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Uncovering the Progress of Planning for Vulnerability to Sea-Level Rise & Coastal Storms:
A Plan Evaluation of Norfolk, VA & New York City

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Urban and
Regional Planning at Virginia Commonwealth University.

by

Eric Karl Borchers.

Master of Urban and Regional Planning, Virginia Commonwealth University, May 2017
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May, 2017

Acknowledgement

As the author, I would like to dedicate this Thesis to my late grandfather, Dr. Alvin D. Schnitzler, who instilled in me a sense of curiosity to be aware of the environment around me, and my grandmother, Joan M. Borchers, who passed before completion of this report. The ultimate themes of this Thesis would not have been envisioned without the insightful direction and confident leadership of my main advisor, Dr. Meghan Z. Gough. Her consistent encouragement, oversight, and clarity throughout the entirety of the process was invaluable and the heart center of my gradual progress toward this final product. I also deeply appreciate the personable advice and intelligent touch of Dr. Damian Pitt, and the grounded perspective and thoughtful wisdom of James Keck, whom both graciously served on my committee. Further, I would like to recognize the VCU Graduate School for presenting me with the opportunity and resources to pursue such a personally enlightening and fulfilling endeavor. And to all those family, friends and colleagues who supported me along the way, you were an essential source of motivation and reassurance.

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Abstract

UNCOVERING THE PROGRESS OF PLANNING FOR VULNERABILITY TO SEA-LEVEL RISE AND COASTAL STORMS: A PLAN EVALUATION OF NORFOLK, VA & NEW YORK CITY

By Eric Karl Borchers, Master of Urban and Regional Planning

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Urban and Regional Planning at Virginia Commonwealth University.

Virginia Commonwealth University, 2017.

Major Director: Meghan Z. Gough, PhD, L. Douglas Wilder School of Government and Public Affairs

In response to recent storms like Superstorm Sandy and sea-level rise influenced by climate change, cities, particularly those located at the coast, have taken initiative to combat these growing threats with adaptive urban planning. Although civilians residing in susceptible neighborhoods are often the most vulnerable socioeconomically, there has been minimal evidence that planning has accounted for the characteristics of vulnerability. This thesis evaluates the recent planning efforts and vulnerability of Norfolk, VA and New York City to gauge the progress being made toward reducing citizen vulnerability and raising adaptability and preparedness. The most recent peer-reviewed research is consulted to forge the evaluation framework and also to recognize breakthroughs and conformity. After analyzing the performance of the sets of planning documents in both cities, it is evident that the ability to effectively plan for the public's vulnerability is contingent in part on inter-governmental capacity, but more specifically on disaster experience.

Chapter 1. Introduction

Extreme flooding caused by the one-two punch of coastal storms and sea-level rise constantly threatens to undercut the balance or aggravate the imbalances in society. Floods themselves are characterized as a hazard to communities but events that are devastating enough to severely disrupt life in communities are classified as natural disasters. Predicting the timing, severity and positioning of these disasters is an enigmatic task. What can however be anticipated is the people and places that are more likely to face their wrath and are unarguably predisposed to natural disasters. Under that very nature, people and their exposed places are specifically defined as vulnerable to extreme flooding. The planning profession, with the aid of government at all three levels, has championed a range of efforts to combat the present and future impacts of flooding in urban jurisdictions. To what degree these efforts are able to shift the tide whenever a disastrous flood strikes, in communities with the least political and economic power, from a scene of deep-rooted recovery to one of burgeoning opportunity is inconclusive.

To shed light on the consideration for social dynamics of cities on the front lines of the perpetual battle against extreme flooding events, I meticulously evaluate the planning efforts in Norfolk, VA and New York City. Both cities have experienced coastal storms declared federal disasters since 2010, both are prone to rising sea-levels influenced by climate change, and both have fought tirelessly to combat their impacts. This plan evaluation centered on the momentum in Norfolk and New York City aims to better unveil to what degree plans are fostering resilience in communities most vulnerable to the impacts of coastal storms and sea-level rise. The plan evaluation and hazards planning literature distinctly lay out a foundation for goals, fact base, strategies, coordination, participation and implementation in plans that is most directly

associated with reducing vulnerability to sea-level rise and coastal storms. Both cities have pursued the wide range of planning approaches like regenerative design, climate adaptation, risk reduction and mitigation, and disaster recovery to attempt to shape a future that is resilient even to worst case scenarios. Further evidence in the literature communicates characteristics of local communities such as low levels of income that make them most susceptible to these disasters.

The evaluated plans are vessels of long-range planning efforts to prepare for and adapt to sea-level rise and coastal storms. Both threats are identified as pervasive obstacles to resilience in each city currently and in the future, and in many other cities around the world. I consult the planning literature to forge the framework for evaluating the content and quality of plans and their ability to engender resilience in vulnerable locations. To equate the plan evaluation with vulnerable neighborhoods, I synthesize available information and data to formulate a vulnerability index that pinpoints areas of alarming vulnerability in each city from a social, physical and geographic perspective. Recent literature combined with the evaluation results begin to unveil the persistent barriers and limitations undercutting the ability of plans to successfully plan for vulnerable groups, and where areas of greatest emphasis in these recent planning endeavors lie.

1.1 Rationale

In response to recent “storms of the century” like Superstorm Sandy, that devastated the New York metro region, and Hurricane Katrina, experts have warned of an uptake in extreme weather on the horizon. The frequency and intensity of certain types of weather events can be attributed to a globally changing climate that is already affecting the United States and abroad. Risks from climatic events such as flooding, sea level rise, extreme weather, and higher temperatures are concentrated in urban areas (Melillo, Richmond, & Yohe, 2014). Storms and other extreme

weather events have been described by some as social equalizers, however in actuality these events exacerbate underlying economic inequities (Weiss, Weldman, & Bronson, 2012).

The vulnerability of urban residents and communities to disasters is influenced by pronounced social inequalities reflecting age, ethnicity, gender, income, health, and mobility. Climate risks threaten urban infrastructure, flows of goods and services, natural resources, health, and livelihoods, especially in vulnerable low-income areas (IPCC, 2014; Melillo et al., 2014). Low-income communities, specifically, have a high degree of vulnerability from a housing perspective, where residents are more likely to be confronted with poor-quality housing and infrastructure. Low-income housing is more vulnerable to extreme weather, is often located in areas with a high chance of experiencing extreme weather, and requires extensive rebuilding efforts (Baussan, 2015). Vulnerability, generally, refers to the propensity or predisposition of a population or group to suffer harm or be adversely affected by a hazard event (Glavovic & Smith, 2014). Risk levels from hazardous events will continue to rise unless cities are prepared to manage disaster risks and adapt to them (IPCC, 2014).

Responses to climate change have, before recently, focused narrowly on energy efficiency and mitigation. The fight has since expanded to include adaptation as local governments become motivated by an understanding of the climate related risks and vulnerabilities that their city will face in the future (Aylett, 2014). By 2015, there were more than 90 cities in the U.S engaged in either the early scoping stage, the planning and analysis stage, or the implementation stage of climate adaptation planning (Shi, Chu, & Debats, 2015). Despite the heightened perception that adaptation to climate hazards and disasters is an integral part of future planning, the inclusion of adaptation with respect to vulnerable sub-populations remains low across all actions. A vulnerability approach is a practical way to assess risks because it confines the analysis to people

and communities, which in turn allows planners to devise place-based adaptation strategies. These strategies alleviate adversity in local areas while making effective use of scarce resources (Rumbach & Kudva, 2011). Progress is budding for adaptation initiatives drawn from impact and vulnerability assessments and adaptation research, though in practice a gap in understanding still persists (Ford et al., 2011; Lesnikowski et al., 2015).

Lack of a public constituency has been a major impediment to action on public risks. In the case of climate adaptation, a lack of awareness cannot explain this deficiency. A low level of priority for action consistently accompanies a moderate-to-high level of awareness. Much of the public is aware of the risks of climate change and natural hazards but assigns low priorities to taking action. The perceptions are consistent with the temporal and geographic remoteness, broad distribution of risk, and limited individual understanding associated with public risks (Berke & Lyles, 2013). Arguably, the same is true of planning for disaster recovery. Natural disasters fall into a general class of planning issues like public risks that have a weak public constituency. Unlike issues that attract broad public interest, such as transportation improvements or neighborhood revitalization, disaster recovery lacks stakeholders who appreciate the issues and are actively engaged to deal with them. Lack of support may be because the costs of recovery planning are immediate, benefits are long-term and uncertain, and the physical manifestations of planning are not visible until after disaster occurs (Berke, Cooper, Aminto, Grabich, & Horney, 2014).

In southeastern Virginia, Norfolk and the Hampton Roads region has garnered formidable state and national attention regarding sea-level rise. The coastal geography combined with regional land subsidence has led the region to experience the highest rate of sea-level rise on the East Coast. Since 1930, mean sea level has risen 14.5 inches in the region, compared with a global

average rise of eight inches since 1875 (ULI Advisory Services Panel, 2014; McFarlane, Coastal Resiliency: Adapting to Climate Change in Hampton Roads, 2013; VIMS, Center for Coastal Resources Management, 2013). At this rate of sea-level rise, the Hampton Roads region is the U.S.' second largest population center at risk from sea level rise after only New Orleans (Mitchell, Stiles, & Hartley, 2014; Virginia Coastal Zone Management Program, 2008; Tompkins & DeConcini, 2014). Considering the extent of development in harm's way, the Norfolk-Virginia Beach Metropolitan Area ranks 10th globally in value of assets exposed to an increase in flooding from sea-level rise (Tompkins & DeConcini, 2014).

Despite how vulnerable the region is to flooding from rising water and coastal storms, Hampton Roads is in a profitable position to plan proactively for eminent disaster. Impacts on the region from recent major storms have been on the milder side, yet other locations like New York and New Orleans, that have been swept into the fight against these dangers, have served as wake-up calls for the rest of the country. Norfolk and Hampton Roads can simultaneously draw inspiration from these trailblazing cities as well as call upon the proliferating research field on hazards like coastal storms and sea-level rise.

1.2 Background

1.2.1 Norfolk

Being cited by experts that their region is highly susceptible to sea-level rise and coastal storms, regional government organizations, private industry and institutions of higher education in Hampton Roads have coalesced to derive the risks and causes of coastal flooding on their localities. Consequently, they have begun to identify ways to adapt to sea level rise. On the global scale, sea level rise is directly attributed to the amount of warming experienced from rise in both land and ocean temperatures. The rate of increase in sea levels locally in the Hampton

Roads Region is notably greater than the global rate because of both natural and anthropogenic causes.

1.2.1.1 Flooding & Sea-Level Rise

Two main forces that affect all sub-regions, are accounting for the disparity in the rate of sea level rise locally; one being ocean currents and the other, land subsidence (McFarlane, 2012; VIMS, Center for Coastal Resources Management, 2013). The Atlantic Ocean current that flows northward along the east coast tends to transport water away from the coast as it curves to the right, though recent analyses have posited that as the ocean warms, this current slows and suppresses the rate that water is pushed away in this manner (VIMS, Center for Coastal Resources Management, 2013). In some parts of the world where the ground is uplifting faster than the global rate of sea level rise, the sea is actually retreating relative to built infrastructure. In Hampton Roads, however, the sea is encroaching on the built environment and this phenomenon is exacerbated by land subsidence occurring from separate unrelated sources (McFarlane, 2012; McFarlane, 2013).

Scientists have pinpointed these three effects being glacial isostasy, sliding of sediment toward the Chesapeake Bay Impact Crater, and sediment compaction from groundwater withdrawal. With these three effects in combination the consequence is a doubling of the rate of relative sea level rise as subsidence has been identified as accounting for one-half to two-thirds of experienced rise (McFarlane, 2012; VIMS, Center for Coastal Resources Management, 2013). In a survey of emergency managers in the region, about half of respondents claimed portions of their locality flooded during normal high tides, three-quarters that areas flooded during extreme high tides, and nearly all that their localities flooded during large storms. While coastal flooding is an observed issue for almost all municipalities in Hampton Roads, less than half of emergency

managers view sea level rise as a contributor to these problems (VIMS, Center for Coastal Resources Management, 2013). Separate detailed analyses conducted by the Virginia Institute of Marine Science and researchers at Old Dominion University revealed that not only has sea level rise been greater than the global average, but it has increased from a rate of 1 to 3 mm per year to 4 to 10 mm per year as of 2011 and is accelerating at rate of 0.30 mm/year² (McFarlane, 2013).

1.2.1.2 Recent Planning

Emerging from the many diagnoses of the effects of climate change on the Hampton Roads region is a momentous intergovernmental effort to prescribe and implement a set of functional adaptation strategies. Before Hurricane Katrina ravaged the Gulf Coast, Virginia was inflicted with lesser impacts by Hurricane Isabel that spurred a more localized interest into the repercussions of sea level rise and a changing climate. Coastal inhabitants began to realize and be informed that damage from storms will only intensify as ample coastal development persists and frequency of violent storms escalates under predicted by climate scientists (Virginia Coastal Program, 2005).

Early trends in planning policy to reduce the risks of hazards involved assigning prohibitive development controls in high risk areas (Serrao-Neumann et al., 2015). Having not yet progressed from also following this simplistic approach at the time of Isabel in 2003, Hampton Roads was not prepared for the pervasive impacts storms like Isabel could inflict on the region (Virginia Coastal Program, 2005). Amidst the aftermath of Isabel, the Virginia Marine Resources Commission and the now defunct Chesapeake Bay Local Assistance Department issued emergency guidance on rebuilding procedures, but this was faced with widespread confusion. Taking advantage of the opportunity to learn from the experiences of Hurricane Isabel, local and regional governments subsequently began the pre-disaster planning process, though several years

after the Disaster Mitigation Act of 2000 set national standards for hazard mitigation planning (Virginia Coastal Program, 2005).

Fast forwarding to 2016, a versatile portfolio of planning reports, programs and projects have been implemented to further the ability of Hampton Roads to adapt to the adverse conditions it faces. Planning efforts ranging from private-sector and academic reports to federal programs and state plans to local projects are relevant to informing an assessment of whether Norfolk and Hampton Roads are forging a resilient future in regards to its most vulnerable residents.

1.2.1.3 Federal/State

In the years immediately following the aftermath of Hurricane Isabel, Virginia mainly adhered to Federal requirements and filtered Federal funding down to the localities in greatest need of assistance. In more individualistic fashion, the State has also distinguished itself in inventing programs to mobilize innovation around mitigating and adapting to natural hazards. The Virginia Coastal Zone Management Program under the direction of multiple coordinating state agencies, existing long before the mainstreaming of pre-disaster hazard mitigation, has latched onto this mobilizing role.

Some initial needs at the state level that have already been identified for enhancing the efficacy of Hampton Roads to adapt to climate change include an updated statewide climate adaptation plan with detailed adaptation measures or a timeline for implementation across the sections examined, more dedicated funding, policies, or guidelines to improve resilience against exacerbated flooding from climate change and sea level rise, and more evidence of action to incorporate climate change projections into state-level programs, investments, and activities (Climate Central, ICF International, 2015).

1.2.1.4 Regional/Local

Evidenced by the cohort of collaborative projects ongoing in Hampton Roads to adapt to sea-level rise and climate change supported by state and federal agencies and programs, this planning movement is converging over a fairly condensed period of time, though locally, lesser efforts have occurred in the past with similar intentions in mind. The Hampton Roads region geographically encompasses all of the counties, cities and towns south of the Middle Peninsula Planning District in Virginia, north of the Virginia-North Carolina state line, and to the east of the Richmond Metropolitan Region. Politically, all of this region is governed by the Hampton Roads Planning District Commission (HRPDC), however the region can be further broken down into the Peninsula as the spurt of land between the York and James Rivers, and Southside Hampton Roads, the area to the south of the James River and the mouth of the Chesapeake Bay. Southside Hampton Roads, the economic engine of the region, happens to be the most at risk portion of the region and so it makes unequivocal sense that the percentage of resources directed at its municipalities for learning to adapt far surpasses that of the Peninsula.

1.2.1.5 Vulnerable Households

Norfolk has a majority rental-occupancy housing market with 55% of its 86,485 occupied housing units that are rentals. The existing housing stock is more mature in comparison with other municipalities in Hampton Roads in bolstering a stock that nearly two-thirds of which is 50 years of age or older. This older housing stock places an unnecessary strain on low income residents with the compounding effects of deteriorating quality, absentee landlords, and limited financial resources available for maintenance and repair. In the city's comprehensive plan, this dire issue is identified as an essential need to be addressed. Certain neighborhoods have received status as a redevelopment, conservation, or special service district through a partnership between

the City and Norfolk Redevelopment and Housing Authority (NRHA). In redevelopment districts the intent is for blight removal and new construction, in conservation districts it is rehabilitation via home improvement loans and grants and home buyer assistance, and in special service districts the emphasis is on rehabilitation loans and grants in targeted areas (Department of Planning and Community Development, 2013).

The City has also targeted housing affordability for renters and homeowners alike as an utmost priority. Old Dominion University has offered its assistance to the city with its Community Development Corporation to increase affordable homeownership opportunities in several locations. The City of Norfolk and NRHA continue to reinforce affordable rental housing with the development of new apartments in the Broad Creek mixed-income community, and through the provision of over 3,600 public housing units and 3,500 housing choice vouchers. Norfolk also realizes that it must meet the housing needs of its large special needs population that it has identified as the most vulnerable in the city in requiring supportive services in addition to housing solutions. The extremely low income households is one group the City has categorized as among the vulnerable special needs population in its most recent comprehensive plan (Department of Planning and Community Development, 2013).

1.2.2 New York City

Benefiting from greater financial and governmental resources, the New York City region has taken initiative on sea-level rise and coastal storms earlier and more vigorously than most other cities and regions. Like Norfolk, New York faces the increasing challenges of coastal flooding and storms, and sea-level rise and coastal erosion. The city is compounded with an increasing population at risk to flooding and sea-level rise, an aging building stock, and growing income inequality.

1.2.2.1 Flooding and Sea-Level Rise

With more than 520 miles of waterfront and 400,000 people in the highest risk areas for flooding, New York City is one of the most susceptible cities to hurricanes and coastal storms in the country. Exemplifying its position on climate change and sea-level rise, the city has relied on its own panel on climate change to model localized climate change impacts. The New York City Panel on Climate Change (NPCC) has determined, consistent with the IPCC that heavy rain events are increasing in frequency and intensity, and the sea is rising at its coastlines. Populations living in coastal and low-lying areas, and lower income neighborhoods are highly vulnerable to the risks associated with climate change.

In New York City, the sea has risen on average 1.2 inches per decade since 1900 for a total of around 13 inches. Projections for future sea level rise range from 11 to 21 inches by 2050, 18 to 39 inches by 2080, and up to 6 feet by 2100. The consequence of this amount of sea-level rise, which is greater than the global average rate, would be an up to 10- to 15-fold increase in the frequency of the current 100-year coastal flood by the 2080s. The most common coastal storms in New York are tropical cyclones and nor'easters. Filtering down information from the IPCC, it has been determined that it is more than likely that the intensity from winds and precipitation of hurricanes will increase in the North Atlantic Basin. The result is an increase in exposure of the city's neighborhoods, businesses and infrastructure, with the aging building stock located in flood zones only growing (NPCC, 2015; Department of City Planning, 2015; NYC Recovery, 2016).

