 2012. "Resilience and human security: The post-interventionist paradigm." *Security Dialogue* 43(3):213-229.

Charmaz, Kathy. 2006. *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. Thousand Oaks, California: Sage.

Checker, Melissa. 2011. "Wiped Out By the Greenwave." *City & Society* 23(2):210-229.

Christophers, Brett. 2009. "Complexity, finance, and progress in human geography". *Progress in Human Geography* 33(6):807-824.

Christophers, Brett. 2015. "The limits to financialization." *Dialogues in Human Geography* 5(2):183-200.

Christophers, Brett, Patrick Bigger and Leigh Johnson. 2020. "Stretching scales? Risk and sociality in climate finance." *Environment and Planning A: Economy and Space* 52(1):88–110. https://doi.org/10.1177/0308518X18819004

Coffee, Joyce. 2020. “Financing Resilient Infrastructure.” Chapter 6 in *Optimizing Community Infrastructure: Resilience in the Face of Shocks and Stresses*, edited by Ryan Colker. Cambridge, MA: Butterworth-Heineman.

Colker, Ryan. 2020. “Introduction to Infrastructure Resilience.” In *Optimizing Community Infrastructure: Resilience in the Face of Shocks and Stresses*, edited by Ryan Colker. Cambridge, MA: Butterworth-Heineman.

Conch Republic. 2001a. “The Beginning.” Retrieved February 7, 2020 (https://web.archive.org/web/20120805224346/http://www.conchrepublic.com/the_beginning.htm)

Conch Republic. 2001b. “A Brief History of the Conch Republic.” Retrieved February 7, 2020. (https://web.archive.org/web/20121102113712/http://www.conchrepublic.com/history.htm)

Connolly, James J.T. 2018. “From Systems Thinking to Systemic Action: Social Vulnerability and the Institutional Challenge to Urban Resilience.” *City and Community* 17(1):8-11.

Cornaggia, Jess, Kimberly J. Cornaggia, and Ryan D. Israelsen. 2018. “Credit ratings and the cost of municipal financing.” *The Review of Financial Studies* 31(6):2038-2079.

Cowley, Robert, Clive Barnett, Tania Katzschner, Nathaniel Tkacz, and Filip De Boeck. 2018. “Forum: Resilience & Design.” *Resilience* 6:(1):1-34.

Cretney, Raven. 2014. “Resilience for whom? Emerging critical geographies of socio-ecological resilience.” *Geography Compass* 8(9):627-640.

Curran, Winifred. 2007. “‘From the Frying Pan to the Oven’: Gentrification and the Experience of Industrial Displacement in Williamsburg, Brooklyn.” *Urban Studies* 44(8):1427-1440.

Curran, Winfred and Trina Hamilton. 2012. “Just green enough: contesting environmental gentrification in Greenpoint, Brooklyn.” *Local Environment* 17(9):1027-1042.

Curtis, Katherine J., Elizabeth Fussell, and Jack DeWaard. 2015. “Recovery migration after Hurricanes Katrina and Rita: Spatial concentration and intensification in the migration system.” *Demography* 52(4):1269-1293.

Cutter, Susan L., Lindsey Barnes, Melissa Berry, Christopher Burton, Elijah Evans, Eric Tate, and Jennifer Webb. 2008. “A place-based model for understanding community resilience to natural disasters.” *Global Environmental Change* 18(4):598-606.

Cutter, Susan L., Kevin D. Ash, and Christopher T. Emrich. 2014. “The geographies of community disaster resilience.” *Global Environmental Change* 29(2014):65-77.

Davis, Cindy and James Tim Ryan. 2020. “Building Codes: The Foundation for Resilient Communities.” Chapter 12 in *Optimizing Community Infrastructure: Resilience in the Face of Shocks and Stresses*, edited by Ryan Colker. Cambridge, MA: Butterworth-Heineman.

Danyluk, Martin. 2018. “Fungible Space: Competition and Volatility in the Global Logistics Network.” *International Jounral of Urban and Regional Research* 43(1):94-111.

Dawson, Ashley. 2017. *Extreme Cities: The Peril and Promise of Urban Life in the Age of Climate Change*. London and New York: Verso.

Desmond, Matthew. 2012. “Eviction and the Reproduction of Urban Poverty.” *American Journal of Sociology* 118(1):88-133

DiMaggio, Paul J., and Walter W. Powell. 1983. “The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields.” *American Sociological Review* 48(2):147-160.

Dobraszczyk, Paul. 2017. “Sunken cities: climate change, urban futures and the imagination of submergence.” *International Journal of Urban and Regional Research* 41(6):868-887.

Duffy, Mignon, Amy Armenia, and Clare L. Stacey. 2015a. “On the Clock, Off the Radar: Paid Care Work in the United States.” Chapter 1 in *Caring on the Clock: The Complexities and Contradictions of Paid Care Work*, edited by Mignon Duffy, Amy Armenia, and Clare L. Stacey. New Brunswick, NJ: Rutgers University Press.

Duffy, Mignon, Amy Armenia, and Clare L. Stacey. 2015b. “Hazards of Care.” Introduction to Part III in *Caring on the Clock: The Complexities and Contradictions of Paid Care Work*, edited by Mignon Duffy, Amy Armenia, and Clare L. Stacey. New Brunswick, NJ: Rutgers University Press.

Duffield, Mark. 2012. “Challenging Environments: Danger, Resilience and the Aid Industry.” *Security Dialogue* 43(5):475-492.

Dunlap, Riley E., and Aaron M. McCright. 2011. “Organized climate change denial.” *The Oxford Handbook of Climate Change and Society* 1:144-160.

Easterling, Keller. 2014. *Extrastatecraft: The Power of Infrastructure Space.* London and New York: Verso.

Elliott, James R. 2015. “Natural Hazards and Residential Mobility: General Patterns and Racially Unequal Outcomes in the United States.” *Social Forces* 93(4):1723-1747.

Elliott, James R., Amy Bellone Hite, and Joel A. Devine. 2009. “Unequal Return: The Uneven Resettlements of New Orleans Uptown Neighborhoods.” *Organization and Environment* 22(4):410-421.

Elliott, James R. and Matthew Thomas Clement. 2017. “Natural Hazards and Local Development: The Successive Nature of Landscape Transformation in the United States.” *Social Forces* 96(2):851-875.

Elliott, James R. and Junia Howell. 2017. “Beyond Disasters: A Longitudinal Analysis of Natural Hazards’ Unequal Impacts on Residential Instability.” *Social Forces* 95(3): 1181-1207.

Erickson, Kai. 1991. “Notes on trauma and community.” *American Imago* 48(4):455-472.

Erickson, Kai. 1994. *A New Species of Trouble: Explorations in Disaster, Trauma, and Community.* New York: W.W. Norton and Company.

Espeland, Wendy Nelson, and Michael Sauder. 2007. “Rankings and reactivity: How public measures recreate social worlds.” *American Journal of Sociology* 113(1):1-40.

Espeland, Wendy, and Michael Sauder. 2008. “Rankings and diversity.” *Southern California Review of Law & Social Justice* 18:587-608.

Etcétera … 2012. “To Occupy Spaces Means to Generate Time.” In *What Is Critical Spatial Practice?*, edited by Nikolaus Hirsch and Markus Miessen. Berlin: Sternberg Press.

Eyerman, Ron. 2015. *Is this America: Katrina as Cultural Trauma.* Austin, Texas: University of Texas Press.

Fainstein, Susan. 2015. “Resilience and justice.” *International Journal of Urban and Regional Research* 39(1):157-167.

Fasenfest, David. 2019. “A neoliberal response to an urban crisis: Emergency management in Flint, MI.” *Critical Sociology* 45(1):33-47.

Filosa, Gwen. 2020. “State to send $38M to the Keys to fix its Hurricane Irma-damaged desalination plant and sewer systems.” *Miami Herald,* January 30, 2020. Retrieved February 15, 2020. (https://www.miamiherald.com/news/local/community/florida-keys/article239789403.html)

Fowles, Jacob, Gao Liu, and Cezar Brian Mamaril. 2009. “Accounting for natural disasters: The impact of earthquake risk on California municipal bond pricing.” *Public Budgeting & Finance* 29(1):68-83.

Flavelle, Christopher. 2018. “Critics Say Bond Rating Agencies Ignore Municipalities’ Climate Risk.” *The Insurance Journal.* Retrieved December 15, 2019 (https://www.insurancejournal.com/news/national/2018/11/05/506538.htm)

Flavelle, Christopher. 2019. “Moody’s Buys Climate Data Firm, Signaling New Scrutiny of Credit Risks” *New York Times,* July 24, 2019. Retrieved December 15, 2019. (https://www.nytimes.com/2019/07/24/climate/moodys-ratings-climate-change-data.html)

Flavelle, Christopher and Patricia Mazzei. 2019. “Florida Keys Deliver a Hard Message: As Seas Rise Some Places Can’t Be Saved” *New York Times,* December 4, 2019. Retrieved December 15, 2019. (https://www.nytimes.com/2019/12/04/climate/florida-keys-climate-change.html)

Fligstein, Neil, and Luke Dauter. 2007. “The sociology of markets.” *Annual Review of Sociology* 33:105-128.

Fligstein, Neil and Adam Goldstein. 2015. “The emergence of a finance culture in American households, 1989-2007.” *Socio-Economic Review* 13(5):575-601.