In 2012, Hurricane Sandy devastated hundreds of thousands of New York residents with wind, rain, and water that left them without power, damaged the city's critical infrastructure, and

destroyed some 300 homes. The city's most vulnerable population was left with limited access to food, clean water, healthcare, and other essential life-dependent functions.

1.2.2.2 Recent Planning

Before the threat of sea-level rise and extreme coastal storms was a personal issue for New Yorkers, the city often ignored flooding and coastal erosion and built structures on beaches, dunes, barrier islands, and flood plains, subjecting them to damage and loss. To combat the problem the solution would be to install inadequately designed and constructed protective structures. During and after Hurricane Sandy, the city's immediate response and preparations were among the largest efforts to mobilize public services in its long history.

1.2.2.3 Federal/State

The New York State Coastal Management Program, the equivalent program for channeling funds down from the national government via the Coastal Zone Management Act, elects to abide by a set of coastal policies that (1) steer development away from environmentally sensitive areas, (2) channel waterfront development and revitalization activities towards areas which are neither without ecological and physical development constraints or areas which had once been developed but need rehabilitation , (3) promote the proper use, development or preservation of coastal erosion hazard areas, and (4) encourage wide utilization of coastal resources which are renewable and nonrenewable (New York Department of State, 2007).

HUD's Community Development Block Grant Disaster Recovery (CDBG-DR) program provided the additional funding the city needed to divvy out resources to communities to address the wide range of development needs, to support continued recovery, and to build resiliency in the face of climate change. The CDBG-DR program provides communities impacted by disasters with resources to address a wide range of disaster-related needs. CDBG-DR allocations provide

funding to develop viable communities, particularly for low- and moderate-income persons, through decent housing, a suitable living environment, and the expansion of economic opportunities (NYC Recovery, 2016).

In mid-2014, the National Disaster Resilience Competition was introduced as a partnership between the Rockefeller Foundation and HUD to remit funds to communities that suffered from a presidentially declared disaster between 2011 and 2013. 67 disaster affected jurisdictions competed for \$1 billion in HUD leftover disaster recovery funding to implement disaster resilience strategies and projects that directly benefit low- and moderate-income groups by focusing on unmet recovery needs, as well as building regional resilience capacity to manage extreme weather events and adapt to sea level rise. The Rockefeller Foundation, pioneer of the 100 Resilient Cities initiative, provided targeted technical assistance to states and communities and support a stakeholder-driven process to identify recovery needs and innovative solutions in the first and second phases of the competition. The partnership built on the Rebuild by Design model that awarded \$930 million in 2014 to projects that demonstrated how private-philanthropic resources and federal funding can be leveraged to support the design of innovative resilience projects that conceived a vision for protection from future disasters in neighborhoods and cities in New York, New Jersey and Connecticut that were affected by Hurricane Sandy.

The State of New York, to expand on the city's capacity for adapting to sea-level rise and coastal flooding and ensuring another Sandy does not breach the gaps in resources, has, through its Department of Homeland Security and Emergency Services, Homes and Community Renewal division, Disaster Preparedness Commission and Governor's Office of Storm Recovery, dedicated resources for coastal storms and other intrusive hazards to supplement resources at the local and regional levels. The New York Rising Community Reconstruction program through a

collaboration between the Governor's Office of Storm Recovery and the Homes and Community Renewal division culminated with a series of reconstruction plans for coastal areas throughout New York City that warranted supplemental long-term strategies post-Sandy (NY Rising Community Reconstruction Planning Committee, 2014).

1.2.2.4 Regional/Local

Suffering from the city's worst natural disaster to the tune of \$19 billion in damages and economic disruption in 2012, New York has been compelled to expand and enrich its portfolio of plans to combat and prepare for coastal flooding and storms and sea-level rise. Fortunately, the city has been greeted with enormous assistance from the state and federal government to both build back better post-Sandy and to serve as a hotbed for innovative solutions to extreme storms and flooding (Office of Recovery and Resiliency, 2015).

In the aftermath of Hurricane Sandy, New York funneled resources from all places to rapidly recover from its impacts and return to a normal routine. Months after the brunt of the recovery work had been undertaken, the city began to think creatively to transcend its existing intelligence on dealing with extreme storms and flooding. The mayor commissioned a new wave of plans embracing resilience, preparedness and building back better to account for future disasters of the worst possible magnitude.

Like Norfolk, New York received both funding and expertise through the 100 Resilient Cities challenge of the Rockefeller Foundation and the National Disaster Resilience Competition of HUD. The product of these grants is a groundbreaking comprehensive plan positioned toward resilience that incorporates the vision of 100 Resilient Cities while also going above and beyond, and an ongoing project to build resilience in low- and moderate-income areas of Lower Manhattan.

Foregoing these two grants, the Rebuild by Design initiative selected several pioneering projects designed by private-sector firms. One of the more esteemed projects awarded under this model was the self-proclaimed BIG team championed collaborative scheme that relied on the strengths of several high-profile firms (BIG Team, 2014).

1.2.2.5 Poverty & Inequality

Despite the overall prosperity of some New Yorkers, the city has been a poster child for high living costs and income inequality. Poverty and homelessness remain a significant challenge across all five boroughs. Affordable housing is in short supply and is dwindling in areas previously thought of as reasonably priced. New York is a different animal than Norfolk and as such, experiences similar modern urban plights but on a glorified scale.

As certain neighborhoods and sections of New York become more attractive to live in thanks to investment, the areas left glanced over can become disconnected and eventually blighted. This issue has dissipated in most areas of the city as many sections and neighborhoods have thrived from investment and the recent urban immigration movement. As such, what was an issue of blight has transformed into a widespread affordability crunch that has left many reeling to remain in place. In its housing plan, the city has set a commitment to preserve or create 200,000 units of affordable housing and then expanding on that goal by setting a target of 240,000 new housing units in the immediate future. But presently, with the high cost of housing (making up more than 30 percent of income in a majority of renters), and as wages stagnate among lower and lower-middle class citizens, income inequality is increasing and nearly half of the population lives at or near the poverty line. Moreover, 1.4 million residents live in households that do not have access to sufficient food. As Hurricane Sandy made apparent, and as peer-reviewed studies will admit,

many of these strained residents are vulnerable to the consequences of sea-level rise and coastal flooding (Department of City Planning, 2015).

1.3 Research Questions

Undoubtedly, both Norfolk and New York City are accompanied by socioeconomic and physiographic characteristics that make them among the most susceptible urban centers in the U.S. to the alarming risks associated with sea-level rise and coastal storms. Hurricane Sandy in New York and the recurrent flooding in Norfolk has added another dynamic to the inequality present between neighborhoods to the extent that these two cities have been compelled to do something about it. They have concurrently taken action themselves and benefitted from the actions taken by their state and federal governments. Thus, they serve as prime subjects to apply this multi-faceted plan evaluation methodology with the aim of answering some of the most imperative questions in response to this new realm of planning:

(1) Are recent planning efforts adequately accounting for the vulnerability of local communities, especially their social dynamics, such that they are better able to prepare and cope for future sea-level rise and coastal storms?

(2) What obstacles have persisted preventing planners from reducing vulnerability in these communities and what have cities like Norfolk and New York done to overcome them?

Because Norfolk and New York City are in no way representative of all other cities in the U.S. or even the East Coast, my research acknowledges this and thus outlines the takeaways from the experiences of these two cities to inform other cities. I make judgments about the extent to which these two cities are able to answer these questions for this planning field.

Chapter 2. Literature Review

2.1 Theoretical Background

2.1.1 Role of Plans

Plans continue to endure the test of time in the planning profession as they remain the ideal form to distribute information and share meaningful future intentions for a place. A planner's chief responsibility has then been to produce plans to capture the creative process within the profession (Ryan, 2011; Talen, 1996). The planning profession's dominant purpose has been to solve societal problems like congestion, environmental degradation, poverty and more recently, those caused by natural forces. Particularly, planning has extended its reach to tackling natural phenomena that are recurring like floods, hurricanes and other natural hazards (Brody, 2003). The value of plans lies in their capacity to capture visions for the future, guide and regulate urban development, and encourage democratic realization of visions for community conditions and growth. When adopted, plans own the ability to influence any range of matter such as environmental justice, quality of life, economic development, hazard mitigation, transportation, and other elements of community life (Berke & Godschalk, 2009; Lyles & Stevens, 2014).

Despite the endurance of planmaking, only in the last couple decades has the importance of many of the aspects of plans been recognized among the upper tiers of government. Many state governments have mandated the preparation of local area plans that adhere to thorough, methodological and exhaustive requirements (Baer, 1997). Physical plans have proved to be an effective tool to actualize urban change and urban policy. As opposed to a process, plans record historical, cultural and intellectual concepts, a statement of social and political values, and an accord of the profession and society (Ryan, 2011). Traditionally, plans have steered urban facilities and set parameters for zoning and other regulatory measures on real property though

they have also ignited stakeholder action with images for the future. When it comes to visualizing a future, citizens and interest groups are more welcoming of planning decisions depicted through graphic images within a plan because it allows them to conceptualize the outcome (Neuman, 1998).

2.1.1.1 Plan Quality

Plans have been published and adopted for all sorts of purposes and intentions. Whether or not a plan is a vision, blueprint, land use guide, antidote, or any other action guide, it is accompanied by a different set of criteria that determines its quality and efficacy (Baer, 1997; Berke & Godschalk, 2009). Incidentally, plans of greater quality are usually those that hold greater precedence in the profession, or plans that bring about government action on the issues they address (Burby, 2003). Persuasive plans have the ability to inspire action through their images, designs, maps and visions that other instruments of public policy do not incorporate.

Empowering qualities have elevated plans to be able to overcome barriers in planning (Berke & Godschalk, 2009). Plans have connected people to places by rallying them around a common future for their place and self. The pictorial depictions of place help to portray collective hopes. Plans coalesce together different perspectives and interests together in an institutional setting that nurtures conflict and contention. Plans derive power by being themselves an extension of the governing power structure. The spatiality of plans successfully conceptualizes what outcomes will occur where, to whom, and when they will occur (Neuman, 1998). Two dimensions of plans collectively reveal their quality that predict their ability to achieve these planning feats; internal plan qualities and external plan qualities. Internal plan quality is the content and format of key components of the plan whereas the external plan quality is the relevance of the scope and

coverage to reflect stakeholder values and the local situation to maximize use and influence of the plan (Berke & Godschalk, 2009; Lyles & Stevens, 2014).

Plan qualities have been the impetus for evaluating plans and the progression of planning to change and adapt to new conditions. The whole notion of comprehensive plans and similar policy instruments is that in order to remain relevant by adapting over time to the needs, knowledge base, and experiences of a community they require continual revisions and updates. Similarly, it is the goal of communities to improve plans' abilities to address particularly recurring problems like floods, hurricanes and other natural hazards. Strong factual basis, clearly articulated goals, and appropriately directed policies have been repeatedly identified as the core characteristics of plan quality, and with measurable indicators of each characteristic adapted to a particular planning domain (Brody, 2003). Communicative action theory has been a funnel for more contemporary principles of plan quality in evaluating local plans. Communicative action principles comprise of qualities that reflect conditions fostering democratic discourse like all-inclusive clarity, emulation of stakeholder interest, liberating scientific accuracy open to interpretation, and sincerity and accountability (Berke, Smith, & Lyles, 2012). Generally, plan quality is used as an outcome variable for assessing the planning process and as a causal variable for assessing the planning implementation process (Brody, 2003).

2.1.1.2 Plan Evaluation

To examine the quality of a plan is to conduct a content analysis to determine whether certain pre-set plan criteria or characteristics introduced in the analysis exist in the studied plan. Plan content analysis relies on replicable methods for content analysis that generate reliable information regarding the content of plans (Lyles & Stevens, 2014). Plan quality evaluation is the process by which data from a content analysis is linked to a determination of what constitutes

a superior plan based on normative criteria. Plan outcome evaluation then further incorporates plan quality evaluation by verifying that certain characteristics are akin to desired or intended outcomes. The normative criteria that ultimately distinguishes good plans from poor ones can be largely dependent on the context of a plan like its planning domain and geographic scale or location (Lyles & Stevens, 2014).

After a plan has been implemented, a post hoc evaluation becomes a viable option to assess the outcomes of that plan. A post hoc evaluation is a tool that can verify performance and effectiveness. Certain criteria is essential to decide the appropriate timing for outcomes to be realized and what the actual outcomes should be compared to. The outcomes of a plan can be compared to the expected outcomes in the absence of that plan. Alternatively, the actual outcomes could be compared to the intended outcomes of the plan. Further comparisons could comprise of either evaluating the effects of any unanticipated outcomes, evaluating the influence the plan had on the reality for a place, or evaluating different expressions of outcome in instances where the intended outcome might not be tangible (Baer, 1997). Post hoc evaluation has been applied for more specific purposes such as assessing the distribution of outcomes versus the intended distribution linked to planning goals. The correlation between planned accessibility of public facilities and actual accessibility adds a spatial and socioeconomic dimension to post hoc evaluation that is complimentary to assessments of plan effectiveness and performance. Spatial interaction models, distance measures, and facility and demographic characteristics can be used to measure the socioeconomic component of distribution or the accessibility between public facilities and population groups (Talen, 1996).

To attain conclusive evidence of how effectively plans have reduced the vulnerability of low-income populations to coastal flooding and storms, ideally, an evaluation would want to look at

the outcomes of those plans. With the novelty of addressing these issues in the planning profession, outcomes have not been fully realized or are still in their early stages so this has yet to become a possible option. Evaluations then must resort to the second best option – plan quality evaluation. Compiling normative criteria from the latest research on this planning domain and linking the criteria to an identification of plan quality can create a veritable determination of future outcomes. The criteria conceived in research is generally influenced by several planning themes that have evolved out of other areas of research. In evaluating planning for low-income groups residing in coastal communities, vulnerability, resilience, adaptation, preparedness, anticipation, and equity are all guiding principles.

2.1.2 Vulnerability

Vulnerability is interrelated with risks or hazards that pose a threat to the livelihood and wellbeing of people. Considering disasters are the by-product of extreme events and vulnerable conditions, the depth and magnitude of vulnerability is a predictor that a community will experience a disaster in the future (Glavovic & Smith, 2014). Vulnerability is a variable for equating the risk of suffering. The magnitude of suffering from risks is the product of hazards and vulnerability. Housing, infrastructure and land that is unsafe all characterize vulnerability, as does human susceptibility. Physical exposure and social circumstances function as interdependent agents of vulnerability to hazards (Jones & Andrey, 2007). Social vulnerability is defined as the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Rumbach & Kudva, 2011, Van Zandt, et al., 2012; Oulahen et al., 2015). Physical vulnerability, on the other hand, is the physiological, structural and infrastructural exposure to hazards (Highfield, Peacock, & Van Zandt, 2014; Lindell, Prater, & Perry, 2006).

2.1.2.1 Physical Vulnerability

Physical vulnerability can also be interpreted as the vulnerability of people, places and things according to innate traits that predispose them to ill-fated risk factors. Human vulnerability is the physiological disposition of certain people to be more susceptible to life-threatening circumstances from hazards. Youth and elderly are familiar images of human vulnerability but also representative of a component of social vulnerability. Agricultural vulnerability, the susceptibility of plants and animals to environmental impacts, also falls into physical vulnerability though poses less of a bearing in the urban settings of Norfolk and New York. Structural vulnerability, another form of physical vulnerability, is symptomatic of subpar roofs, foundation, exterior materials, and building standards, specifically their inability to resist damage (Jones & Andrey, 2007; Lindell, Prater, & Perry, 2006). Ultimately, societies face no impact despite their accompanying physical and social vulnerability until they are exposed to hazards. Then, hazards have the ability to uncover the pervasive disparities among vulnerable populations and the potential to make a permanent imprint on communities.

2.1.2.2 Hazard Exposure

Hazard exposure arises from people's occupancy of geographical areas where they could be affected by specific types of events that threaten their lives or property. For natural hazards, this exposure is caused by living in areas near or within the floodplains that sometimes extend only a few feet beyond the floodway (Lindell, Prater, & Perry, 2006). A hazard can be any event that poses an unavoidable danger or risk, but for these purposes, coastal flooding and storms are chosen as threats that low-income people are vulnerable to for their intensification from climate change and sea-level rise. When people, no matter vulnerable or not, are greatly impacted by the dangers of coastal hazards, those hazards are then regarded as natural disasters. Adaptation

strategies that directly address the inherent structural vulnerabilities and reduce exposure decrease the likelihood of harm, but preclude any socioeconomic characteristics that yield a great potential to suffer from hazards once they do occur (Jones & Andrey, 2007; Highfield, Peacock, & Van Zandt, 2014).

2.1.2.3 Social Vulnerability

Characteristics of social vulnerability easily dispute the consenting belief that natural disasters are undifferentiating events while suggesting that they are instead socially constructed (Peacock, Van Zandt, Zhang, & Highfield, 2014). Social circumstances are most often predictors of insufficiencies in the accessibility of social, economic, and political resources (Jones & Andrey, 2007). Incidentally, damage from coastal storms and flooding are shaped by social, political, and economic vulnerabilities of people and societies. Disasters tend to amplify and accelerate trajectories already occurring in communities, thus preexisting conditions are key indicators of future outcomes (Mearns & Norton, 2009).

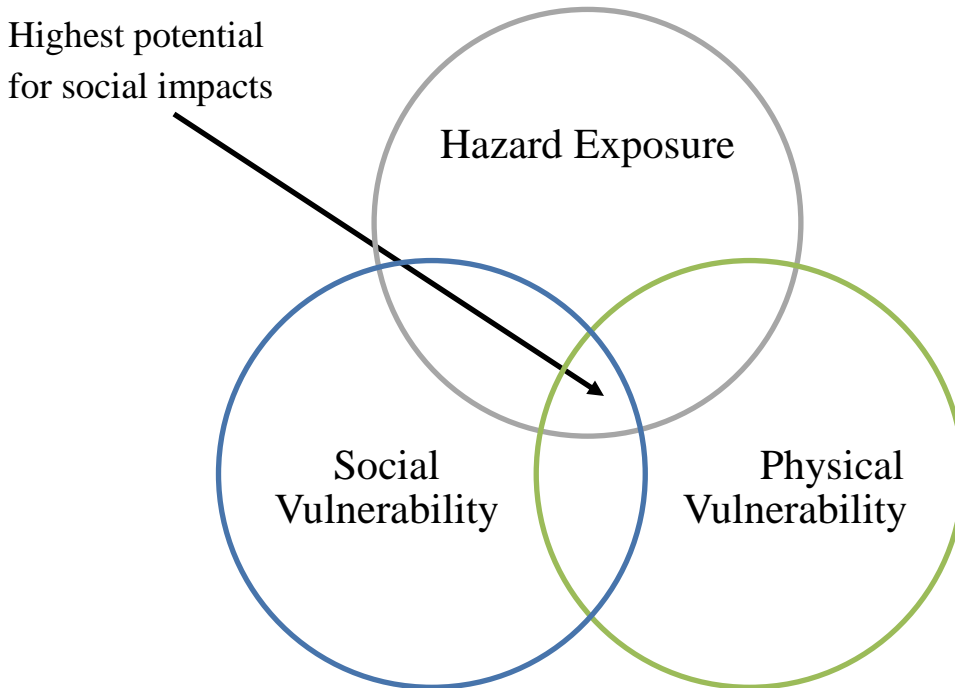


Figure 1. Intersectionality of Vulnerability & Social Impacts

Vulnerability is also a function of the nature and types of resources that individuals and groups have at their disposal. Resources like human capital in the form of training, skills, and knowledge; social capital as relationships and institutional access; financial capital as liquid and non-liquid assets; natural capital in terms of natural resources; and built capital in the form of infrastructural resources, all reduce the vulnerability of people to disasters and climate variability (Mearns & Norton, 2009). Exploring the inner processes of a population's vulnerability to risks and disaster and their detected anticipation potentials could culminate with coping strategies toward resilience enhancement (Mitrovic, 2015).

2.1.3 Resilience

Resilience has been increasingly leveraged to drive desired planning outcomes especially as attention to coastal hazards has burgeoned. Bouncing back from unforeseen circumstances has always been at the crux of resilience, even with all of its adaptations. Specific to bouncing back

from coastal flooding and storms, resilience is the ability of a community or society, along with the biophysical systems on which they rely, to resist or absorb the impacts of hazards, rapidly recover from those impacts and reduce future vulnerabilities through adaptive strategies (Berke & Lyles, 2013).

Resilience can trace its meaning along a trajectory spanning varying fields. The field of ecology has been instrumental in giving rise to ideas on resilience related to global environmental change. Particularly, ecology has associated an understanding of social ecological systems with dynamic action on climate change and disasters (Davoudi, Brooks, & Mehmood, 2013; Brown, 2014). A social ecological system is purely a unit of interaction between people and the environment wherein ecology forms the basis for its body of thinking that the two are ubiquitously interdependent of one another. Repeated research has identified a strong correlation between human activity and ecosystems at a global scale. Whereas people have had a substantial influence on the global environment and in engendering ecological change, it is regarded that if ecological systems exceed a certain threshold then human well-being will be compromised, resulting in social change (Folke, 2010).

This complex relationship can be understood in the example of a neighborhood of growing appeal adjacent to a coastal wetland. The neighborhood may choose to accommodate for growth by infringing on the wetland, and gradually erasing its existence. Once as a natural protective barrier from the dangers of the open shore, the wetland as a shadow of its former self no longer has the ability to mitigate the full effects of a threatening storm. The threatening storm is able to wreak full havoc on the neighborhood and permanently change its outlook. Had the neighborhood chosen to allow for growth more strategically it would have preserved the delicate relationship with an ecological system that returns the favor.

The Intergovernmental Panel on Climate Change describes resilience as the amount of change that a social ecological system can undergo without experiencing a change in state. Some argue that social ecological systems and resilient societies may be unable to avoid transition to an alternative state, after exposure to previously unforeseen threats. Rather, the amount of change a social ecological system can absorb without sacrificing key structures, the capacity to reorganize, and the capacity to learn and adapt in the face of change are all characteristic of resilience (Glavovic & Smith, 2014). Concepts arisen out of social ecological resilience include capacity, complexity, connectedness, adaptation and feedback (Brown, 2014).

2.1.3.1 Resilience Framework

Resilience began as the idea of a dynamic system, responding to a shock, being brought into a brief chaotic state and returning back to its original state. This depiction does not account for the complexities of systems, of their environments, and of the changes that occur. Key findings on resilience thinking incorporate two other aspects with resilience that are interrelated and draft a more representative picture of resilience – adaptability, and transformability. Adaptability is defined as the capacity to adjust responses to changing external drivers and internal processes and thereby allow development along the current trajectory. Adapting can more tangibly be thought of as the process to achieve resilience and stability. Transformability is the capacity to cross thresholds into new development trajectories. Combining principles, they equate to the capacity to continually change and adapt yet remain within critical thresholds (Folke, 2010).

Evolutionary resilience broadens the description of resilience to incorporate the dynamic interplay between persistence, adaptability and transformability across multiple scales and time frames (Davoudi, Brooks, & Mehmood, 2013). A persistent system subject to change remains within a stability domain, continually changing and adapting yet remaining within critical

thresholds. When united, persistence, adaptability, and transformability forge a framework that carries thought about processes like climate adaptation into realms that are more dynamic and holistic. At the intersection of all three is preparedness, where social learning capacity is rendered as a human responsibility to enhance the chances of resisting disturbances, absorb disturbances, and move toward a more desirable trajectory (Davoudi, Brooks, & Mehmood, 2013).

From a coastal disaster perspective, resilience thinking could be defined as the capacity of interconnected physical, social, and economic systems to rebound from an episodic shock or extreme event. The societal context within which disasters occur and the precondition to confront the agents of vulnerability that predispose communities to disaster are central to this capacity (Glavovic & Smith, 2014).

2.1.3.2 Adaptability

Adaptability has an interdependent relationship with resilience. Adaptability captures the capacity of a system to learn and to combine experience and knowledge, in addition to adjusting responses to changing external drivers and internal processes, and continuing to develop within the current stability domain (Folke, 2010).

Resilience thinking is critical to analyzing the complex dynamics of communities. Communities themselves, after enduring a shock to its status quo, emerge from an event in a multitude of manners. A social system such as a neighborhood may emerge from a threatening event in severe disarray - a worsened version of its preexisting state, in an adaptive state, or a transformative state (Folke, 2010). Deliberate transformation requires resilience thinking, first in assessing the relative merits of the current versus alternative, potentially more favorable stability domains, and second in fostering resilience of the new development trajectory (Folke, 2010).

Adaptability is achieved through flexibility and resourcefulness. Both flexibility and resourcefulness are pathways to resilience, with flexibility denoting the existence of networks and cooperation. Networks either facilitate the flow of ideas and resources or foster connections between people and institutions. In other words, in this manner, networks can increase the adaptability of systems. Cooperation across scales and times is equally as essential for adaptability. Resourcefulness is comprised of efficiency, quickness, and diversity.

Homogenization is associated with an undermining of resilience. Biological diversity and diversified economies are both adept at dealing with the adverse consequences of macro-level instability (Davoudi, Brooks, & Mehmood, 2013).

2.1.3.3 Preparedness

In relation to the themes of resilience, adaptability and transformability, preparedness influences all three. Preparedness reflects the intentionality of human action and intervention that demonstrates learning capacity. In order to be prepared, groups must search for ways to enhance their ability to anticipate and plan (Davoudi, Brooks, & Mehmood, 2013). Actions exhibiting preparedness, when planned for ahead of time, typically satisfy what to do during a disaster, what supplies are needed, evacuation protocols, points of contact, and where to find emergency shelter. Preparedness includes five mission areas – prevention, protection, mitigation, response, and recovery. Each area correlates with a stage in the overall process of reducing impacts, and tend to be sequential (Schwab, 2014).

2.1.3.4 Transformability

In the interplay between persistence, adaptability and preparedness, transformability syncs with innovation to bring a system from an undesirable state to a more desirable one. Transforming to a radically different and more desirable trajectory becomes an option in chaos and trauma

(Davoudi, Brooks, & Mehmood, 2013). Innovation is key to envisioning a fundamentally new system when a group or society is so entrenched in a stigma of distress that reconfiguration arises (Walker, Holling, Carpenter, & Kinzig, 2004). Adapting and transforming is as much about finding potential vulnerabilities as it is about identifying opportunities for reconfiguration. Desire for transformation over persistence is merely a difference in perspective where rather than viewing impacts as detrimental they are viewed as opportunistic and creatively destructive (Davoudi, Brooks, & Mehmood, 2013). Transformation that is unplanned can actually be detrimental to a community. Only when a transformative state is planned for can desirable social change be ensured. Resilience as transformation considers shifts in variables but also shifts in perception and meaning, patterns of interaction among political leadership and other power relations, and institutional arrangements (Folke, 2010; Brown, 2014). Transformational change occurs at all the interconnected scales of individual, society, institution, technology and economy. These changes can be embodied in practice, lifestyle, power relation, norm and value (Brown, 2014).

2.1.3.5 Resilience in Practice

By and large, three different views for reaching resilience have surfaced from recent research. The first, *resistance and maintenance*, indicates a controlling and defensive response to change and a decisiveness to maintain business as usual, even in the face of imperative change and intensifying risk. Maintaining stability may be socially desirable as long as resistance to change is concurrent with continued societal success; otherwise it may lead to collapse. The second interpretation, *change at the margins*, is typical incremental adjustments within communities and societies to adapt to change while still preserving the status quo. This view could be characterized as one that identifies the symptoms of climate change as they appear and

subsequently eliminates them, but not as one that addresses the underlying causes of climate change. The third view, *openness and adaptability*, demonstrates an awareness for addressing the underlying causes of risks and threats by embracing transformative or radical change.

Considering existing power structures, building resilience in communities then requires planners to confront systemic barriers (Glavovic & Smith, 2014).

Resilience in policy and practice is applied in responding to climate change uncertainties and socio-economic insecurities. Building resilience has become synonymous with the component of climate adaptation whereby a society has the capacity to bounce back or rebound to a stable state. *Stability* refers to the ability of a system to return to an equilibrium state after a temporary disturbance (Davoudi, Brooks, & Mehmood, 2013). Resilience as coupled incremental and transformative change stresses the need to frame planning as a fundamental socio-political course of action that explicitly recognizes and confronts the perpetuated status quo of practices and inequitable power distributions that deepen vulnerability (Glavovic & Smith, 2014).

2.1.3.6 Shortcomings of Resilience

Independently, resilience has fallen short on several fronts and fails to address issues of equal if not greater importance. Resilience seldom applies to a specific population or group of people, but rather a species, a habitat, or a development, and has not achieved social contingency. When resilience does pertain to a human society or any multitude of systems, it's most common application has been persistence, the mildest form of adaptation, and very seldom transformation. Part of what influences persistence as a prescription for resilience is the emphasis on troubling exogenous forces and ignorance toward internal social dynamics. Resilience in theory overlooks conflicts over resources and the importance of power relations, in assuming that there is consensus on the desired state or that a desired state is even identified. A prominent dialogue

stressing management for resilience exists, and so do powerful interests that threaten the implementation of a dynamic or adaptive strategy. Not taking into account the institutions within which practices and management are embedded and the politics of their distribution and management has driven resilience in practice to conservatism or a business as usual perspective, particularly in the fields of development and climate change. In the interplay of vulnerability and resilience to coastal disasters, resilience approaches have brought increased capacity, but evaded consideration of the root causes of vulnerability (Brown, 2014).

2.1.4 Equity

Coastal disasters and the changing climate that influences them correlate with contentious intra-generational and inter-generational equity issues. The intra-generational inequities are a matter of the distribution of impacts across individuals and at different points in time. Inter-generational aspects relate to the discrepancy of consequences from climate change occurring across time between the near-term and the long-term. Intra-generational inequity is a fuel that incites action to guarantee preparedness and resilience in the most vulnerable and inflicted communities.

Equity itself is based loosely on wellbeing or security, health, and education among others. This vision of equity encompasses not only economic goods and services but also individuals' health and life expectancy, education and access to public goods, social and economic security, and capacity to partake freely in economic interchange and social decision-making (Markandya, 2011).

Inequality and climate change are in fact deeply interlaced. The causes and implications of climate change are entwined with patterns of inequality where climate change acts as a multiplier of existing vulnerabilities. It threatens to quickly erode at the long ensuing progress made in reducing poverty and enhancing overall wellbeing. The injustices of climate change are rooted in

the dilemma of responsibility for its causes which are inversely proportional to the degree of climate vulnerability. This pervasive dilemma demands equity, social justice, and environmental justice to be placed at the core of a reactive agenda (Mearns & Norton, 2009).

2.1.4.1 Environmental Justice

Three forms of environmental inequality have emerged or intensified from climate risks and disasters, one of which being environmental justice. Climate activism has increasingly galvanized around environmental justice, as the impacts of risks and hazards are unequally distributed across all populations. Environmental justice bears a resemblance to vulnerability and the moral obligation of unequal hardship wherein support for justice in the poorest communities is stimulated by an awareness of these unevenly distributed impacts. (Alario & Freudenburg, 2010).

2.1.4.2 Social Justice

Coastal storms and extreme flooding often fracture down social lines. Those stuck in the lower end of the socioeconomic spectrum suffer an unequal share of impacts from these coastal disasters. Typical of environmental injustice, the ability to secure economic, social and political opportunities is sacrificed among those that are more vulnerable and impacted. By that undue limitation, coastal storms and extreme flooding are pressing social justice issues. Social justice is precisely the right for all to have equal access to economic, political and social opportunities. Climate change, a stimulus of storms and flooding, is often cited as the defining social justice issue of our time for its tendency to place a disproportionate burden on the livelihood of those most vulnerable and who have contributed the least to its causes. It raises equity considerations between generations because actions taken or not taken today will affect future generations. It

also has powerful implications for intra-generational equity today, among individuals and groups within societies (Mearns & Norton, 2009).

Social justice has been approached from several views, but under the cost-benefit analysis tool, an outcome is considered most desirable or socially just if the net benefit or the difference between the added benefits and added costs is greatest. Although the proportionality does not hold unless the utility of net benefits is weighted more heavily and the distributional implications are taken into account. Alternatively, social justice can be judged in terms of the level of wellbeing of the worst-off member of society. On top of wellbeing, social justice denotes the capability of all individuals to freely make choices from a set of alternatives and engage in social and market transactions (Markandya, 2011).

2.1.5 Anticipatory & Adaptive

2.1.5.1 *Anticipatory Governance*

Adaptation and flexibility go hand in hand, since the act of adapting to risks entails being open to change driven by expected risks. Therefore, adaptation is an anticipatory principle. Anticipatory governance is a model for planning and decision-making under volatile conditions that merges concepts of foresight, flexibility, and a range of futures to anticipate adaptation strategies. Actual change and uses of these adaptation strategies are monitored in order to guide decision making.

The anticipatory planning model recognizes the limitations of managing environments based on previous experience, and it offers opportunities to build local networks and problem-solving capacity amid great uncertainty about the future (Berke & Lyles, 2013; Berke et al., 2014).

Making adaptive policies under these circumstances requires policy makers to treat strategies and programs as iterative processes of exploration and learning, based on targets and milestones,

strong performance-based monitoring and evaluation systems, and enabling frameworks for interactive engagement with a host of stakeholders (Mearns & Norton, 2009).

The pool of knowledge for local planmaking and implementation considers a range of possible future scenarios rather than a forecast derived from empirical evidence and historic variability for a single future scenario. Local planmaking that employs scenario development to account for a range of possible future climate conditions and associated impacts on communities and their environments provide local governments the foresight to reduce risks and to increase their ability to more vigilantly anticipate and adapt to events at early onset. Scenarios become anecdotes capable of aiding decision-makers, encouraging creativity and facilitating brainstorming about possible futures. While scenario development requires expert consulting, scenario planning can be extended to the affected public and other interested parties through focus groups and roundtable discussions to not only inform the public, but coordinate and collaborate on ideas. Involving the public, a diverse range of stakeholder groups, and experts together in a collaborative atmosphere enables expert knowledge and personable knowledge of existing conditions and future concerns to synthesize into a more expansive outlook (Berke & Lyles, 2013).

2.1.5.2 Adaptive Management & Policy Learning

Adaptive policy making in the context of the climate challenge is a guide to ensuring an approach shaped by a socially inclusive learning process is infused into a portfolio of climate action. Three sets of features of the climate challenge influence this directive. The first features are the long time horizon over which decisions must be made, and the path-dependent nature of these decisions. The next feature is uncertainty such that even if some changes are inevitable, their precise timing, location, and distributional impacts usually remain unclear. And third, that

effective and coherent climate change adaptation involve coordinated action amongst an abundance and diversity of decentralized agents. Adaptive policy making then calls on public participation for defining place specific contexts for climate change adaptation (Mearns & Norton, 2009).

An adaptive management approach is a highly effective framework for enabling policy learning. Constantly changing environmental conditions, drastic shifts in political interests and objectives, and a continuous barrage of new and often ambiguous information lends planners to be able to react to a range of situations. Hazard mitigation plans and policies then should function for uncertainty and surprise by acting as flexible instruments. Under adaptive management policies are designed as hypotheses and management is implemented as a series of experiments to test those hypotheses. Hypotheses are often predictions about how existing conditions will respond to management actions (Brody, 2003).

Much like technical scientific experimentation, the consequences of the actions should be potentially reversible or replicable allowing for the experimenter to learn from breakthroughs and failures. When a policy meets its objectives successfully, the hypothesis can be affirmed resulting in the protection of human well-being. Fortunately a failed policy also has intrinsic value in permitting learning such that future decisions can be accompanied with a larger body of comprehension. In this sense, policy learning experimentation is a very pragmatic process, but is an effective tactic for devising innovative adaptation solutions to natural hazards like coastal flooding and storms. Each occurrence of a flood or severe storm offers ample opportunity to experiment by testing out ideas or hypotheses and determining their success. Thus, if plans are regularly updated after or prior to an event, the policy instruments themselves can demonstrate learning that takes place within the planning organization and community at large (Brody, 2003).

2.1.5.3 Adaptive Thinking

Devising ideas for adapting to coastal flooding and storms is a more intellectually and emotionally demanding exercise than planners are accustomed to and requires them to dig more deeply and think more creatively than they typically do. Planners and professionals representing the community are expected to think critically about the problems that can arise with these hazards. Critical thinking allows professionals to grasp the implications of any intended set of actions that affect the future of communities in some shape or form. Positive thinking emerges from ideas, or creative thinking that people gravitate to. Particularly in brainstorming for whole communities and audiences of citizen participants creativity flourishes in group environments. People can not only be creative individually, but collectively, building off of each other's ideas and learning from each other. Collaborative creativity in this manner effectively engages citizens and generates public support for the strategies that are subsequently implemented, in part because such collective creativity is action provoking and empowering (Schwab, 2014).

Plans generate the most buy-in among affected communities when they demonstrate emotional intelligence and the ability to empathize. Disaster survivors process emotional reactions that accompany their disaster experience. Without allowing time and space for these emotional reactions, planners are inviting delay to adaptation by suppressing natural response to catastrophe. Planners and public officials who can think intuitively and learn to respond constructively and empathetically to people will benefit the recovery process, most often. However, the attachment many people have to conditions and a sense of place preceding disaster can impede people's ability to re-envision the future of their community, no matter how torn from hazards or other problems, such as poverty or social inequality, ultimately perpetuating a state of vulnerability. Adaptive thinking among planners and policy makers embodies more than

mere anticipatory thinking, though essential, but also thinking critically, positively, creatively, intuitively, and emphatically (Schwab, 2014).