Fligstein, Neil and Alexander F. Roehrkasse. 2016. “The Causes of Fraud in the Financial Crisis of 2007 to 2009: Evidence from the Mortgage Backed Securities Industry.” *American Sociological Review* 81(4): 617-643.

Florida Housing Finance Corporation. 2018. “The Vestcor Companies Break Ground on The Quarry in Big Coppitt Key, Florida”. Retrieved February 7, 2020 (https://www.ncsha.org/hfa-news/the-vestcor-companies-break-ground-on-the-quarry-in-big-coppitt-key-florida/)

Foster, John Bellamy. 1999. “Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology.” *American Journal of Sociology* 105(4):366-405.

Foster, John Bellamy, Brett Clark, and Richard York. 2011. *The Ecological Rift: Capitalism’s War on the Earth*. New York: NYU Press.

Fowles, Jacob, Gao Liu, and Cezar Brian Mamaril. 2009. “Accounting for natural disasters: The impact of earthquake risk on California municipal bond pricing.” *Public Budgeting & Finance* 29(1):68-83.

Freeden, Michael. 2007. “Ideology and Political Theory.” Pp. 1-20 in *The Meaning of Ideology: Cross-Disciplinary Perspectives*, edited by Michael Freeden. New York and London: Routledge.

French, Shaun, Andrew Leyshon, and Thomas Wainwright. 2011. “Financializing space, spacing financialization.” *Progress in Human Geography* 35(6):798-819.

Freudenburg, William R. 1997. "Contamination, corrosion and the social order: An overview." *Current Sociology* 45(3):19-39.

Freudenburg, William R., Robert Gramling, Shirley Laska, and Kai T. Erikson. 2009. "Disproportionality and Disaster: Hurricane Katrina and the Mississippi River-Gulf Outlet." *Social Science Quarterly* 90(3):497-515.

Fussell, Elizabeth, and James R. Elliott. 2009. "Introduction: Social Organization of Demographic Responses to Disaster: Studying Population—Environment Interactions in the Case of Hurricane Katrina." *Organization & Environment* 22(4):379-394.

Gaillard, J. C., and Lori Peek. 2019. "Disaster-zone research needs a code of conduct." *Nature* 575:440-442. doi: 10.1038/d41586-019-03534-z440-442.

Gieryn, Thomas F. 2000. "A space for place in sociology." *Annual Review of Sociology* 26(1):463-496.

Goodhue, David. 2018. "4 percent of Keys population has left since Irma. Businesses can't find enough workers." *Miami Herald,* September 13, 2018. Retrieved September 25, 2019. (https://www.miamiherald.com/news/local/community/florida-keys/article218341010.html)

Goodhue, David. 2019. "Government preparing to be sued in 2023, when the Keys stop issuing building permits." *Miami Herald,* February 23, 2019. Retrieved September 25, 2019. (https://www.miamiherald.com/news/local/community/florida-keys/article226639119.html)

Gopal, Prashant. 2019. "America's Great Climate Exodus Is Starting in the Florida Keys." Bloomberg News. Retrieved September 25, 2019. (https://www.bloomberg.com/news/features/2019-09-20/america-s-great-climate-exodus-is-starting-in-the-florida-keys)

Gotham, Kevin Fox. 2000. Urban Space, Restrictive Covenants, and the Origins of Racial Residential Segregation in a US City, 1900-50. *International Journal of Urban and Regional Research* 24(3):616-633.

Gotham, Kevin Fox. 2002a. Beyond Invasion and Succession: School Segregation, Real Estate Blockbusting, and the Political Economy and Neighborhood Racial Transition. *City & Community* 1(1):83-111.

Gotham, Kevin Fox. 2002b. *Race, Real Estate, and Uneven Development: The Kansas City Experience, 1900-2000*. Albany, NY: State University of New York Press.

Gotham, Kevin Fox. 2009. "Creating Liquidity Out of Spatial Fixity: The Secondary Circuit of Capital and the Subprime Mortgage Crisis." *International Journal of Urban and Regional Research* 33(2):355-371.

Gotham, Kevin Fox and Miriam Greenberg. 2014. *Crisis Cities: Disaster and Redevelopment in New York and New Orleans*. New York: Oxford University Press.

Gotham, Kevin Fox and Megan Faust. 2020. "Antagonisms and Adaptation: Climate Change Adaptation Measures in New Orleans and New York City." Chapter 4 in *Louisiana's Response to Extreme Weather*, edited by S. Laska. Springer.

Gottdeiner, Mark. 1993. "A Marx for Our Time: Henri Lefebvre and the Production of Space." *Sociological Theory* 11(1):129-134.