2.2 Measuring & Quantifying

2.2.1 Vulnerability Assessment

Many communities are inherently more able to overcome hazards and disasters, but in order to identify those that require extraordinary assistance to resist and adapt, communities' vulnerability should be mapped, particularly their social vulnerability. Generally speaking, socially vulnerable populations are not evenly distributed throughout an urban area, but are instead clustered in neighborhoods. Pinpointing socially vulnerable neighborhoods can ignite action by public officials in developing an awareness of the exacerbation of impacts this clustering causes and the ability to target efforts spatially before and after disaster. Systematic application of social vulnerability perspectives at the community scale can identify concentrations of populations at the household level with particular social characteristics meriting special attention, planning efforts, and mobilization to respond to and recover from disasters and hazards (Van Zandt, et al., 2012).

Social constructivist approaches to vulnerability assessment characterize the multitude of causes for individual outcomes in an entitlement and livelihood style. Rather than the risk-hazard approach to vulnerability analysis that defines the relationship between an exogenous hazard and its impacts, inadequately addressing social dimensions of risk, the social constructivist approach classifies people as vulnerable to undesirable outcomes. The climatic event or natural hazard is interpreted as an external episode, while the risk of disaster and suffering is socially ridden. The entitlements and livelihoods subsets depict vulnerability as an inadequate means to protect or sustain oneself in the face of climate events such that risk is determined by productivity and

social fortification. Whereas the external dimension is typified as exposure to climate variations, the internal dimension is in connection with sensitivity and adaptive capacity to stressors.

Integrating both internal and external factors, the overwhelming objective of vulnerability assessment is to distinguish those that are vulnerable and ways to assist them (Mearns & Norton, 2009). In all these approaches, there is acceptance that development and disaster preparedness must operate at the level of the community.

An essential purpose is for the assessment to catalyze a process that empowers the people in the community and supports their capacity to control their own situation (van Aalst, Cannon, & Burton, 2008). Participatory risk assessment tools can be useful for building up awareness and capacities for adaptation to climate change and disasters. These tools could include risk mapping, transect walks, asset inventories and livelihood surveys, historical and seasonal calendars, focus group meetings, surveys and discussions, and key informant interviews (van Aalst, Cannon, & Burton, 2008).

On top of impeding socioeconomic qualities is the trickle-down feature of housing whereby minorities and low-income groups reside in older and poorer quality housing concentrated in less desirable, higher risk neighborhoods (Highfield, Peacock, & Van Zandt, 2014). Low-income people frequently inhabit poorer housing quality, are exposed to poor environmental conditions, and experience economic instability (Ross, 2013). Impoverished populations typically lack insurance and access to financial resources that can aid in disaster recovery. Minority groups reside in lower-quality neighborhoods in homes that appreciate at lower rates because of being racially discriminated against in the buying, selling, and renting of housing due to racial steering, redlining, and lender discrimination (Mearns & Norton, 2009).

Despite confidence that impoverished, elderly and minority groups are more at risk to storms and flooding, they uniformly display lower levels of preparedness, and respond less positively to warnings. Since they are more reliant on informal networks, minorities in particular may receive and confirm warning messages later, and once warnings are processed they have a reduced likelihood of evacuating because of lower income and education levels that limit material resources, knowledge, and skill. Their deficient preparedness and evacuation behavior is compounded by disproportionate damage inflicted by and hence their vulnerability to flooding. Being segregated into neighborhoods with poorer quality housing is a large influence into this risky phenomenon (Van Zandt, et al., 2012).

When displaced, pre-existing housing and economic volatility can be worsened. Low-income residents displaced by climatic events experience more difficulty landing on employment opportunities than when remaining in their familiar vicinity. Migrants integrated into the fabric of a different community after being displaced can create civic tension in host communities. Mental illness and depression can also arise in those socially isolated following displacement (Baussan, 2015). Considering the multiple levels minorities are vulnerable to disaster they continue to be excluded from community post-disaster planning and recovery activities because they have less economic power and political representation (Van Zandt, et al., 2012).

2.2.2 Disaster Impacts (Social)

In correspondence with underlying physical and social vulnerabilities, disasters bring about physical and social impacts. The physical casualties and property damage caused by disasters are the most tangible and widely reported impacts, but social impacts, like psychological, demographic, economic and political develop over a longer period of time and can be more elusive in assessing them. Loss of structures as a measure of physical impacts results from

physical damage and destruction of property, but can also be caused by land use losses or loss of land induced by subsidence or erosion. Damage to the built environment can be classified broadly as affecting residential, commercial, industrial, infrastructure, or community services sectors.

2.2.2.1 Psychological & Demographical

Psychological impacts bridge emotional signs such as anxiety, depression, and grief, and behavioral effects like sleep and appetite changes, ritualistic behavior, and substance abuse. Typically, since the observed effects are mild and temporary, few disaster victims require psychiatric diagnosis. Most benefit more from a crisis counseling orientation than from a mental health treatment orientation, especially if their normal social support networks of friends, relatives, neighbors, and coworkers remain largely intact. However, the youth, elderly, disabled, and racial and ethnic minority segments of the population require special attention and active outreach. The major demographical impacts of disasters are likely to be the temporary immigration of construction workers after major disasters and the emigration of population segments that have lost housing (Lindell, Prater, & Perry, 2006).

2.2.2.2 Economic

The ultimate economic impact of a disaster depends upon the disposition of the damaged assets. Disaster losses are initially borne by the affected households, businesses, and local government agencies whose property is damaged or destroyed. The property damage caused by disaster impact creates losses in asset values that can be measured by the cost of repair or replacement. Some of these assets are not replaced, so their loss causes a reduction in consumption (and, thus, a decrease in the quality of life) or a reduction in investment (and, thus, a decrease in economic productivity). In addition to direct economic losses, there are indirect losses that arise from the

interdependence of community subunits. The relationships among the social units within a community can be described as a state of dynamic equilibrium involving a steady flow of resources, especially money. Specifically, a household's linkages with the community are defined by the money it must pay for products, services, and infrastructure support (Lindell, Prater, & Perry, 2006).

2.2.2.3 Political

Disasters are capable of inciting political behavior that deviates from the norm that is generally free from civic disturbance. Disaster impacts can give rise to social activism that disrupts the political landscape, especially during the seemingly long-drawn-out process of recovering from a disaster. The disaster recovery process is a source of many victim grievances that cultivates opportunities for conflict within and conflict between communities and authorities. Threats that undermine existing patterns of civil governance can bubble up when individuals sharing a common grievance about the handling of the recovery process coalesce to seek reparations for their grievances. While it is uncommon for authorities to leverage disaster impacts as an exploitive opportunity, communities of minority groups with marginal political influence or are disregarded by elites can fall victim to detrimental change. Disasters can aggravate preexisting political tension, but generally, disaster impacts might not produce a worse outcome than a renewed set of victims and grievances, and a resultant modest shift in the political agenda (Lindell, Prater, & Perry, 2006).

2.3 Planning Approaches

Given the complexity of coastal flooding and storm type disasters, many approaches and strategies have been employed to reduce their impacts and the vulnerability of those at risk. Collectively, planning strategies can eradicate social and environmental injustices, reduce

exposure, foster social connectedness, ensure preparedness, maintain resilience, enhance adaptive capacity, alleviate vulnerabilities, and guarantee swift and efficient recovery.

Although each planning approach holds a unique assortment of attributes that distinguish each from one another, there are considerable overlaps in policies and outcomes. Individually, the outlined disaster planning approaches can achieve different types of resilience and in different magnitudes, but in certain coordinated efforts, multiple approaches in concert can attain positive results in surplus of their efficacy in isolation. Each planning approach represents a manner in which to reduce vulnerabilities of populations to disaster, but it is also possible to make plans that are insufficient and incapable of fulfilling their objectives pertaining to disaster resilience. Thus, each approach is accompanied by particular details and qualities that optimize their efficacy in the realm of vulnerability reduction and ultimately toward long-term resilience. The collection of detailed approaches shape the evaluation protocol that I employ later on to assess the desirability of their intended and engendered outcomes.

2.3.1 Risk Reduction

Since risks tend to lack evidence, public residents and officials tend to be apathetic toward risk consideration, especially climate change risks. With insufficient incentives for local jurisdictions to combat individualized risks, few at-risk communities have taken initiative. Left to their own devices, relatively few at-risk communities would be expected to initiate risk-reduction actions. Hazard mitigation plans are evidence of the nonexistent or sluggish response by communities to local risks (Berke & Lyles, 2013). Planners have had to overcome the debilitating obstacles of inadequate public buy-in and oppositional community groups motivated by proposed policies they seek to vanquish (Burby, 2003).

Risk reduction and general climate combatant efforts are not lost causes, however. Engaged and educated planners and publics can alter the perception of risk for the better. Risk reduction occupies the space between adaptation and climate mitigation and such could be considered a modest climate adaptation approach but an assertive approach to mitigation.

2.3.1.1 Coastal Hazard Mitigation

The predominant goal of hazard mitigation planning is to decrease hazard exposure and physical vulnerability to hazards in a particular area. State planning for mitigation to achieve resiliency has chiefly been shaped by the role the federal government has played in assisting disaster inflicted localities. State mitigation plans can serve a critical role in cultivating intergovernmental coordination, allowing for local plans to more easily comply with broader state goals, and establishing resilient conditions in communities to resist or absorb and swiftly recover from disasters. The Disaster Mitigation Act of 2000 strongly encourages all state and local governments to prepare hazard mitigation plans based on a participatory process and technical vulnerability analysis or hazard assessment (Berke, Smith, & Lyles, 2012).

The DMA of 2000 was passed as an amendment to the Robert T. Stafford Disaster Relief and Emergency Assistance Act, and it repealed the previous mitigation planning provisions and replaced them with a new set of requirements that emphasized the need for states and municipalities to coordinate mitigation planning and implementation efforts (FEMA, 2013). The act reallocated the focus of disaster resistance toward pre-disaster hazard mitigation measures that are cost-effective and designed to reduce damage and destruction (Disaster Mitigation Act of 2000). A state mitigation plan is continued as a requirement for disaster assistance, and states are granted the authority to recommend a minimum of five local governments to receive mitigation assistance. Additionally, state and local governments alike are required to develop a hazard

mitigation plan in order to remain eligible for pre- and post-disaster mitigation funding.

Communities with an adopted and federal approved hazard mitigation plan are eligible for funding via the Hazard Mitigation Grant Program, Hazard Mitigation Assistance, and the Pre-Disaster Mitigation Program (Southside Hampton Roads Hazard Mitigation Planning Committee, 2011; FEMA, 2013).

Central to the hazard mitigation planning process, the hazards assessment, dissects a community's exposure to hazard agents such as floods, storm surge, wave action, or wind. The assessments identify the potential exposure of populations, businesses, and the built environment. Physical characteristics of the built environment are also equally as critical, with features such as wind protection in buildings, structural elevation relative to potential floods, and engineered or natural environmental features not being overlooked. Solutions are devised accordingly to fill gaps in communities' overall protection and absorption of hazards and disasters (Van Zandt, et al., 2012).

Generally, three types of responses are commonly employed to mitigate coastal hazards under the direction of hazard mitigation plans. An argument can also be made for a fourth approach being the discouraged "do nothing" approach where the risk of damage to and loss of property is simply accepted.

Table 1. Three Hazard Mitigation Responses

Structural response: the building of protective structures to defend coastal property against damage by flooding or erosion	Non-structural response: actions like planting vegetative cover, re-shaping of bluffs, or avoidance of hazards by siting buildings in safe locations	Insurance response: purchasing of insurance against the coastal hazards
<ul style="list-style-type: none"> • Only effective if structures are soundly designed and constructed • May accelerate the loss of a natural shield from erosion if designed improperly • Structural solutions require strict maintenance to ensure they retain marginal effectiveness • Protective devices are typically high dollar 	<ul style="list-style-type: none"> • Strengthening of landforms • Use of appropriate design features in buildings to protect against flooding • Siting of development entirely out of hazard areas avoids difficulties and high costs • Often used in combination with structural response 	<ul style="list-style-type: none"> • National Flood Insurance Program allows structural and non-structural measures • Insurance against property damage caused by flooding is offered • Property owners in participating communities may purchase insurance from NFIP • NFIP also provides for the sale of insurance to property owners against flood-related erosion damage

(New York Department of State, 2007)

2.3.1.2 Disaster Risk Reduction

Disasters occur when natural or technological hazards interact with socioecological systems.

Disaster impacts arise due to interactions among hazard exposure, physical vulnerability, and

social vulnerability (Peacock, Van Zandt, Zhang, & Highfield, 2014). Consequently, local

governments' responses to climate risks are commonly linked to hazard mitigation and disaster

preparedness strategies. Disaster risk reduction emerged out of lasting efforts to deliver

emergency disaster response and recovery services for inflicted communities. Actual disaster risk

reduction planning to enable coordinated large-scale governmental and non-governmental

organization response often accompanies major catastrophes. As a response to climate change, disaster risk reduction encompasses several phases – disaster risk assessment and preparedness planning, response, relief and recovery for managing disaster, and structural and nonstructural hazard mitigation activities (Solecki, Leichenko, & O'Brien, 2011).

Proficient disaster risk reduction does incorporate local vulnerabilities and risks in precise locations, such as communities potentially or actually affected. Disaster risk reduction remains an event-driven approach to adapt to disasters and emphasizes short-term interventions and actions particularly through humanitarian assistance agencies like the Red Cross and donor programs, because it is limited in being merely a mitigation approach despite including people into the equation (Birkmann & Pardoe, 2014).

2.3.2 Disaster Recovery

Though disaster risk reduction is classified as a mitigative approach to planning for disasters, considering it is event-based, much of the outcomes coincide with disaster recovery. The conventional view of disaster recovery is of responding to a disaster declaration in a manner that pieces communities back into working order as they were prior to the event. Following disaster there is ample opportunity to rebuild communities in an adaptive way while considering future climate change and to bring attention to policy failures (Birkmann & Pardoe, 2014; Corbin, 2015). More often than not, impacted infrastructure is rapidly re-built back to pre-disaster conditions and standards. This conventional stability and persistence view of disaster recovery overlooks the internal social dynamics of coastal climate events and incidentally dismisses a possible need to promote transformative change (Birkmann & Pardoe, 2014).

Social awareness calls for recovery planning to be proactive and forgo the conventional reactive attitude that drives technical measures (Serrao-Neumann, Crick, Harman, Schuch, & Choy,

2015; Corbin, 2015). Also, rather than only concentrate on post-disaster states that are more desirable than pre-disaster, disaster recovery can recognize the importance of improved pre-disaster conditions. In high pressure situations after disasters, opportunities for change are rapidly squandered as demand for resources politically and financially prohibits any considerable deviation from the norm (Corbin, 2015). Bouncing back to pre-disaster conditions under stressful conditions can only remain as a resilient state until the next event of equal or greater risk (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015). Long term recovery requires planning for post-disaster recovery in the pre-disaster phase (Schwab, 2014). Pre-disaster planning can assure that communities and officials are more prepared to maneuver through complicated and high pressure situations for a variety of post-disaster scenarios (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015).

Table 2. Four Stages of Housing Recovery Following a Disaster

Emergency shelter	Spontaneously sought locations that are intended to be a refuge and provide protection from the elements during a developing disaster
Temporary shelter	Offer food preparation and sleeping facilities in the short-term following a disaster and sought from those with immediate and greatest needs
Temporary housing	Allows disaster victims to reestablish household routines, though in non-preferred locations or structures
Permanent housing	Reestablished household routines for disaster victims in preferred locations and structures

Source: (Lindell, Prater, & Perry, 2006)

2.3.2.1 *Recovery Plan*

In order to seize opportunities before they vanish, a community should have a recovery plan in place long before a disaster strikes. A recovery plan is a policy document that guides short-term emergency and restoration protocol and long-term redevelopment decisions. A plan that is admired by all that are subject to its recommendations considers the problems and opportunities

for recovery and establishes responsibility among recovery officials. Pre-disaster recovery plans have been fashioned by local officials in one of two ways. The first being a recovery plan that is prepared as a stand-alone plan that is more manageable, viable, technically sophisticated, and less demanding. The second is of a recovery plan as a component of a jurisdiction's comprehensive plan. The integrated approach is more capable of mobilizing additional resources, correlating recovery with other planning facets, and coordinating with existing symbiotic regulatory tools (Berke & Campanella, 2006). Altogether, recovery plans should accommodate for vulnerable populations, disaster mitigation, and long-term gain in considering pre-planning for rebuilding (Corbin, 2015).

Planning should account for how post-disaster recovery efforts can be restrained by any combination of limited funds, lacking consensus and agreement, weak community networks, and inherent lines of communication and planning tools (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015). Without trusted community networks to help negotiate the bureaucracy of disaster recovery, low-income victims of extreme weather may also receive fewer benefits (Baussan, 2015). For other barriers to be overcome and for commitment to be maximized in the recovery process requires early and persistent participation by all pertinent stakeholders including especially those that are affected and marginalized (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015; Corbin, 2015; Berke & Campanella, 2006). On occasion dramatic events can empower traditionally marginalized groups to advocate for policy proposals and capture the attention of particularly persistent policymakers to be more receptive of change (Corbin, 2015). A whole-community approach to emergency management policies that fosters community involvement and engagement with community nongovernmental leaders and state agencies can help to determine the unique needs of communities in emergency situations (Baussan, 2015).

2.3.2.2 *Community Betterment*

The concept of betterment has emerged as an approach that forgoes the trend of rapid reconstruction and rebuilding of affected communities after being stricken by disasters. While reconstruction post-disaster is often seen as an opportunity to build better and more resilient structures, under a betterment approach reconstruction must also add ‘value beyond what existed before the disaster’. Hence, under a betterment approach to reconstruction there are opportunities for considering future spatial and societal impacts caused by climate change. However, reconstruction usually happens at a fast pace and conflicts arise between groups and institutions because different goals are not given sufficient attention in time, resources and values. Betterment extends beyond physical structures, including improved urban planning practices, greater social equity and economic development focused on the strength of local industries (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015).

In terms of adaptation, betterment is synthesized by disaster risk reduction and climate change adaptation. Integrating disaster risk reduction and climate change adaptation demands greater collaboration between communities of policy makers, practitioners and researchers. Experiences from disaster stricken areas highlight the challenges involved in advancing planning strategies to incorporate trends put forward by concepts such as betterment. In post-disaster situations, overall impression that there is compression in time and space under which recovery efforts such as reconstruction work occurs impedes more robust solutions advocated by the betterment concept (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015).

2.3.3 *Climate Adaptation*

Climate adaptation has been a localized focus for community action to combat regional climate impacts utilizing organized resources (Picketts, et al., 2012; Shi, Chu, & Debats, 2015).

Modelling climate change impacts is an intellectually demanding and knowledge-intensive endeavor and thus typically occurs at scales larger than the specific options for responding to impacts account for. Because of its rootedness in scientific inquiry, the adaptation planning process resembles the rational model, from scoping the problem, to analyzing and weighing alternative adaptation strategies, and to implementing plans (Shi, Chu, & Debats, 2015). The combination of resource intensity and modernity of climate has as of yet removed climate adaptation planning from political influence in confining it to nongovernmental organizations or environmental departments of local government (Solecki, Leichenko, & O'Brien, 2011). The conundrum of its current authority is that adaptation planning requires in addition to technical capacity and financial assets, political support in order to find success (Shi, Chu, & Debats, 2015).

Climate adaptation can either be anticipatory or reactive depending on when it occurs in relation to a hazardous event. Anticipatory adaptation occurs before climate impacts are experienced and thus is proactive while reactive adaptation is just the opposite, occurring after impacts have been experienced. Adaptation can also either be private, initiated by individuals, households or private entities, or it can public, undertaken by government to allow desired public outcomes to come into fruition. Adaptation can be impulsive or impromptu as an autonomous adaptation, or it can take the form of a planned style, where a calculated, deliberate course of action is taken (Glavovic & Smith, 2014).

If local governments were to champion adaptation planning efforts they would be tasked with translating scientific forecasts of future climate conditions into tangible impacts on local activities through risk and vulnerability assessments, and deciding on adaptation opportunities for unpredictable climate impacts across long planning horizons (Shi, Chu, & Debats, 2015).

Local and regional government authority over climate adaptation efforts can translate into swift planning for specific impacts close to home, strategies that provide tangible benefits to residents, and policies derived from input and contribution of local stakeholders (Picketts, et al., 2012).

Strategies that have been established under adopted adaptation plans include investments in ecological and engineering infrastructure, institutional reforms to existing plans, codes, insurance policies, and development approval processes, as well as programs to alter cultural and behavioral practices (Shi, Chu, & Debats, 2015). These devised strategies are frequently tied to specific urban sectors, such as water supply and sanitation, public health, energy, and transportation as opposed to communities (Solecki, Leichenko, & O'Brien, 2011).

An exceptional policy portfolio is one that exemplifies anticipatory governance and adaptive thinking. To recall, adaptive and anticipatory policies embody flexibility. Flexible policies are flexible because they consider both contingency and robustness. Contingent policies are tailored to a specific future, while robust policies are those that have a positive effect across many possible futures and can preserve future options. If a particular policy is preferred under one set of changes but not under other sets of changes, then the policy is contingent. If a future outlined by a particular scenario does not materialize, then the policy aligned with that scenario will remain unused, but without such a policy a community risks being unprepared. The *worst case* option is an instance of a contingent policy. Robust policies offer a vigorous decision that yields preferable results under multiple scenarios, and include two options. The *no-regrets* option is justified by current climate conditions, and further justified when climate change is considered across many possible scenarios. The *low-regrets* option is low cost in the short term and can be adapted over time to address several possible scenarios. This latter option allows for the

distribution of costs over time as opposed to one-time lump sum investments to carry out a particular policy that might be abandoned (Berke & Lyles, 2013).

2.4 Planning for Vulnerable Groups

2.4.1 Fundamental Considerations

There are generalized public risks and susceptibility to extreme flooding and coastal storms that planners account for, but when planning for the most socially vulnerable and low-income segment of the public, special consideration should be given for certain socioeconomic limitations. Beyond their recognized characteristics that make them vulnerable to these disasters, low income groups are constantly faced with deficient resources, knowledge of risks, and capacity/influence that exacerbate their situation and less frequently get addressed by planners.

2.4.1.1 Resources

Those living in poverty are more likely to experience wage and food insecurity, lack homeowner or renter insurance, have fewer backing social resources, have access to transportation, and experience housing instability. Insufficient access to any one of these resources diminishes the ability of an impoverished family to properly prepare for and endure a disaster unscathed.

Because of their economic vulnerability, low income households are unable to absorb the financial impact of a disruptive severe storm event. Necessary storm-related preparations in the form of food, fuel and logistics impose an unfathomable demand on the finances of these households. Living month to month, they lack the disposable income to bail themselves out of making risky decisions. Often working temporary or part-time jobs, they lack the luxury of supporting themselves for several days away from home that would require setting aside enough cash or credit, sacrificing pay, and sacrificing the ability to pay next month's rent or mortgage payment and other mandatory expenses. These households also often have minimal or limited

familial or social networks to rely upon in these times of financial strain (Behr & Diaz, 2014; Baussan, 2015).

Familial and social networks made up of extended family, friends, associates and colleagues are a component of social capital. The presence of these networks influence evacuation and sheltering decisions that low income households make as they may coordinate financial, emotional and knowledge-based resources with members of their networks. Low income households that have deficient social capital are both unable to bear the financial strain of a disaster and have no means to evacuate or seek shelter if no emergency facilities are nearby (Behr & Diaz, 2014). The social capital of many low income households is a direct reflection of their housing situation.

The place of residence is arguably the most vital resource financially and in preventing potent impacts and harm from coastal disasters. An unfortunate truth is that even when low-income households are also homeowners they tend to miss out on adequate recovery assistance funds. Housing assistance after extreme weather events often favors middle-class victims as award amounts are based on housing values rather than the cost of repairs. Housing serves as a lifeline between the low-income household and the elements, with construction, age, weatherization and location all contributing to the effectiveness of their defense. Low-income housing is more often than not poorly constructed, aging, in less desirable neighborhoods that lack quality services, and are unfortified (Ross, 2013).

2.4.1.2 Perception of Risks

Failure to acknowledge the risks associated with weather events made worse by climate change is as a matter of fact, a generalized public dilemma. Vulnerable groups are one segment of the latent public that place a low priority on action except that they happen to be more at risk.

Planning domains like hazard mitigation and disaster risk reduction lack publics that have the same degree of appreciation of the problems as planners.

Countless studies have shown that the public is aware of the risks from climate change and natural hazards but yet assign low priorities to taking action. By involving stakeholders, planners can increase public understanding of these issues and persuade potential constituency groups of the need for action. Planners motivate broader involvement by directly engaging more groups and by providing public forums for increasing awareness and understanding that public risks are mass-produced and shared problems (Burby, 2003; Berke & Lyles, 2013).

Connecting back to resources, a low-income household's assessment of impending risk is shaped by their social resources or capital, as are their preparation, evacuation and sheltering decisions. Through their peer networks, households gather knowledge of available resources, and exit strategies, routes and destinations. Without peer anecdotes, isolated households can become complacent toward their safety when more frequent less severe storms given them a false sense of security. The most severe storms that are the largest threat to vulnerable groups are often thought of as off in a distant future or not a threat to their community as low-income households have dodged these storms before (Behr & Diaz, 2014).

Until members of the at-risk public experience a severe hazard event or comprehend their urgency through engagement, they will continue to place them at a low level of priority for their own consideration. Disasters offer an opportunity for the public to become familiar with the response and recovery process and learn how to better prepare for the next event. Unfortunately, though, for those that are most vulnerable, they may not get a second chance to demonstrate their disaster readiness and learning progress from one event to the next (Schwab, 2014).

2.4.1.3 Capacity & Influence

Residents of low-income communities are not as able to inform or influence government officials or are able to recover as quickly or completely as individuals who live in more financially secure neighborhoods (Baussan, 2015). Evidence from hurricanes in the 1990s and 2000s revealed that income was a critical factor in the amount of damage and pace of recovery. Owner-occupied housing and housing located in higher income neighborhoods suffer less damage and recover more quickly than multifamily housing (Peacock, Van Zandt, Zhang, & Highfield, 2014). Lower income minority neighborhoods in cities that endured substantial damage from a hurricane were more devastated and slower to receive back their original residents and return to normal than neighborhoods that were predominantly middle to upper income and non-minority (Green, Kouassi, & Mambo, 2013).

Residents in more whole and connected communities have means to assist in recovery and prevent displacement while identifying local needs for officials during an extreme weather event, although many low-income neighborhoods are disengaged and declining (Baussan, 2015). With rental households often left out of outreach efforts or are deemed inaccessible, low-income families are regularly unaware of actions taking place or resources available considering a majority of low-income households are renters. Higher-income evacuees are able to secure surplus housing in a community during a disaster thanks to heightened knowledge and eligibility, and thus they restrict the ability of low-income renters to find affordable housing in the wake of being displaced. Even when low-income families seemingly benefit from government decisions, without consulting with affected individuals, officials may bring low-cost housing up to safety standards and unknowingly price families out such that they are no longer able to find safe and affordable housing (Ross, 2013).

Without consulting with residents of poor neighborhoods, weaknesses in evacuation plans may never get exposed. Disaster plans of vulnerable communities are not saturated with local knowledge nor are they consistent with local conditions, concerns, and capacities of disadvantaged citizens. One study found that, in the comprehensive planning process, of the typical stakeholders included, groups representing disadvantaged people living in hazardous areas were present in 5% of jurisdictions (Burby, 2003). Compared with middle and upper income families, those belonging in the lowest income groups are inherently limited in self-governance (Berke, Cooper, Salvesen, Spurlock, & Rausch, 2011).

Accompanied by the general apathy toward disaster preparedness and mitigation among low-income groups is uncertainty, distrust and suspicion that further strains their ability to influence as they are more consumed by discrimination and inequality (Berke, Cooper, Salvesen, Spurlock, & Rausch, 2011). Directly correlated with having deficient social capital, isolated residents are less likely to be rescued, seek medical help, evacuate, and receive assistance from others. The highest prevalence of isolated individuals with few social ties is in poor African American communities (Aldrich, 2014). Getting often-neglected stakeholders into the planning process provides planners with an important tool for increasing their political effectiveness (Burby, 2003; Berke & Lyles, 2013). The economic situation of individuals and the sensitivity and disposition of personnel and officials present formidable barriers and opportunities for achieving full recovery and ultimately resiliency (Green, Kouassi, & Mambo, 2013). Breaking down barriers to resiliency among marginalized low-income groups hinges on planning that is in conjunction with a process whereby officials, residents and organizations work together to build community capacity to take on locally defined priorities (Berke, Cooper, Salvesen, Spurlock, & Rausch, 2011).

2.4.2 Community Resilience

A thriving community is a united district where face-to-face interaction is fundamental to building trust within and throughout. Individual members of the community can feel empowered through collective action to hold each other and their authorities accountable. A strategy for building capacity to achieve disaster resiliency within low-income groups finds a balance between engagement of local residents, reinforcement of expert and local knowledge, and activities that match marginalized populations' values and accountability with goals within the community. Accountability and autonomy together grant low-income groups the authority to develop their own plans and to strive for communal ambitions (Berke, Cooper, Salvesen, Spurlock, & Rausch, 2011).

2.4.2.1 *Combining Approaches*

The concept of community resilience is a framework for enhancing disaster resilience at the scale of the community that borrows from the strengths of disaster preparedness, response and recovery, and climate adaptation (Cutter, Ash, & Emrich, 2014). Communities themselves are agglomerations of individuals and groups in a somewhat defined area that may have similar ideals, goals and perspectives, and certain cultural and social attributes. Community resilience describes the collective ability of a neighborhood or geographically defined area to deal with stressors and efficiently resume the rhythms of daily life through cooperation following shocks (Aldrich, 2014). A resilient community resembles a system of resilient socioecological systems. Communities as systems of systems are expected to function proficiently, but watchful design and engineering goes into ensuring they function effectively and resiliently in the face of crises like coastal disasters (Schwab, 2014).

Steps taken to make coastal communities more resilient can also make them more equitable in the long run. Efforts to achieve coastal resilience must acknowledge the disparate vulnerabilities of individuals and groups, as well imbalances in the distributions of benefits and costs associated with resilience outcomes. Resilience policies and projects should aim to reduce burdens on the most vulnerable in communities, and seek to distribute benefits and amenities fairly and in ways that fully benefit all socio-economic groups. Coastal resilience should be understood as a unique opportunity to raise the life prospects and living conditions of the most disadvantaged in the community and remove or at least reduce vulnerabilities as the next storm hits. Hurricane Katrina unabatedly demonstrated that the drivers and root causes of poverty and inequity need to be confronted if disaster risk is to be reduced (Glavovic & Smith, 2014).

2.4.2.2 Social Policy

Applying a social justice lens to climate change helps to direct policies toward priorities that most directly resonate with the communities that are most vulnerable to its destructive consequences (Mearns & Norton, 2009). Social capital and social equity are two concepts of social theory that can be adapted to the urban environment specifically in identifying unique attributes and areas of need in communities (Aldrich, 2014). A perennial need in dealing with coastal flooding and storms is to help poor and vulnerable people manage climate risks. Climate risk reduction and poverty alleviation can both be achieved mutually and fully when social policy approaches to adaptation are prioritized. Social policies have the added advantage of empowering the poor and helping them to realize the voice and political prowess needed to access risk management tools. Social policy can play a concerted role for climate change adaptation due to its unique ability to unveil an arena of policies where equitable outcomes are attained (Mearns & Norton, 2009).

The earliest known definition of social capital identified social capital as good will, fellowship, mutual sympathy, and social interaction among a group of individuals and families who make up a social unit. Several disciplines have adopted the concept of social capital which identifies how involvement and participation in groups can have positive outcomes for the individual and the community. A more recent definition refers to social capital as the aggregate of the actual or potential resources that are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition. This characterization is expanded to the role of social capital in generating benefits beyond individuals at the neighborhood and community level. From a community perspective, social capital is the features of social organizations, such as networks, norms, and trust that facilitate action and cooperation for mutual benefit (Aldrich, 2014).

Social cohesion and networks have been a proven method for nurturing long-term resilience during and after catastrophe. Social capital can be utilized as an asset for experts to be communicated what resources are accessed through social networks, levels of trust in communities, collective action, and other public goods by individuals. Disasters have become platforms for reform in communities wherein practitioners have accounted for the increase in those that are at risk to disasters and that disasters disrupt the fabric of community life and stress social systems (Aldrich, 2014). In times of stress and crises social networks and relationships can serve as critical support systems (Glavovic & Smith, 2014). Friendships, neighborly relations, well-developed patterns of community and neighborhood socializing and sharing exemplify ways that a community can be prepared for an extreme flood or severe storm (Glavovic & Smith, 2014). Incorporating social enhancement and maintenance into resilience fostering can counter the perception of a paradoxical relationship between resilience and equity (Baussan, 2015).

Integrating goals of equity, in the context of low-income communities, climate resilience is not necessarily about bouncing back, but rather about bouncing forward to eliminate inequities and the unsustainable use of resources. Shifting the pattern of attention in low income areas from stagnant underfunded initiatives and infrastructure to enhancing social cohesion reinforces climate resiliency and improves fiscal and human health. Improvements to hard infrastructure often comes at a cost to soft infrastructure, that includes institutions vital to maintaining the health, cultural, and social guidelines of a community. Planning for resilient communities that neglects reinforcing social interconnectivity overlooks the ability of social cohesion to protect highly vulnerable communities from the adverse impacts of dangerous coastal events (Baussan, 2015).

Table 3. Capacity Building to Maximize Interaction

Time banking and community currency	Provide incentives or rewards for those who volunteer
Focus group meetings and social events	Casual atmosphere to personalize planning and air out issues related to planning
Visioning, charrettes and workshops	For establishing goals and deciding on strategies that are consensus driven
Planning community layout and architectural structures	Careful planning of the physical layout of communities, neighborhoods, and housing complexes can affect creation and maintenance of social capital

Source: (Aldrich, 2014; Berke, Cooper, Salvesen, Spurlock, & Rausch, 2011)

Breaking down barriers to disaster resiliency hinges on community planning that embraces the idea that public officials, local people, and independent mediating organizations work together in a process aimed at building community capacity to engage, organize, and take action on locally defined priorities (Berke, Cooper, Salvesen, Spurlock, & Rausch, 2011). Given the importance of social capital in determining resilience to shocks, NGOs and government agencies have adopted

a number of policies and programs shown to increase reservoirs of trust and deepen networks. The various methods build on existing networks and community activities as spaces for incorporating disaster issues and resilience actions or create whole new networks and activities focused specifically on disaster issues (Aldrich, 2014).

2.5 Plan Qualities

In a broad sense, two dimensions of plan quality principles are conceived for application in plan quality evaluations. The internal plan quality dimension captures principles that guide the content and format of the key components of a plan. The external plan quality dimension serves principles related to how well the plan is compatible with its local situation to maximize its efficacy and influence. Goals, fact base, policies and actions, and implementation and monitoring make up those internal plan quality principles. To be expected, inter-organizational coordination and participation then compose the external dimension of plan quality (Berke, Smith, & Lyles , 2012).

Goals, affected by the expanse of values, convey a vision for future desired conditions. Fact base delivers the empirical basis to which key hazard risks, susceptibilities and vulnerabilities are identified and prioritized for policy making to be free from gaps. Policies and actions ensure that the vision laid out in plan goals is achieved by guiding decisions influenced by fact and experience. Implementation and monitoring involves the coordinating of organizational responsibilities, timelines, and funds to implement a plan. Monitoring specifically, involves tracking the extent to which policies are carried out and how conditions have changed over time. Inter-organizational coordination is then a recognition and demonstration of the interdependence of actions among local and regional entities. Rather relatedly, participation is a recognition and demonstration of the role formal and informal actors such as governmental bodies, private-sector

institutions, nonprofits, and individual citizens have in preparing plans (Berke, Smith, & Lyles, 2012).

2.5.1 Goals

Typically, goals for resilience are conservative and conventional in accounting for efficiency and public safety but not other arguably more important values for long-range resiliency, like social and environmental equity. Maintaining efficiency and public safety are bases for persistence rather than constructive transformation that result from capitalizing on those windows of opportunity (Berke & Lyles, 2013). Goals that guide all other principles to secure long-term resilience and promote equity are transformative goals with a vision for building back better, and restorative goals for minimizing losses (Berke, Cooper, Aminto, Grabich, & Horney, 2014).

Within a disaster recovery plan, goals are attentive to the nature and magnitude of a disaster, the needs of individuals and households, broader community characteristics, and a wide range of appropriate housing options to meet disaster needs and enable individuals, households, and communities to rebuild quickly and effectively (Cantrell, Nahmens, Peavey, Bryant, & Stair, 2012).

2.5.2 Fact Base

A fact base that does not capture the whole picture is already debilitating for future action considering policymakers cannot change what is not measured. An inadequate fact base is based solely on maps that delineate hazards, and quantified current property and population exposure to hazards. These are neglecting potential future levels of exposure and alternative future scenarios of exposure and do not account for uncertainty and the possibility for a range of future changes (Berke & Lyles, 2013; Baussan, 2015).

A comprehensive fact base identifies localized hazards, estimates population and property exposed, and models disaster impact scenarios of varying severity and exposure from changing development patterns (Berke, Cooper, Aminto, Grabich, & Horney, 2014; Glavovic & Smith, 2014).

2.5.2.1 Vulnerability Index

Agencies can create a social and climate vulnerability index to reduce vulnerability and increase resilience in low income communities. Data from the index would also help planners and emergency preparedness personnel understand the geography and manner to which resources should be focused (Baussan, 2015).