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

Gould, Kenneth A. and Tammy Lewis. 2016. "Green Gentrification and Hurricane Sandy: The Resilience of the Green Growth Machine around Brooklyn's Gowanus Canal." Chapter 7 in *Taking Chances: The Coast After Hurricane Sandy*, edited by Karen M. O'Neill and Daniel J. Van Abs. New Brunswick, New Jersey: Rutgers University Press.

Gould, Kenneth A. and Tammy Lewis. 2017. *Green Gentrification: Urban Sustainability and the Struggle for Environmental Justice*. New York: Routledge.

Gould, Kenneth A. and Tammy Lewis. 2018a. "From Green Gentrification to Resilience Gentrification: An Example from Brooklyn." *City and Community* 17(1):12-15.

Gould, Kenneth A., and Tammy L. Lewis. 2018b. "Green Gentrification and Disaster Capitalism in Barbuda: Barbuda has long exemplified an alternative to mainstream tourist development in the Caribbean. After Irma and Maria, that could change." *NACLA Report on the Americas* 50(2):148-153.

Graham, Leigh, Wim Debucquoy, and Isabelle Anguelovski. 2016. "The influence of urban development dynamics on community resilience practice in New York City after Superstorm Sandy: Experiences from the Lower East Side and the Rockaways." *Global Environmental Change* 40:112-124.

Greider, Thomas and Lorraine Garkovich. 1994. "Landscapes: The Social Construction of Nature and the Environment." *Rural Sociology* 59(1):1–24.

Hackworth, Jason. 2007. *The Neoliberal City: Governance, Ideology, and Development in American Urbanism*. Ithaca, NY: Cornell University Press.

Hall, Peter A., and Michèle Lamont. 2013. "Introduction: Social Resilience in the Neoliberal Era." Pp. 1-31 in *Social Resilience in the Neoliberal Era*, edited by Peter A. Hall and Michelle Lamont. New York: Cambridge University Press.

Hall, Sarah. 2013. “Geographies of money and finance III: Financial circuits and the ‘real economy.’” *Progress in Human Geography* 37(2):285-292.

Hall, Stuart. 1986. “The Problem of Ideology-Marxism Without Guarantees.” *Journal of Communication Inquiry* 10(2):28-44.

Hamilton, Malcolm B. 1987. “The Elements of the Concept of Ideology.” *Political Studies* 35(1):18-38.

Harvey, David. 2012. *Rebel Cities: From the Right to the City to the Urban Revolution.* London: Verso.

Hayden, Dolores. 1984. *Redesigning the American Dream: The Future of Housing, Work, and Family Life.* New York: W.W. Norton and Company.

Helmuth, Allison Suppan. 2019. “Chocolate City, Rest in Peace”: White Space-Claiming and the Exclusion of Black People in Washington, DC. *City & Community* 18(3):746-769.

Heynen, Nik. 2014. “Urban Political Ecology I: The Urban Century.” *Progress in Human Geography* 38(4):598-604.

Heynen, Nik, Maria Kaika, and Erik Swyngedouw. 2006. “Urban Political Ecology: Politicizing the Production of Urban Natures.” Chapter 1 in *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, edited by Nik Heynen, Maria Kaika, and Erik Swyngedouw. London and New York: Routledge.

Hochschild, Arlie. 1983. *The Managed Heart: Commercialization of Human Feeling.* Berkeley: University of California Press.

Holling, Crawford S. 1973. “Resilience and Stability of Ecological Systems.” *Annual Review of Ecology and Systematics* 4(1):1-23.

Howell, Junia, and James R. Elliott. 2019. “Damages done: The longitudinal impacts of natural hazards on wealth inequality in the United States.” *Social Problems* 66(3):448-467.

Hyde, Cheryl A. 2003. “Multicultural organizational development in nonprofit human service agencies: Views from the field.” *Journal of Community Practice* 11(1):39-59

IPCC. 2014. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.] https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

Illouz, Eva. 2007. *Cold Intimacies: The Making of Emotional Capitalism*. Cambridge: Polity Press.

Jacobsen, Henrik. 2016. “Book Review: Crisis Cities: Disaster and Redevelopment in New York and New Orleans.” *Urban Studies* 53(11):2443-2446.

Keil, Roger. 2003. “Urban Political Ecology.” *Urban Geography* 24(8):723-738.

Kern, Leslie. 2015. “From toxic wreck to crunchy chic: environmental gentrification through the body.” *Environment and Planning D: Society and Space* 33:67-83.

Klein, Naomi. 2007. *The Shock Doctrine: The Rise of Disaster Capitalism*. New York: Macmillan.

Klein, Naomi. 2018. *The Battle for Paradise: Puerto Rico Takes on the Disaster Capitalists*. Chicago: Haymarket Books.

Klinenger, Nancy. 2018. “Florida Keys Cope With Suicide Spike After Hurricane Irma”. *WLRN Radio.* Retrieved February 7, 2020 (https://www.wlrn.org/post/florida-keys-cope-suicide-spike-after-hurricane-irma#stream/0)

Koslov, Liz. 2016. “The Case for Retreat.” *Public Culture* 28.2(79):359-387.

Kostof, Spiro. 1989. “Foreword.” Pp. ix-xx in *Architects’ People*, edited by Russell Ellis and Dana Cuff. New York: Oxford University Press.

Krippner, Greta. 2005. “The financialization of the American economy.” *Socio-Economic Review* 3(2):173-208.

Kurowski, Alicia, Jon Boyer, and Laura Punnett. 2015. “The Hazards of Health Care: Physical and Psychosocial Stressors in Paid Care Work.” Chapter 7 in *Caring on the Clock: The Complexities and Contradictions of Paid Care Work*, edited by Mignon Duffy, Amy Armenia, and Clare L. Stacey. New Brunswick, New Jersey: Rutgers University Press.

Larrain, Jorge. 1991. “Stuart Hall and the Marxist Concept of Ideology.” *Theory, Culture & Society* 8(4):1-28.

Lefebvre, Henri. 1991. *The Production of Space*. Oxford and Cambridge, MA: Basil Blackwell Ltd.

Lefebvre, Henri. 2003. *The Urban Revolution*. Minneapolis: University of Minnesota Press.

Leyshon, Andrew & Nigel Thrift. 2007. “The Capitalization of Almost Everything: The Future of Finance and Capitalism.” *Theory, Culture & Society* 24(7-8):97-115.

Liévanos, Raoul S. and Christine Horne. 2017. “Unequal Resilience: the Duration of Electricity Outages.” *Energy Policy* 108:201-211.

Liévanos, Raoul S., Pierce Greenberg, and Ryan Wishart. 2018. "In the shadow of production: Coal waste accumulation and environmental inequality formation in Eastern Kentucky." *Social Science Research* 71:37-55.

Linkov, Igor, Todd Bridges, Felix Creutzig, Jennifer Decker, Cate Fox-Lent, Wolfgang Kröger, James H. Lambert Levermann, A., Montreuil, B., Nathwani, J. and Nyer, R. 2014. "Changing the Resilience Paradigm." *Nature Climate Change* 4(6):407.

Lipsitz, George. 2011. *How Racism Takes Place*. Philadelphia: Temple University Press.

Logan, John, and Harvey Molotch. 1987. *Urban Fortunes: Toward a Political Economy of Place*. Berkeley: University of California Press.

Madden, David J. 2014. "Neighborhood as Spatial Project: Making the Urban Order on the Downtown Brooklyn Waterfront." *International Journal of Urban and Regional Research* 38(2):471-497.

Martin, Isaac William. 2019. "Land, Power, and Property Tax Limitation." *In The Politics of Land (Research in Political Sociology, Vol. 26)*, edited by Tim Bartley. Emerald Publishing Limited. https://doi.org/10.1108/S0895-993520190000026007

Martin, Isaac William, and Kevin Beck. 2017. "Property tax limitation and racial inequality in effective tax rates." *Critical Sociology* 43(2):221-236.

Martin, Isaac William, and Kevin Beck. 2018. "Gentrification, property tax limitation, and displacement." *Urban Affairs Review* 54(1):33-73.

Martin, Ron. 2011. "The local geographies of the financial crisis: from the housing bubble to economic recession and beyond." *Journal of Economic Geography* 11(4):587-618.

Meerow, Sara, Joshua P. Newell, and Melissa Stults. 2016. "Defining Urban Resilience: A Review." *Landscape and Urban* Planning 147:38-49.

Meléndez, Edwin and Jennifer Hinojosa. 2017. "Estimates of Post-Hurricane Maria Exodus from Puerto Rico." Centro: Hunter College Center for Puerto Rican Studies, Report RB2017-01.

Merton, Robert. 1995. "The Thomas Theorem and the Matthews Effect." *Social Forces* 74(2):379-422.

Monroe County. n.d.a. "A Layman's Guide to Residential ROGO." Retrieved February 7, 2020. (http://www.floridakeyskeywestrealestate.com/pdf/laymansguideROGO.pdf)

Monroe County. n.d.b. “Substantial Improvement or Substantial Damage: Information and Required Forms for Structures in Flood Zones AE & VE.” Retrieved February 7, 2020 (https://www.monroecounty-fl.gov/DocumentCenter/View/12592/FAQ-Substantial-Damage?bidId=)

Monroe County. 2019. News Releases: Monroe County Welcomes “The Quarry” to Rockland Key at Ribbon Cutting. Retrieved January 17, 2020 (http://www.monroecounty-fl.gov/CivicAlerts.aspx?AID=1292)