2.5.3 Policies

Regardless of goals, action all too often focuses on structural projects rather than on comprehensive strategies that coordinate multiple economic, environmental, and social policies and investments (Berke & Lyles, 2013). A superior array of policies is one that is proactive not reactive (Glavovic & Smith, 2014).

2.5.3.1 Preparedness, Recovery & Restoration

Building back better can be realized through action by removing blight, smart growth, enhancing public safety, and distributing services and facilities equitably among others. Actions such as repairing and replacing development, and resuming economic activity satisfy restorative goals (Berke, Cooper, Aminto, Grabich, & Horney, 2014).

In planning for disaster recovery, policies should support individuals, households and communities in returning to self-sufficiency as quickly as possible, affirm and fulfill fundamental disaster housing responsibilities and roles, increase collective capacity and ability to meet the needs of those affected, build capabilities to provide a broad range of flexible housing

options (sheltering, interim housing, and permanent housing), better integrate disaster housing assistance with related community support services and long-term recovery efforts, and improve disaster housing planning to better recover from disaster. These policies might also be temporary building moratoriums, graduated standards for activating building acquisition and relocation, post-disaster housing siting and supply for sheltering, interim housing and permanent housing, provisions for adjusting public facility capital improvements, provisions for changing land use regulations, changing building code standards (Cantrell, Nahmens, Peavey, Bryant, & Stair, 2012; Berke, Cooper, Aminto, Grabich, & Horney, 2014).

2.5.3.2 Infrastructure & Assets

Government policies should generally minimize displacement under extreme flooding and disaster scenarios. In tackling inequities governments can enhance the affordable housing stock, invest in urban infrastructure improvements, and improve access to public transportation particularly in low income neighborhoods. Weatherizing existing low income housing as a preventative measure for expecting the worst, and prioritizing post-disaster repairs to have the greatest impact in low income areas can increase climate resilience. In the event that portions of or whole communities are displaced, voluntary buyout programs should be in place and community relocation programs should be devised with communities to not sacrifice social connectedness or economic vitality (Baussan, 2015).

2.5.3.3 Awareness & Knowledge

Operating in the space where climate adaptation and disaster risk reduction overlap, policies can encompass awareness, training, education and capacity building programs targeted for specific communities including those most vulnerable. Sufficient resources should be reserved to sustain

them, and they should be presented in a way so as not to inject fear to citizens that might occur with negative messaging (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015).

2.5.4 Inter-Organizational Coordination

Unlike the first three principles, inter-organizational coordination can either be present or not present in plans and not just of good quality or bad quality. Pulling from climate change adaptation, coordination would look like an enhancement of the role of local government, and adequate resources provided in support of collaborative governance and local capacity building, local advocacy and disasters as opportunity (Glavovic & Smith, 2014). In recognizing that recovery tasks are interconnected and that a systems approach to institutional management can enhance adaptive capacity, inter-organizational coordination applies systems thinking (Schwab, 2014).

2.5.4.1 *Plan Integration & Horizontal Coordination*

Invaluable collaboration is achieved when there is effective horizontal and vertical integration and coordination of actions across a region or system. In a unified region or system, there is a free flow of information, transparent communication, shared resources, and parallel practices (Schwab, 2014; Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015). Significant interoperability between organizations at all levels is key to a whole government approach whereby policies, programs and actions are developed and implemented across a number of distinct actors (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015). This is accomplished by decentralizing implementation where decision-making authority to carry out operations is spread out across departments, and accountability is emphasized in decision-making (Schwab, 2014). Other components of coordination could be identifying representatives to serve on local recovery task forces charged with directing rebuilding, identifying external organizations to

serve as sources of resources from the network of disaster assistance, and identifying and building trust with elected and civic leaders of climate and economically vulnerable communities via vulnerability indexes (Berke, Cooper, Aminto, Grabich, & Horney, 2014; Baussan, 2015).

2.5.5 Participation

An absence of robust participation in plans is rooted in the limited support for pre-disaster planning with considerable public indifference and local official reluctance to act on public risks. As a result, forward movement on action has been sluggish and limited (Berke & Lyles, 2013). Reserving a place for inclusive and continued participation can ignite communities and planners to improve on their plans, and if a standard of excellence is established, momentum may gather to increase the speed of learning and quality in plans (Brody, 2003).

2.5.5.1 *Diverse Communication*

Residents often become disconnected from the planning process when abstract policy issues are addressed during the development of the comprehensive plan, though they are more engaged when they become aware of the impacts of hazards and climate risks on their personal property and safety. This type of awareness can be achieved through targeted information dissemination in linking planning problems to specific sites or properties, and presenting problems to the public in a way that is comprehensible during the planning process. Positive and committed leadership in government, the private sector and the community is required to improve the communication about climate risks and establish planning and decisions horizons focused on combating future vulnerabilities. Community engagement processes and community partnerships for action can inform leadership. A bottom-up approach to community engagement should be positioned that facilitates a consultative partnership supporting, rather than being replaced by, strong leadership. (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015). Leadership within low income

communities should be championed by state and local organizations by supporting community engagement programs (Baussan, 2015).

2.5.5.2 Capacity Building

Informed, engaged and prepared communities, inclusive of all citizens, that compliments leadership requires a community with high adaptive capacity capable of managing risks especially during the response and recovery phases and seizing opportunities that arise as a consequence of disasters (Brody, 2003). Informed and prepared communities also need the support of awareness, training, education and capacity building programs (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015). Stakeholder groups can boost collective planning capacity by bringing knowledge, expertise, and resources to the planning process. Stakeholder participation can also educate the public through involvement in the process, which can facilitate and increase the pace of collective learning, and help prepare for the impacts of climate change to ensure that a range of development priorities are not undermined in the future (Brody, 2003; Glavovic & Smith, 2014).

2.5.5.3 Participation Techniques

Participation in the planning, response and recovery process can take on different forms and involve many actors. Participation can and should occur in the pre-event phase and after to adaptively manage the recovery process and fit transforming conditions and needs. Participation involves community liaison designation, citizen advisory committees, public meetings, media releases through radio, television and local papers, and in public notices, public surveys and online. Participation should have record of all involved by including a narrative on participants, how they participated, and how they affected the progression of the plan (Berke, Cooper, Aminto, Grabich, & Horney, 2014)

2.5.6 Implementation and Monitoring

Elements of implementation often do not assign organizational responsibility or identify timelines and sources of funding for carrying out action, and monitoring programs often fail to specify indicators and sources of data to track progress toward plan goals and assign organization responsible for data collection (Berke & Lyles, 2013). Monitoring is necessary to ensure that decisions in the recovery process align with the community's vision and long-term recovery goals and objectives outlined in the pre-disaster conceived recovery plan. It also ensures accountability, transparency, and equity in the recovery process in being able to set a time-table for reaching milestones and clearly communicate progress to the public and stakeholders. Monitoring allows damage and economic loss assessments to be reviewed and the need to modify or supplement post-disaster actions to be evaluated. Reviewing priorities for implementation on a regular basis is necessary post-disaster to accordingly adjust as circumstances warrant. The result of monitoring might be recommendations for enactment, extension, or repeal of emergency ordinances and procedures that affect long-term development (Schwab, 2014).

Implementation and monitoring is represented in post-event roles and responsibilities, pre-disaster maintenance to keep implementers familiar with the plan, criteria to guide determination of partial or full activation of the plan, monitoring indicators to track outcomes, use of recovery funds and evaluate and adapt policies, and a space provided for learning and increased financial support in climate change adaptation policy and practice (Berke, Cooper, Aminto, Grabich, & Horney, 2014; Glavovic & Smith, 2014).

Chapter 3. Methods

3.1 Research Strategy

The core of this assessment is to analyze the ability of jurisdictional plans to tackle the intensifying coastal perils of storms and flooding, specifically for the low-income segment of the population that is statistically more vulnerable to these dangers. In order to successfully arrive at conclusive evidence of whether or not these plans are accomplishing that feat, I package recommendations from peer reviewed studies and protocol items from related evaluation protocol into a replicable plan evaluation protocol explicit to reducing the vulnerability and risks of low-income populations.

The hazard mitigation, climate adaptation, emergency management, and disaster recovery plans of the two coastal cities of Norfolk and New York serve as the subject of evaluation. New York and Norfolk, VA are two cities that have been on the forefront of planning for coastal storms, flooding and climate change. As noted earlier, both cities have also experienced a federally declared disaster since 2010, both of which were hurricanes that brought damaging winds and widespread flooding, in Hurricane Irene for the City of Norfolk, and Hurricane Sandy for the City of New York. This is important as it means that both Norfolk and New York have received federal disaster relief and recovery funding, and have had motive to invest in improving their pre-event planning.

To further emphasize the focus on reducing the vulnerability of the low-income portion of the most susceptible populations, certain customary principles in disaster plan evaluation protocol are omitted in place of more appropriate indicators. The resulting fine-tuned evaluation protocol is in the perspective of the planner and plan creator who plans for an area with a fairly high number of low-income residents, even if wealthy residents are also present. As income inequality

has increased in New York where low-income neighborhoods stagnate, and whole portions of Norfolk are overcome by poverty, both cities satisfy the low-income condition of the evaluation protocol. Ultimately, though the specially designed evaluation protocol correlates content present in plans with a determination of plan ability, the framework that is laid out on planning for low-income vulnerable populations in the literature review shapes the interpretation of the plans' proficiency in reducing vulnerability to low-income persons.

3.2 Preliminary Data Collection

The accumulation of plans from Norfolk and New York is the preliminary data collection phase while the principal data collection phase involves dissecting the quality and content of these plans as it relates to each item in the evaluation protocol. The score given to each protocol item or indicator for each particular evaluated plan represents points of data to be analyzed once all plans have been evaluated completely.

Prior to evaluating the plans, to offer additional context to patterns of vulnerability in both cities and areas where social impacts are most likely to occur following a disaster, I conduct vulnerability assessments incorporating pieces of information that are most widely cited as indicators of vulnerability to coastal storms and flooding. This information provides a benchmark to validate that the plans are or are not justified in their approaches to enhancing the preparedness and adaptability of low-income communities particularly vulnerable. The vulnerability indexes that are created influence the plan evaluation process in relation to content relevant to low-income and other vulnerable populations.

3.2.1 Plan Assimilation & Refinement

Plans to be examined in detail under the evaluation protocol were predominantly assimilated from electronic sources. Government and organization, academic and private sector sites, and

academic journals were perused to acquire plans of interest. News articles, press releases, PowerPoint presentations, links from related sites, and journal articles offered knowledge of the existence of plans not immediately apparent in initial searches. Around twenty plans were identified for each city that included action for coastal hazards and climate change risks such as sea-level rise, flooding events, and coastal storms. The plans were produced over a period from around 2003 to the present and represented private-sector, local government, regional government, academic, and state plans. To limit the reach of plans that would be included in the evaluation I placed a limit on the date to be no earlier than 2011 for Norfolk and no earlier than 2012 for New York, or around the time that each had a federal disaster declaration. The list of plans was narrowed down to six for each city. Individually the plans were quite different from each other without substantial overlap for its respective jurisdiction, though they had counterparts across jurisdictions. Collectively, the plans represent collaborative private sector efforts, nonprofit endeavors, resilience-themed comprehensive plans, 100 Resilient Cities funded reports, neighborhood scale plans, federally required hazard mitigation plans, and HUD funded disaster recovery plans.

3.2.1.1 Norfolk Plans

Specific plans for Hampton Roads and Norfolk were obtained from websites for the HRPDC; the City of Norfolk; Hampton Roads and Norfolk's emergency management agencies; state divisions like the Department of Housing and Community Development, the Department of Environmental Quality's Coastal Zone Management program, and the Department of Conservation and Recreation; the Mitigation and Research Institute and the Center for Sea Level Rise at Old Dominion University; Resilient Virginia; Wetlands Watch; federal agencies like HUD and FEMA; Structures of Coastal Resilience; and Norfolk Resilient City.

One criteria for plan selection was that the city of Norfolk must be within the geographic scope of the plan, though it was not required that it be the focus of attention. The second requirement was that the plan, as a means to capture a broad spectrum of plans, must address coastal storms, climate change (as adapting to), sea level rise, flooding, and/or coastal erosion.

Once all pertinent plans for Norfolk were retrieved as complete documents, they were compiled into a full list by name of the document, planning domain or approach, name of the organization responsible, sector the organization belongs in, geographic scope of the plan, and date of publication. Each of these characteristics are important as they may come into play when interpreting and forging conclusions of plan evaluation data, to what degree a plan underperforms or outperforms its scope, and to understand unforeseen factors influencing the quality of the plans. All plans were published either around the time of Hurricane Irene or later, though plans published most recently were included more often.

Table 4. Final List of Evaluated Plans for Norfolk, VA

Document Title	Domain/ Approach	Organization	Sector	Jurisdiction	Publish Date
RE.invest City Report 2015 Norfolk	Risk reduction	Re:Focus Partners	Non-profit	Norfolk	2015
Southside Hampton Roads Hazard Mitigation Plan	Hazard mitigation	HRPDC	Regional government	Southside Hampton Roads	8/1/2011
PlaNorfolk 2030	Hazard mitigation	City of Norfolk	Local government	Norfolk	3/26/2013
Tidewater Rising Resiliency Challenge	Regenerative design	Wetlands Watch, ODU, Hampton U	Non-profit, academic	Norfolk	1/1/2016
ThRIVE: Resilience in Virginia	Community resilience, risk reduction	Commonwealth of Virginia	State government	Hampton Roads	10/1/2015
Norfolk Resilience Strategy	Risk reduction, climate adaptation	Norfolk Office of Resilience	Local government	Norfolk	10/28/2015

3.2.1.2 New York Plans

Specific plans for New York were acquired through websites for the Department of City Planning; the City of New York; New York's emergency management division; state divisions like the Governor's Office of Storm Recovery; New York's Office of Recovery and Resiliency; and Rebuild by Design.

Both criteria were similar as for Norfolk, though the first requirement for New York plans was that the plans be either synonymous with the city itself geographically or be for a subarea of the city like a borough, group of neighborhoods, or neighborhood. The second requirement was that each plan must address coastal storms, climate change (adapting to), sea level rise, flooding, and/or coastal erosion.

Once all pertinent plans for New York were retrieved as complete documents, like Norfolk's plans, they were compiled into a full list by name of the document, planning domain or approach, name of the organization responsible, type of organization or its sector, geographic scope of the plan, and date of publication. All plans were published either around the time of Hurricane Sandy or later. Emphasis was placed on plans that were published most recently.

Table 5. Final List of Evaluated Plans for New York City

Document Title	Domain/ Approach	Organization	Sector	Jurisdiction	Publish Date
Lower Manhattan Protect and Connect: NDRC Phase 2 Application	Mitigation, regenerative design, preparedness	New York City Office of Recovery and Resiliency	Local government	Manhattan	10/1/2015
Resilient Neighborhoods: Edgewater Park	Risk reduction, adaptation	Department of City Planning	Local government	Bronx	10/1/2015
The City of New York Hazard Mitigation Plan 2014	Hazard mitigation	NYC Emergency Management	Local government	New York City	1/31/2014
One New York: The Plan for a Strong and Just City	Adaptation, mitigation, community resilience	The City of New York	Local government	New York City	4/22/2015
PlaNYC: A Stronger, More Resilient New York	Adaptation, mitigation, recovery, preparedness	The City of New York	Local government	New York City	6/11/2013
The Big "U": Rebuild by Design	Regenerative design	Bjarke Ingels Group	Private-sector	Manhattan	6/1/2014

3.2.2 Plan Background & Status

Accounting for the varying uses of plans from information document to policy document to implementation roadmap, the background and status of each plan is identified and noted. To ascertain an understanding of the generalized characteristics, introductory or appended information that does not contribute to the plan evaluations, is scanned. In regards to status, many plans written and published by local governments describe briefly the approval process and the data of plan approval by a respective governing body as a matter of protocol. Others, chiefly those created by consultants, non-profits and academia do not always make this information public in the document itself. Local governments typically are responsible for adopting consulted plans and putting the recommendations and information to use. Most recent budget and financial report information for Norfolk and New York City are inspected to find

current, past or future spending on plans, policies, and programs based out of the evaluated plans. Whatever progress reports, annual updates, or press releases exist for the evaluated plans are also gathered and examined for key status information. All of this accessory information does not affect the plan evaluations in any way, but it does influence the analysis of the plan evaluations, specifically as to the connection between quality vs. scope, and quality vs. adoption.

3.2.3 Vulnerability Assessment

A vulnerability assessment of the two examined cities is conducted by collecting and analyzing a pool of information that illustrates the characteristics of these urban centers and of their inhabitants. This information is specifically representative of the social and physical vulnerability, and hazard exposure of the neighborhoods that make up their composition. Social vulnerability is comprised of socioeconomic status, household composition, minority status, housing type, transportation availability, and community facilities. All of the data except for community facilities can be assembled from the U.S. census and American Community Survey (Berke, et al., 2015). Physical vulnerability is composed of limited infrastructural conditions and construction data. Hazard exposure for neighborhoods in the two cities consists of concentrations of people and buildings located in flood-prone areas.

3.2.3.1 *Census Data*

Specific social vulnerability data points for each block group in both Norfolk and New York City are collected from the 2010 U.S. Census. The 12 variables of data gathered from the census are measures of social vulnerability from the Social Vulnerability Index for Disaster Management developed by the U.S. Centers for Disease Control. The Social Vulnerability Index typically includes 15 variables, however 3 were excluded that were not included in the most recent U.S. Census (Berke, et al., 2015).

Table 6. Social Vulnerability Index for Disaster Management Using Census Variables

Domain	Variable	Description
Socioeconomic status	% Individuals below poverty	Individuals below poverty = "under .50" + ".50 to .74" + ".75 to .99"
	Per capita income	Mean income computed for every person in census block group
	% Persons with less than high school diploma	Percentage of persons 25 years of age or older, with less than a 12 th -grade education
Household consumption	% Persons 65 years of age or older	
	% Persons 17 years of age or younger	
	% Male or Female householder, no spouse present, with children under 18	"Other family: male householder, no wife present, with own children under 18 years" + "Other family: female householder, no husband present, with own children under 18 years"
Minority status	% minority	Total of the following: "Black or African American alone" + "American Indian or Alaska Native alone" + "Asian alone" + "Native Hawaiian and other Pacific Islander alone" + "some other race alone" + "two or more races" + "Hispanic or Latino – White alone"
	% Persons 5 years of age or older who speak English less than well	For all age groups and all languages- the total of the persons who speak English "not well" or "not at all"
Housing/Transportation	% multiunit structure	Percentage of housing units with 10 or more units in structure
	% mobile homes	Percentage of housing units that are mobile homes
	Crowding	At household level, more people than rooms. Percentage of total occupied housing units with more than one person per room
	No vehicle available	Percentage of households with no vehicle available

3.2.3.2 *Vulnerability Mapping*

The data points for each data category are compiled and mapped by block group GIS layer for both the City of Norfolk and the City of New York. The census data provides socioeconomic and demographic information that might not be obtainable otherwise but is limited in its picture of social vulnerability. To supplement this data, several GIS datasets of community facilities are acquired from each city's respective open data site. Facilities such as hospitals, police and fire stations, schools, senior and day care centers, shelters and other miscellaneous facilities are mapped to overlay on top of the census tracts. The GIS data depicts the social resources of people inherent in their proximity to critical facilities.