Monroe County Emergency Management. n.d. “Hurricane Irma Recovery.” Retrieved February 7, 2020 (http://monroecountyem.com/726/Hurricane-Irma-Recovery)

Moody’s. n.d. “Moody’s Rating Scale and Definitions”. Retrieved March 1, 2020. (https://www.moodys.com/sites/products/productattachments/ap075378_1_1408_ki.pdf)

Moody’s. 2017a. *Evaluating the impact of climate change on US state and local issuers.* Retrieved March 1, 2020 (https://southeastfloridaclimatecompact.org/wp-content/uploads/2017/12/Evaluating-the-impact-of-climate-change-on-US-state-and-local-issuers-11-28-17.pdf)

Moody’s. 2017b. “Announcement: Moody's: Climate change is forecast to heighten US exposure to economic loss placing short- and long-term credit pressure on US states and local governments.” Retrieved February 7, 2020. (https://www.moodys.com/research/Moodys-Climate-change-is-forecast-to-heighten-US-exposure-to--PR_376056)

Moody’s. 2019. “Research Announcement: Moody's - Largest US cities take proactive steps to mitigate credit risk from climate change.” Retrieved February 7, 2020. (https://www.moodys.com/research/Moodys-Largest-US-cities-take-proactive-steps-to-mitigate-credit--PBM_1158519)

Nagel, Joane. 2012. “Intersecting identities and global climate change.” *Identities* 19(4):467-476.

Neisser, Florian and Simon Runkle. 2017. “The future is now! Extrapolated riskscapes, anticipatory action and the management of potential emergencies.” *Geoforum* 82:170-179.

Norgaard, Kari M. 2009. “Cognitive and Behavioral Challenges in Responding to Climate Change.” World Bank Policy Research Working Paper 4940. Retrieved February 7, 2020. (http://elibrary.worldbank.org/doi/book/10.1596/1813-9450-4940.)

Norgaard, Kari M. 2011. *Living in Denial: Climate Change, Emotions, and Everyday Life*. Cambridge, MA: MIT Press.

Offenhartz, Jake. 2020. "'Unprecedented and Dangerous': Trump Administration Halts NYC's Most Important Climate Resiliency Study." *Gothamist*, February 25, 2020. Retrieved February 25, 2020. (https://gothamist.com/news/unprecedented-and-dangerous-trump-administration-halts-nycs-most-important-climate-resiliency-study)

O'Hara, Timothy. 2018. "Keys population drops after Irma." *Key West Citizen*, October 22, 2018. Retrieved February 7, 2020. (https://keysnews.com/article/story/keys-population-drops-after-irma/)

Olsson, Lennart, Anne Jerneck, Henrik Thoren, Johannes Persson, and David O'Byrne. 2015. "Why resilience is unappealing to social science: Theoretical and empirical investigations of the scientific use of resilience." *Science Advances* 1(4):e1400217.

Omstedt, Mikael. 2020. "Reading risk: The practices, limits and politics of municipal bond rating." *Environment and Planning A: Economy and Space* 52(3):611-631.

O'Neill, Karen M., Daniel J. Van Abs, and Robert B. Gramling. 2016. "Introduction: A Transformational Event, Just Another Storm, or Something in Between." Introduction in *Taking Chances: The Coast After Hurricane Sandy*, edited by Karen M. O'Neill and Daniel J. Van Abs. New Brunswick, New Jersey: Rutgers University Press.

O'Toole, Veronica M. 2018. ""Running on fumes": emotional exhaustion and burnout of teachers following a natural disaster." *Social Psychology of Education* 21(5):1081-1112.

Ouma, Stefan, Leigh Johnson, and Patrick Bigger. 2018. "Rethinking the financialization of 'nature'." Environment and Planning A: Economy and Space 50(3):500-511.

Pacewicz, Josh. 2012. "Tax increment financing, economic development professionals and the financialization of urban politics." *Socio-Economic Review* 11(3):413-440.

Painter, Marcus. 2020. "An inconvenient cost: The effects of climate change on municipal bonds." *Journal of Financial Economics* 135(2):468-482.

Pais, Jeremy F. and James R. Elliott. 2008. Places as Recovery Machines: Vulnerability and Neighborhood Change After Major Hurricanes. *Social Forces* 86(4):1415-1453.

Pellow, David N. 2000. "Environmental Inequality Formation." *American Behavioral Scientist* 43(4):581-601.

Pellow, David N. 2018. *What Is Critical Environmental Justice?* Cambridge: Polity Press.

Picou, Steven J., and Kenneth Hudson. 2010. "Hurricane Katrina and mental health: A research note on Mississippi Gulf Coast residents." *Sociological Inquiry* 80(3):513-524.