To convert the qualitative associations of the facilities data into quantitative the distance between and from each spatial feature is measured. That is, the straight-line distance from each feature representing a specific feature is calculated city-wide. The distance is depicted as equally spaced rings where each ring symbolizes a set range of distance. The distance values are then averaged across census tracts so that each census tract can then contain a value for its average distance from a specified type of facility. Distance from critical facilities together with census characteristics of the population make up the complete social vulnerability index.

In order to maintain accuracy and objectivity, first, percentile ranks are calculated for each data point. Otherwise, each data point would unequally contribute to the overall measure of social vulnerability. For instance, the percentage of those in poverty would inhabit a completely different numerical range than per capita income. Also, several data points would need to be flipped, like per capita income, where the lower values represent the higher rank values and the higher values represent the lower ranks. Once all census tracts have rank values between 0 and 100 for each social vulnerability data point, they are all combined into a complete measure of

social vulnerability. Since 17 individual data points were utilized in calculating the social vulnerability of all census tracts for Norfolk – 13 census data points and 4 types of facilities – values for social vulnerability can range from 0 to 1700, as a raw calculation. For New York City, in the same manner, 13 census data points were used and 10 types of facilities. The social vulnerability values for both though are further normalized, for the purposes of mapping, as percentile ranks.

Physical vulnerability is then representative of the structural and infrastructural vulnerabilities of neighborhoods. In theory, the clearest image of structural vulnerability would be the structural condition of buildings of significant use or importance, however, no such information exists on any scale for either city. Still, road and shoreline conditions, green space, and building age and cost information supply enough data to formulate an acceptable physical vulnerability index. Road conditions only exist for New York City, while shoreline conditions such as wetlands, beaches, and green space exist in GIS form for both.

Green space itself could be considered a quality of life measure, but for these purposes it is an indicator of the permeability and thus regenerative ability of the environment in each census tract. Green spaces are treated similarly to facilities, where the average distance from green space is the desired permutation for each census tract. Building age and cost data is collected through the American Community Survey and so it exists for both cities as well. Specifically, for housing cost, the percentage of housing that costs in the lowest or two lowest cost categories for New York and Norfolk is desired. All four data points (three for Norfolk) are normalized the same way through percentile ranks and added together to determine physical vulnerability. The physical vulnerability index is then similarly mapped, after normalizing and combining data points, by census tract to be illustrated at the same scale as the social vulnerability index.

Finally, mapping hazard exposure is more straightforward than social or physical vulnerability. Since hazard exposure is the proximity of buildings and people to hazard-prone areas, mapping it involves depicting the structures and population inhabiting areas in or near flood zones, storm surge zones, or future flood zones based on sea-level rise. Hazard exposure is precisely the product of density and exposure – in this instance flood exposure. Relying on census data and buildings GIS data, population and building density relying on tract areas, are calculated for each census tract. Both of these are overlaid on top of the 100-year flood zone, category 1-3 storm surge areas, and sea-level rise mapping.

Flooding, storm surge and sea-level rise are all joined spatially, but each occurs in differing severities to warrant their depiction. The various flood zones are treated as a hierarchy of flood intensity and frequency. Values are assigned according to the number of different flood zones from current 100-year flood zone to 2050 category 3 storm surge zone, where the current flood zone is assigned a value of 1 and less frequent and future flood zones are assigned values higher. The distances from the lowest chance flood zone is measured and added to the value of that zone. All areas inside of the flood zones receive values according to which they are inside. The high and low values are reversed and normalized by percentile rank. To abide by the accepted equation for hazard exposure, the normalized density (population + building) is multiplied by the normalized exposure values. The resulting values for hazard exposure are again normalized through percentile ranks for mapping purposes. The hazard exposure index itself is thus the approximate number of buildings and people located within different degrees of at-risk areas measured according to density and the size of the at-risk area within each census tract.

3.2.3.3 *Vulnerability Index*

Once all three – social vulnerability, physical vulnerability and hazard exposure – are mapped by census tract, they can be combined into a single measure for social impacts, the intersection of all three. To emphasize the focus on social vulnerability while also applying equal weight to each data point within the indexes, each data point is multiplied by a constant such that the collection of data points representing vulnerability and exposure add up to a total out of 100. The census blocks with resulting values closest to 100 are considered most likely to experience social impacts in the event of a disaster. Creating an index where values for total vulnerability are distributed between 0 and 100 is accomplished by normalizing the minimum and maximum scores for each measure of vulnerability before multiplying each by a constant.

Since census tracts are not synonymous with neighborhood boundaries, neighborhood locations are mapped for each city alongside their census tracts data to aid in vulnerability determination. Neighborhood vulnerability potential is determined by observing the proximity of neighborhoods to their census tract counterparts. Whichever census tract a neighborhood is most closely related with becomes the basis for the level of vulnerability that is observed for a neighborhood. Because of the amount of estimation that goes into juxtaposing neighborhood units to census spatial forms, the neighborhood units are categorized as having either above average, near average or below average vulnerability. Neighborhoods with above average vulnerability are those at or above the 60th percentile compiled vulnerability score. Below average vulnerability is assigned for those at or below the 40th percentile. While near average vulnerability is determined as a value between 40th and 60th percentiles. Mapping is color coded according to each 10-point percentile range to dramatically simplify the process of categorizing the vulnerability of neighborhoods.

3.3 Plan Evaluation & Content Analysis

3.3.1 Coding Instrument

The coding instrument was developed based on a derivation of coding items to serve as a recording unit for the plan content data. Within the coding instrument, the protocol items are a holistic list of coding indicators that represent all relevant or necessary criteria adapted for this study. The items are selected to assess how well each of the plan quality principles for coastal storms and flooding are accounted for in the plans – specifically in enabling low-income populations to be better prepared and adaptable. The content analysis itself cannot forge a conclusion about whether a plan is of superior quality in that regard. The content analysis instead relies on the replicable coding instrument to generate reliable information regarding the content of plans (Berke, Smith, & Lyles, 2012; Berke, Cooper, Aminto, Grabich, & Horney, 2014; Lyles & Stevens, 2014).

To further emphasize the attention given to planning for the low-income, items that contribute more to the preparedness and adaptability of these groups are distinguished from other coding items. Their distinction lies in their weight that is greater than all other general population planning indicators. The weighting of coding items is done categorically, by criteria, rather than individually as all items are linked to similar items by a common criterion. Their specific weighting is detailed in the scoring process. These weighted items are cited as quality indicators that specifically enhance their ability to be prepared and adapt, or they are discussed in research and interpreted as influential indicators created for the coding instrument. All of these more heavily weighted items are subject to influence by the vulnerability index conducted prior to coding. Much of the lesser weighted criteria is still relevant to a degree in planning for low-

income populations, though they are decidedly less important than the others holding greater weight either from emphasis or prevalence in the literature.

3.3.2 Direction-Setting Principles

The direction-setting principles for content analysis embody the vision and objectives of a plan. These principles encompass goals, fact base, and strategies/actions. Each of these principles are broken down into one or more criteria of which the protocol items are nestled under. General context and the overarching vision of the plan both greatly influence how the plan will transpire through goals especially, in deciding on what information is needed, and in making decisions on what strategies and actions to implement.

3.3.2.1 *Goals*

The principle of goals encompasses future desired conditions that the plan intends to achieve that reflects the breadth of values influencing the plan. In addition to general guidelines goals in all plans should follow, in applying to vulnerability reduction, this principle is divided up into the criteria of coordination, equity and social cohesion, restoration, adaptation and anticipation, minimal impacts, and sustainability. Though goals illustrate the intentions and purpose of a plan, no items under that principle receive added weight, even for equity and social cohesion, as goals do not specifically translate into anything physical or measurable.

3.3.2.2 *Fact Base*

The fact base of a plan to reduce vulnerability to coastal hazards is the evidence-based foundation to derive the characteristics of the people in harm's way that contributes to their susceptibility. Therefore, the fact base is partial to the vulnerability assessment, but also includes more generalized existing conditions that set the standard. The vulnerability assessment, setting

the standard for the rest of the document, receives weight equal to that of other more critical planning criteria, and is thus subject to the results of the mapped vulnerability index.

3.3.2.3 Strategies/Actions

The strategy and action indexes are determinants of the approach that a particular plan takes to combat coastal storms, flooding, and climate change. These criteria are of the more ubiquitous awareness/knowledge and coordination, but also include the more specific smart growth and development, preparedness and response, structural and infrastructural controls, design tools, recovery and restoration, households and individuals, and community assets and services.

Awareness/knowledge, smart growth and development, preparedness and response, recovery and restoration, households and individuals, and community assets and services are all weighted to be subject to the result of the vulnerability index.

3.3.3 Action-Oriented Principles

The action-oriented principles are linked to the process and implementation of a plan. These particular principles are of inter-organizational coordination, participation, implementation and monitoring.

3.3.3.1 Inter-organizational Coordination

Inter-organizational coordination is included as a principle for the mobilization of knowledge and resources, adherence and cooperation with other planning domains and organizations, exchange of ideas, and intergovernmental support. Thus, criteria for this principle include plan integration and horizontal coordination. Vertical coordination is typically also essential for plans, specifically with the state and federal level, though is not included as an indicator of quality in planning for vulnerable populations. The pooling of resources to support actions that benefit the

poor manifests through coordination, but is merely an indirect effect on the low-income population and so is weighted no differently than other general population criteria.

3.3.3.2 Participation

Participation is a measure of how the public is engaged to build a knowledgeable and empowered constituency able to devise a plan that reflects local values, risks, needs, capabilities, and enables ongoing public involvement. Participation consists of items that support the planning process, public engagement techniques, and stakeholder/public involvement in the process.

Participation, viewed as a cornerstone in planning for low-income communities, is weighted and influenced by the vulnerability index for all three criteria.

3.3.3.3 Implementation

Implementation ensures that the document is not just a collection of information, but a plan that achieves what it recommends. To do this requires meticulous detail for each policy and program, and universality in language and understanding. Two types of implementation are pertinent for the purposes of this evaluation – responding to and recovering from coastal storms and flooding, and implementing policies and programs. Principles of implementation in the protocol are then responsibilities of organizations, responsibilities of individuals, timeline, and finances. Among implementation items, the responsibility of individuals is weighted with other more essential criteria.

3.3.3.4 Monitoring

The notion of accountability, important in following through on reducing vulnerability to low-income populations, is central in monitoring plans. Monitoring occurs during implementation of the plan to track its performance. The principle of monitoring in the protocol then encompass monitoring implementation, self-monitoring, and updating the plan. Because of the political

capacity bestowed on communities in monitoring the process, items for monitoring implementation and self-monitoring are weighted.

3.3.4 Coding

The principles of the coding instrument can be separated into those that set the direction or purpose of the plan and those that involve action. A total of 100 protocol items for content analysis are divided up among the direction-setting and action-oriented plan principles. Each planning principle has certain criteria that all protocol items meet. For example, a plan principle might be the fact base of the plan, a criteria for fact base could be a vulnerability assessment, and a protocol item within that criteria could be identifying socially and physically vulnerable populations. Coding of each plan under the evaluation protocol is on an item-by-item basis rather than by criteria. A code assigned for a particular protocol item corresponds with a numeric value. A majority of items are coded using an ordinal 0-2 scale, while introductory and vision items are coded using a binary 0-1 scale. 0 denotes that the item does not exist or is not mentioned in the plan, 1 denotes that it exists or is mentioned in the case of a binary scale or that the particular item is mentioned but not detailed in the case of an ordinal scale, and 2 denotes that the item is mentioned and described in sufficient detail. In order for an indicator to be coded with a 2, when applicable, the item should be denoted by a clear and detailed narrative description with lists, tables, figures and maps etc. (Berke, Smith, & Lyles, 2012; Berke, Cooper, Aminto, Grabich, & Horney, 2014).

3.3.4.1 *Coding Process & Reliability*

Because coding the content of these plans is the most subjective and contingent data collection procedure, the various pieces that contributed to this process were arranged in a manner that maximize objectivity. The coding instrument reliably captures the meaning of desired content

through the consistent use of items concocted from contemporary literature, other precedent coding instruments, and my own interpretation of the literature. Where items breed subjectivity in their vague phrasing, relatively speaking, informative comments are placed to accompany each item and reinforce the structure and accuracy of the coding procedure. To further minimize subjectivity, I conceived of an overwhelming majority of the coding indicators directly through the literature I investigated rather than relying on personal inspiration. In most instances the indicators were conceived by triangulating the literary interpretations of items that determine plan quality. An issue that has been commonly expressed in coding plans using a succinct instrument is to experience fluctuating results because fewer opportunities exist to remedy human errors in coding. Many items representative of a type of content or approach reduce the chance that a particular piece of content will be omitted or that errors in coding will invalidate the results. Also, since I am the only coder, it is not necessary to instruct and acquaint other potential contributors with the prerequisite knowledge. This eliminates the natural effect of multiple coder subjectivity, but also a check on the potential subjectivity as a result of my exclusive coding (Norton, 2008).

The actual coding of a plan first requires reading through plans as a basis to grasp their organization and become acquainted with the arrangement of content. After a preliminary “run-through” of a plan, I scrupulously search through sections of the specific plan that would contain certain types of content. Key words are flagged to identify any associations that might satisfy the meaning behind comments accompanying coding indicators. When words and phrases closely match an indicator’s phrasing, a score is applied according to the detail included in that indicator’s comment. Once a section that includes a portion of content has been completely examined in this way, the corresponding portion of the coding instrument is revisited to both

ensure items were coded correctly and that if indicators were not coded because no content closely matched, then they are now coded accordingly. Although, due to the time-consuming nature of constantly revisiting the wording of every coding indicator, and because after enough practice the wording becomes ingrained, I eventually search sections and keep note of pertinent content to code accordingly, through memory of the criteria. Nonetheless, this incremental and adaptive procedure is repeated until all coding principles and criteria have been assigned a score throughout.

3.3.4.2 Spatial Coding for Vulnerability

Before tallying the coding results, and during the coding process, the 54 coding items that are weighted as a result of their subjectivity to the vulnerability index are supplementary scored according to the mapped spatiality of vulnerability. In order to correlate the two processes, the coding indicators for one weighted criterion or category that were identified in an evaluated plan are observed at the spatial level. That is, any mention or detail of the location (neighborhood or sub-area) within the city of a particular quality or piece of content is recorded. Using a table of neighborhoods and block groups with their level of vulnerability specified as either below average, near average, or above average, coding content is tallied for spatial reference into whichever neighborhood it falls within, or census block if, due to vagueness, a neighborhood label cannot be assigned. This is done for all plan content that satisfies one particular criterion.

Once all spatial references for a criterion are recorded, a count is made of the number of spatial references. On a criterion by criterion basis, spatial references for neighborhoods of average vulnerability are negated while below average references are subtracted from above average references. If the operation results in a value of 1 or greater than a score of 1 is tacked on to that criterion's total coded score – the total of scores coded for each coding item within a single

criterion. If the result is a value less than 0 then a value of 1 is subtracted from that criterion's total coded score. In the instance that the count for above average and below average neighborhoods is equal, the score for a criterion is left unchanged. Additionally, if no spatial references are mentioned in the plan for a specific criterion, then this spatial coding process is not applicable and thus the score is also left unchanged. The value that is added or subtracted from a criterion's total coding score acts as a potential bonus point or penalty.

3.4 Data Manipulation & Interpretation

The scores assigned for each coding indicator in the evaluation protocol determine how the data will be interpreted and the results of the interpretation.

3.4.1 Scoring

3.4.1.1 Total Score & Weights

After all plans are scored according to each coding indicator within the protocol, each plan's scores are tallied to determine a total score. The total score generates an idea of the amount of items present and level of detail of those items for each plan. The total score does not however convey the breakdown of scores for specific items and criteria.

To calculate the total score of a plan's evaluation, first, weights are applied to each of the 100 coding indicators. The 54 indicators that were subjected to the vulnerability index receive larger weight than the other 46 indicators that are more broadly applicable for the general population. Hypothetically, a plan could receive a score of up to 200 in the absence of weighting. The score is normalized, however, to be out of 100, where the 54 vulnerability-specific indicators contribute to 75% of the score and the other 46 only 25% of the score. To achieve this result, each of the 54 indicators are multiplied by a ratio of $75/108$ or about 69.4%. The other 46 indicators are multiplied by the ratio $25/92$ or roughly 27.2%. The vulnerability-specific

indicators thus receive about 2.5 times as much weight as the other indicators. Including the spatial coding associated with the vulnerability index, the maximum possible score could be 109, in the event that each vulnerability-specific criterion receives a bonus point. In the absence of this supplementary coding, the highest score is 100.

3.4.1.2 Spatial Coding Scores

Similarly to the regular plan evaluation scoring, for the spatial coding, after all additive or deducted points are tallied, the value assigned to each eligible plan criteria is totaled for every plan. Since 13 plan criteria are coded spatially, each plan can receive up to an additional 13 points added on to its overall evaluation score. The average total spatial coding score is then calculated for each city's set of plans. Finally, to add tangibility, the percentage that would be added or subtracted from each plan's weighted evaluation score is calculated. The total spatial coding score of each plan is multiplied by the fraction of a percentage point that each weighted coding value is worth, 0.694.

3.4.1.3 Plan Principle Percentages

To accompany overall weighted plan evaluation scores, each plan's score is broken down into grouped totals for each of the seven plan principles. The maximum total score for each principle is equal to two times the number of indicators among them. Principles like fact base and inter-organizational coordination appear to have lower scores than all others, but they merely consist of fewer indicators or content. Once calculating the proportion of the total amount that each plan scores for each principle do fact base and coordination more closely resemble other totals. The proportions are determined by calculating the ratio of principle subtotals to maximum principle subtotals. Since the weighted plan evaluation totals are out of 100, the proportions indicate which principles the plans performed better in and which they performed worse in. For instance, a plan

that received a total weighted score of 50 points could have an implementation score of 40% of the total with a participation score of 60% of the total, to balance out to its overall score.

3.4.2 Descriptive Statistics

Statistics describing and summarizing the spread, commonalities, and central tendencies in the data are attained to analyze and reach certain conclusions.

3.4.2.1 *Criteria Statistics*

During the process of tallying all scores, the codes applied to indicator are grouped into subtotals for each criterion. The maximum value for each subtotal would be two times the number of coding indicators among each particular criterion for general population criteria. For vulnerable-specific criteria, the maximum value would be the same plus one point for coding spatially. As an example, the vulnerable assessment criterion inside the fact base principle has three indicators that satisfy its determined requirements for quality. Since the vulnerability assessment criterion is specific to vulnerable populations, it can receive a subtotal value of up to seven. The existing conditions criterion on the other hand can only receive a subtotal value of up to six since it applies to the general population, even though it also contains three indicators.