Picou, J. Steven, Brent K. Marshall, and Duane A. Gill. 2004. "Disaster, litigation, and the corrosive community." *Social Forces* 82(4):1493-1522.

Peck, Jamie. 2012. "Austerity urbanism: American cities under extreme economy." *City* 16(6):626-655.

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

Quastel, Noah. 2009. "Political Ecologies of Gentrification." *Urban Geography* 30(7):694-725.

Rashidi, Kaveh, Martin Stadelmann, and Anthony Patt. 2019. "Creditworthiness and climate: Identifying a hidden financial co-benefit of municipal climate adaptation and mitigation policies." *Energy Research & Social Science* 48:131-138.

Rayer, Stefan and Ying Wang. 2018. "Projections of Florida Population by County, 2020, with Estimates for 2017." University of Florida Bureau of Economic and Business Research, Florida Population Studies, Volume 51, Bulletin 180. Retrieved February 15, 2020 (https://www.bebr.ufl.edu/population/population-data/projections-florida-population-county-2020%E2%80%932045-estimates-2017)

Reghezza-Zitt, Magali, Samuel Rufat, Géraldine Djament-Tran, Antoine Le Blanc, and Serge Lhomme. 2012. "What resilience is not: uses and abuses." *Cybergeo: European Journal of Geography.* DOI: 10.4000/cybergeo.25554

Rogers, Peter. 2015. "Researching Resilience: An Agenda for Change." *Resilience* 3(1):55-71.

Rogers, William W. 1996. "The Great Depression." Chapter 17 in *The New History of Florida*, edited by Michael Gannon. Gainesville, FL: University of Florida Press.

Ross, Michael S., Danielle E. Ogurcak, Susana Stoffella, Jay P. Sah, Javiera Hernandez, and Hugh E. Willoughby. 2019. "Hurricanes, storm surge, and pine forest decline on a low limestone island." *Estuaries and Coasts* (2019):1-13.

Rugh, Jacob S., Len Albright, and Douglas S. Massey. 2015. "Race, Space, and Cumulative Disadvantage: A Case Study of the Subprime Lending Collapse." *Social Problems* 62*:*186-218.

Satake, Kenji, Kunihiko Shimazaki, Yoshinobu Tsuji, and Kazue Ueda. 1996. "Time and Size of a Giant Earthquake in Cascadia—Earthquake Inferred from Japanese Tsunami Records of January 1700." *Nature* 379:246–249. (https://doi.org/10.1038/379246a0.)

Sattar, Siamak, Therese P. McAllister, Steven L. McCabe, Katherine J. Johnson, Christopher L. Segura, Christopher Clavin, Juan F. Fung, Marc L. Levitan, and Kenneth W. Harrison. 2018. *Research Needs to Support Immediate Occupancy Building Performance Following Natural Hazard Events*. National Institute of Standards and Technology Special Publication (NIST SP)-1224.

Saunders, Benjamin, Julius Sim, Tom Kingstone, Shula Baker, Jackie Waterfield, Bernadette Bartlam, Heather Burroughs, and Clare Jinks. 2018. "Saturation in qualitative research: exploring its conceptualization and operationalization." *Quality & Quantity* 52(4):1893-1907.

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

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

Shatkin, Gavin. 2019. "Future of Crisis, Future of Urban Political Theory: Flooding in Asian Coastal Megacities." *International Journal of Urban and Regional Research* 43(2):207-226.

Shtob, Daniel A. 2019. "Remembering the future: natural disaster, place, and symbolic survival." *Rural Sociology* 84(1):123-147.

Sovacool, Benjamin K., Lucy Baker, Mari Martiskainen, and Andrew Hook. 2019. "Processes of elite power and low-carbon pathways: Experimentation, financialisation, and dispossession." *Global Environmental Change* 59:101985.

S&P. 2019. "ESG in Credit Ratings." Retrieved March 1, 2020. (https://www.spglobal.com/ratings/en/products-benefits/products/esg-in-credit-ratings)

Star, S.L. and J.R. Griesemer . 1989. "Institutional ecology, 'translations,' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-1939." *Social Studies of Science* 19:387-420.

Stein, Samuel. 2019. *Capital City: Urban Planners in the Real Estate State*. New York: Verso.

Strauss, Anselm, and Juliet Corbin. 1990. *Basics of Qualitative Research*. Thousand Oaks, California; Sage Publications.

Sullivan, Esther. 2018. *Manufactured Insecurity: Mobile Home Parks and Americans' Tenuous Right to Place.* Oakland, California: University of California Press.

Summers, Brandi Thompson and Kathryn Howell. 2019. “Fear and Loathing (of Others): Race, Class and Contestation of Space in Washington, DC.” *International Journal of Urban and Regional Research* 43(6):1085-1105.

Swyngedouw, Erik. 1996. “The city as hybrid: On nature, society, and cyborg urbanization.” *Capitalism, Nature, Socialism* (7)2:65-80.

Swyngedouw, Erik. 2006. “Chapter 2: Metabolic Urbanization.” In *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, edited by Nik Heynen, Maria Kaika, and Erik Swyngedouw. London and New York: Routledge.

Swyngedouw, Erik and Nikolas C. Heynen. 2004. Urban Political Ecology, Justice, and the Politics of Scale. *Antipode* 35(5):898-918

Tapp, Renee, and Kelly Kay. 2019. “Fiscal geographies: “Placing” taxation in urban geography.” *Urban Geography* 40(4):573-581.

Thomas, W.I. and Dorothy Swain Thomas. 1928. *The Child in America: Behavior Problems and Programs.* Knopf.

Thorén, Henrik, and Lennart Olsson. 2018. “Is resilience a normative concept?” *Resilience* 6(2):112-128.

Tierney, Kathleen. 2003. “Disaster Beliefs and Institutional Interests: Recycling Disaster Myths in the Aftermath of 9–11.” Pp. 33-51 in *Terrorism and Disaster: New Threats, New Ideas*. Emerald Group Publishing Limited.

Tierney, Kathleen J. 2007. “From the margins to the mainstream? Disaster research at the crossroads.” *Annual Review of Sociology* 33:503-525.

Tierney, Kathleen. 2015. “Resilience and the Neoliberal Project: Discourses, Critiques, Practices—and Katrina.” *American Behavioral Scientist* 59(10):1327-1342.

Tierney, Kathleen, Christine Bevc, and Erica Kuligowski. 2006. “Metaphors Matter: Disaster Myths, Media Frames, and their Consequences in Hurricane Katrina.” *The Annals of the American Academy of Political and Social Science* 604(1):57-81.

Tomiczek, Tori, Kiera O’Donnell, Kelsi Furman, Brittany Webbmartin, and Steven Scyphers. 2020. “Rapid Damage Assessments of Shorelines and Structures in the Florida Keys after Hurricane Irma.” *Natural Hazards Review* 21(1):05019006.

Viele, John. 2011a. *The Florida Keys (Volume 1): A History of the Pioneers*. Sarasota, Florida: Pineapple Press.

Viele, John. 2011b. *The Florida Keys (Volume 2): True Stories of the Perilous Straits*. Sarasota, Florida: Pineapple Press.

Viele, John. 2011c. *The Florida Keys (Volume 3): The Wreckers*. Sarasota, Florida: Pineapple Press.

Wachsmuth, David. 2012. "Three Ecologies: Urban Metabolism and the Society-Nature Opposition." *Sociological Quarterly* 53:506-523.

Wadlow, Kevin. 2018a. "Work underway on 208-unit housing complex." *Florida Keys News.* Retrieved February 7, 2020 (https://www.flkeysnews.com/news/local/article195743824.html.)

Wadlow, Kevin. 2018b. "Big Lower Keys housing project gets boost." *Florida Keys News.* Retrieved February 7, 2020 (https://keysnews.com/article/story/work-underway-on-208-unit-housing-complex/)

Weber, Rachel. 2002. "Extracting value from the city: neoliberalism and urban redevelopment." *Antipode* 34(3):519-540.

Welsh, Marc. 2014. "Resilience and responsibility: governing uncertainty in a complex world." *The Geographical Journal* 180(1):15-26.

Wyly, Elvin K, Mona Atia, Holly Foxcroft, Daniel J. Hammel, and Kelly Phillips-Watts. 2006. "American Home: Predatory Mortgage Capital and Neighborhood Spaces of Race and Class Exploitation in the United States". *Geografiska Annaler Series B Human Geography* 88(1):105-132

Wyly, Elvin, Markus Moos, Daniel Hammel, and Emanuel Kabahizi. 2009. "Cartographies of Race and Class: Mapping the Class-Monopoly Rents of American Subprime Mortgage Capital." *International Journal of Urban and Regional Research* 33(2):332-54.

Xian, Siyuan, Kairui Feng, Ning Lin, Reza Marsooli, Daniel Chavas, Jie Chen, and Adam Hatzikyriakou. 2018. "Brief communication: Rapid assessment of damaged residential buildings in the Florida Keys after Hurricane Irma." *Natural Hazards and Earth System Sciences* 18(7):2041-2045.

Yin, Robert K. 1994. *Case Study Research, Second Edition.* Thousand Oaks, California; Sage Publications.

Yin, Robert K. 2003. *Applications of Case Study Research, Second Edition*. Thousand Oaks, California; Sage Publications.

Zebrowski, Chris. 2013. "The Nature of Resilience." *Resilience* 1(3):159-173.