These subtotals are then averaged by dividing the number of contained indicators by the total score applied for all those indicators for the entire set of plans. This average would be, for a subtotal summing three indicators, the mean of eighteen individual scores. Similarly to mean, standard deviation is calculated for each identical subset of scores. For determining the minimum and maximum of each subset, averages are also generated of the scores applied to each indicator for an entire set of plans. The maximum value is the highest average value for a criterion's set of indicators. The minimum value is the lowest average value indicator. Descriptive statistics in this manner are calculated universally for all criteria for both sets of plans. The statistics are then

packaged and presented as groups of criteria under respective plan principles, direction-setting and action-oriented.

3.4.2.2 Evaluation Score Statistics

Once all plan evaluation score totals are tallied including applying weights, descriptive statistics are calculated for each set of scores. Mean and median are computed to measure central tendency and be able to contrast the scores of each set of plans. Standard deviation and range disclose the spread of scores among each set of plans, and minimum and maximum simply indicate potential outliers in the scores.

3.4.3 Evaluation Scores by Initiative

Relying on the accumulated plan background information for support, the sets of plans for both cities are paired up based on any combination of parallels in approach, type, economic sector, geographic scale, and/or initiative. Not all of the plan pairs are of the same initiative per se, but each one is consistent enough to be decidedly referred to as a type of initiative. After pairing the plans in this way, the average weighted evaluation scores are computed for each set, regardless of the difference in performance. The scores are then further presented by reproducing the plan principle percentage scores for the plans as pairs. The proportions are created by totaling the indicator score averages for each pair of plans again within each individual plan principle. The plan evaluation scores are thus essentially recreated in the format of the plan evaluation tables, but for the set of six pairs where each coding value is an average out of two.

3.5 Data Analysis

Analyzing the results of the research requires examining trends in the data individually and finding associations when paired together with the prevailing research findings. The conditions revealed and outcomes produced across the two jurisdictions by the vulnerability mapping and

spatial coding processes are highlighted, as are the results of the plan evaluations, the heart of the analysis.

3.5.1 Vulnerability & Spatial Coding Analysis

While maps were created representing social vulnerability, physical vulnerability and hazard exposure independently, only the maps portraying social impacts potential – the product of the three measures of vulnerability – are interpreted. After all, this dimension of vulnerability was the impetus behind the supplementation of evaluating plans for their content geographically.

To provide evidence supporting the results of the geographic portion of the plan evaluations, the two maps, one for each city, are deciphered by locating areas with clear concentrations of low or high impacts potential.

The scores assigned to plan criteria for the spatiality of content, influenced by the vulnerability maps, are then examined individually. The bonus points or penalties incurred by each plan is observed. Later, the spatial coding results are associated back with the vulnerability mapping. The spatial coding indicates which areas are receiving more than their fair share of investment and which areas are not, when correlated with the inventory of areas with a high impacts potential and those without. Again pulling in research to tie in to spatial content, the types of outcomes to expect in impact prone areas is inferred.

3.5.2 Plan Quality Analysis

An analysis of the plan quality according to the statistics and qualitative associations linked to the data is explored. The analysis begins with an overall look into the quality of the plans individually and collectively for Norfolk and New York City for the general population and how they are either meeting or transcending the limits of their scope or approach. The plan quality

scores are then linked to adoption and reliance on plans through recent government spending trends and budget leveraging.

3.5.2.1 Planning to Prepare and Adapt

The normalized plan evaluation scores for each plan are indicators of their quality and potential to adequately meet the needs of the general population and especially the most vulnerable in the face of worsening coastal hazards. The total evaluation score for each plan is compared with one another, with the highest score denoting the plan that has the greatest potential to improve the preparedness and adaptability of the population. Certain plans may receive higher overall scores simply due to a broadened vs. narrow scope and/or a primary vs. secondary focus. That is, a comprehensive plan that addresses flooding hazards complimentary to economic development or housing will have an advantage score-wise over an emergency management plan that is produced not typically by urban planners and tailored for a specific purpose while meeting certain protocol.

The initial analysis of the plan content is organized akin to the character of the plan evaluation protocol itself. The content observed in the two sets of plans is extracted and dispersed among the direction-setting and action-oriented segments of the plan. More successful evaluation scores with certain types of goals can be equated with a certain type of vision. Despite being autonomous documents each city's set of plans are analyzed as a unit rather than as they were originally intended in conception. Analyzing their content in this manner allows more dominant themes to emerge that might not have been as perceivable in investigating a single plan. Thus, it becomes possible to speculate within the analysis the intentions of the plans' authors and influential decision-makers. The observed action-oriented content that typically follows later on in the plans can either be associated back with conclusions and hypotheses of the direction-

setting content or serve as a departure from the chronicled prevailing direction of each city's set of plans.

3.5.2.2 Plan Adoption vs. Plan Quality

The plan adoption information compiled from within plans, from progress reports and plan updates, and from financial/budget releases is revisited to compare the plan quality scores of plans with their adoption and reliance. To be able to anticipate what might ensure in the coming years, the progress reports and financial information are summarized independently of the plans themselves and their quality. The implementation and monitoring actions declared in the plans can then be validated or discredited through this information. Rather than report on the adoption and implementation of coupled plans, the analysis is instead returned to investigating the individual plans, since each plan is carried out autonomously.

Many published local and regional government plans, as a matter of requirement for their advertisement for public use, have been adopted. Several of these plans may emerge as superior quality in planning for vulnerable populations and be adopted, but have had little visible impact on the community because of inattention and lax reliance on them by governments. On the contrary, in-house plans may prove to be severely underperforming in quality yet be apportioning off local resources and funds, and be idealized by their creators. A detailed assessment is made of plans on one end of the spectrum, the other end of the spectrum and everywhere in between, in terms of adoption, reliance and quality. In the instance that specific information on the progress of implementation exists for a plan then the quality of the implemented actions is outlined based on their performance in the plan evaluation.

3.5.2.3 Planning for the Vulnerable

Plan evaluation scores are revisited to dissect the results as evidence to support the degree to which these plans are enabling the vulnerable and low-income populations to be better prepared and adapted to coastal storms and flooding. Each plan quality principle broken up into multiple criteria and their subordinate indicators contributes to the adaptability and preparedness of the general population, but only certain criteria and indicators represent enhancements for the low-income population. Since some of these criteria and indicators arose out of socially intent literature repackaged in frameworks for special low-income considerations and community resilience, the composition of the analysis mirrors these frameworks. These frameworks, underscoring the many deep-seated facets of vulnerability among the poor, allow the analysis to plunge deeper into the details of the plan quality and content.

To begin, the quality of vulnerability assessments is commented on in relation to theoretical and empirical declarations for locating and understanding vulnerable populations. Then, theoretical associations are made between the quality of awareness and capacity building programs and formulas for informing risk and strategies to these vulnerable low-income groups. The quality of preparedness and emergency operation strategies and actions to involve individuals together relate to the ability of the plans to prepare and involve the poor. The types of smart growth and housing strategies together with recovery actions in the plans then illustrate how well they are solving potential affordability and disaster housing crises before and after extreme events. To discern the wealth-building and quality of life enhancing abilities of the plans, the quality of household and individual strategies, and community asset and services strategies are critically examined. The extent to which the plans are expanding the capacity and ensuring just representation of the low-income groups is discovered through the quality of inclusion in the

planning process and the landscape of engagement. To round off the analysis, monitoring and individual responsibility quality is critically reviewed by way of the findings on accountability and responsibility.

During extrapolation of the evaluation results – both for the indicator and criteria performance and for the performance of the spatial coding – the vulnerability assessment itself is embedded in the analysis of the plans for low-income population beyond what is directly interpreted from the evaluation results. Characteristics of the mapped vulnerability add an additional layer to surmise the capabilities of the plans in context with the distribution of social and physical vulnerability and hazard exposure. Further associations can then be made between the vulnerability assessment, evaluation results and community resilience/low-income frameworks to equate quality with identified needs. Particularly, characteristics of the vulnerability assessment can be linked with restated literature on low-income linked vulnerability to chronicle the shortcomings and successes of the analyzed plans in fulfilling their moral obligations for low-income communities.

3.5.3 Making Conclusions & Recommendations

Leveraging the foretold analysis as a template, I make conclusions for each of Norfolk and New York on their progress they have made to reduce vulnerability and increase the adaptability and preparedness for future coastal disasters. Relying on the literature for extra support, recommendations are made regarding what could be done better or differently, and what is notably missing in the plans that have been published and adopted in the last several years. Analyses of the quality of each city's plans allows for recommendations to be made for the two urban centers, what each could benefit from the other, and generally which city has been more

innovative and on track with recent theoretical and empirical verdicts on planning to allow for the most vulnerable residents to adapt and prepare for the worst.

3.6 Limitations & Potential Problems

3.6.1 Data Availability

Because of the scope of this study, not all information and knowledge that could have contributed to evidence that supports the conclusion was available. Limited information was available in the time frame of this study to conduct a comprehensive vulnerability assessment that accounts for social behavior and capital, political power, hazard and disaster awareness, etc. of the residents at the neighborhood level in each city. In-person surveys, interviews and assessments might have strengthened the ultimate conclusion or lead to an entirely different conclusion. Furthermore, while the cities may have reported on the progress of their plans, not all aspects of implementation and monitoring can be known without an assessment from the perspective of the low-income residents themselves. Lastly, the range of variability of plans may be so great that it becomes challenging to compare them with one another and also when several plans may be missing substantial content.

3.6.2 Inter-coder Reliability

When a single coder is employed, the audience has no means of assessing whether the judgments made represent those that would have been made by others using the same protocol to evaluate the content. This limitation can hypothetically be reduced by employing two or more coders. The process of using two or more coders enables the audience to be provided with information regarding inter-coder reliability, or the degree to which members of a designated community concur on the readings, interpretations, responses to, or uses of given texts or data. When a single coder is used in content analysis, individual biases will affect the coded data and the analytical

results derived from the data (Stevens, Lyles, & Berke, 2014) Without a second individual to code the plans, the reliability of the plan evaluation data in this study can be put into question, though as outlined earlier, there are also benefits to employing a single coder to obtain the results. Nonetheless, the results of the plan evaluation analysis lay heavily on my own judgment of the content within the plans and my interpretation of the results.

Chapter 4. Results

4.1 Introduction

Presented in proceeding are the results of the two sets of six plan evaluations outlined in the previous chapter that are central to subsequent declarations and conclusions. Remaining consistent with the order of research, observations from the vulnerability mapping process are shared, including data sources used, the influence of individual variables on the distribution of vulnerability, and areas with distinctively higher or lower than average vulnerability. Next, the results of the spatial coding process, which utilized the vulnerability maps for reference, are presented. Even though the spatial coding process was conducted after the plan evaluation process, the final evaluation scores could not be tallied until each plan evaluation was supplemented with the bonus scoring. Thus, the entire plan evaluation results are introduced as the final round of data collection. Once all data results are shared, descriptive statistics generating evidence for trends in the plan quality and content are provided.

4.2 Plan Background

4.2.1 Plan Compliance

4.2.1.1 *Hazard Mitigation*

In compliance with the Commonwealth of Virginia Hazard Mitigation Plan and the Disaster Mitigation Act and its subsequent amendments, Southside Hampton Roads has continually released a hazard mitigation plan of its own, partially funded by FEMA, to remain eligible for disaster assistance funding. Similarly to the state hazard mitigation planning process, the regional hazard mitigation planning is iterative and is updated at regular intervals of every five years (Southside Hampton Roads Hazard Mitigation Planning Committee, 2011). The first rendition of the Southside Hampton Roads Hazard Mitigation Plan was contracted out to a private company,

without having the internal knowledge and expertise to conduct a sufficient assessment in-house. The entire series of hazard mitigation plans for the sub-region is paid through by the same FEMA Pre-Disaster Mitigation Grant under the Disaster Mitigation Act (Southside Hampton Roads Hazard Mitigation Planning Committee, 2011).

New York City's Hazard Mitigation Plan also meets all requirements under the Disaster Mitigation Act, while expanding on the role of the plan. The New York State Department of Homeland Security and Emergency Services promotes the production of jurisdictional hazard mitigation plans across the state, like New York City's, through planning initiatives and select grants. As is the case with the Southside Hampton Roads Plan, NYC's plan is a living document to be refined and updated every five years (NYC OEM Hazard Mitigation Unit, 2014).

4.2.2 Planning Initiatives

4.2.2.1 *RE.Invest Initiative*

The RE.Invest Initiative is a partnership between Re:Focus Partners and the Rockefeller Foundation, both of whom have resilience at the core of their goals. The Rockefeller Foundation supplied a stream of funding and oversight for the eight selected partner cities to use public resources more efficiently and attract new sources of private investment (Gardner & Damm, 2013). The initiative joined the ranks of others to apply a personal approach to enhancing community resilience, while taking into account locational attributes and character. The RE.invest report specialized for Norfolk focused on rethinking stormwater, energy and communications infrastructure based on the team's findings that these systems embodied gaps in investment that undermine the ability of Norfolk to achieve resilience. The team then designed and engineered projects that fell into one or more of those categories, for various locations around the city (Re:focus Partners, 2015).

4.2.2.2 Rebuild by Design

The Rebuild by Design competition was launched by the executive ordered Hurricane Sandy Rebuilding Task Force in June of 2013. It was intended to be a multi-stage planning and design competition to promote resilience in the region most greatly affected by Hurricane Sandy. HUD administered the competition in partnership with philanthropic, academic and nonprofit organizations. The competition aimed at promoting place-based resilience-enhancing strategies that could be replicable and scaled up to be applied to the region (Hurricane Sandy Rebuilding Task Force: Rebuild by Design, 2014).

By June 2014, the interdisciplinary selection committee identified seven winning entries to receive a cut of \$930 in Community Development Block Grant Disaster Recovery (CDBG-DR) funds that would be directed toward implementing the first phase of the projects. Four affected regions including New York City incurred further funding from HUD's CDBG-DR in October 2014 to supplement Sandy recovery and assist in implementing the winning ideas from the Rebuild by Design competition (Hurricane Sandy Rebuilding Task Force: Rebuild by Design, 2014). The competition's mission, to cultivate holistic designs that resolve reoccurring flooding and other vulnerabilities pre-disaster, was supposed as a directive to rethink the traditional rebuilding disaster response.

4.2.2.3 Rising Resiliency Challenge

The Tidewater Rising Resiliency Design Challenge, born out of the Dutch Dialogues, was the product of years-worth of deliberation between local government, nonprofits and outside consultants, to fill a void in adaptation work. The Dutch Dialogues was a series of brainstorming discussions and workshops spanned over several days hosted by an international panel, notably from the Netherlands, that is accustomed to adapting to sea level rise. The panel handed off

responsibility to the coalition of local stakeholders representing higher education, local government, the general public, and the private and non-profit sectors (Dutch Dialogues Virginia, 2015).

The Tidewater Rising Resiliency Challenge arose from the series of sessions to carry on the progress made in envisioning site-specific regenerative strategies by scaling down. The exercise facilitated by a collaboration between professors at Hampton University and Old Dominion University assigned their students from backgrounds in architecture and civil engineering to explore viable place-based solutions to sea level rise and coastal vulnerability. Their work centered on the Chesterfield Heights neighborhood in South Norfolk, after whittling away three other candidate neighborhoods located in Hampton, Newport News and Portsmouth. The selected Chesterfield Heights neighborhood fronts the Elizabeth River and is adjacent to several low income neighborhoods of interest (Stiles, 2014; Stiles Jr., Andrews, & Erten-Unal, 2015).

4.2.2.4 Resilient Neighborhoods

Resilient Neighborhoods is an initiative administered by New York's Department of City Planning that rides the momentum started by Rebuild by Design, New York State's Community Reconstruction Program, and other place-based resilience initiatives. The initiative was launched in 2013 to work with communities adjacent to or in the floodplain so that they conform to the newly codified Flood Resilience Zoning Text Amendment, adopted in October 2013. After firsthand experience of coastal flooding risk, land use, zoning, and development is revamped through infrastructure investment and other policies and programs. All of the neighborhood studies under the initiative are funded by HUD's Community Development Block Grants for Disaster Recovery. A similar initiative – PLACES (Planning for Livability, Affordability, Community, Economic Opportunity and Sustainability) – was started to address affordable

housing, economic development and community resources, in accordance with Housing New York, the city's housing plan published in 2014 (Resilient Neighborhoods, 2016).

4.2.2.5 100 Resilient Cities

The challenge is a global initiative evoked to inspire cities to join the resilience movement and combat their most pervasive problems in innovative ways. The pioneer of the 100 Resilient Cities movement, the Rockefeller Foundation, engaged in a selective process to grow the network of cities that are extended the opportunity to participate. A panel of experts comprised of 100 Resilient Cities' team members reviewed the many applicant cities that sought inclusion. The selection process consisted of three separate rounds of cities to be awarded membership into the network. Both Norfolk and New York City were among the first 32 cities to spearhead the challenge beginning in December 2013. Subsequent groups of 35 cities in 2014 and 33 cities in 2016 followed their lead in devising resilience strategies (100 Resilient Cities, 2016).

As members of the network of 100 Resilient Cities, participants gain access to financial and logistical guidance; expert support for development of a custom-fit resilience strategy; solutions, service providers and partners from the various sectors for formulating and implementing; and mutual accountability from the global network of cities (100 Resilient Cities, 2016). 100 Resilient Cities' City Resilience Framework, the foundation of its advisory approach, was developed by Arup in collaboration with the Rockefeller Foundation. The Framework is built upon the four dimensions of urban centers – health and wellbeing, economy and society, infrastructure and environment, and leadership and strategy. The four dimensions and set of three drivers that influence each dimensions are ubiquitous across all city reports (The City Resilience Framework, 2016).

4.2.2.6 National Disaster Resilience Competition

More recently, coinciding with broad adoption of resilience, HUD organized a competition among communities that suffered from a federally declared natural disaster occurring between 2011 and 2013, to devise innovative solutions for recovering from these prior disasters and improving their ability to withstand and more swiftly recover from future disasters and hazards. The National Disaster Resilience Competition (NDRC), in partnership with the Rockefeller Foundation, was a two-phase competition that awarded up to \$1 billion in HUD Disaster Recovery funds to eligible communities (U.S. Department of Housing and Urban Development, 2015). The NDRC also pulled from the successes of the Foundation's Rebuild by Design competition to inform a participatory and stakeholder-driven process (Gonzalez, 2016).

The first phase of the competition requested applicants to frame their ideas for recovering from the effects of the affecting disaster, advancing community development objectives, and to improve the ability to absorb or rapidly recover from the effects of future events, threats or hazards (U.S. Department of Housing and Urban Development, 2015). Applicants were required to consult with stakeholders, and frame the recovery needs, personalized risks and vulnerabilities, and associative development opportunities within the targeted area. The intention was for applicants to demonstrate a connection between unmet recovery needs from the applicatory declared disaster to the revealed objectives (Taffet, 2014).

Those applicants that were selected to proceed into the second phase of the competition then were required to conceptualize their ideas into a resilience-enhancing disaster recovery or revitalization project that addresses their identified risks, vulnerabilities, and development opportunities (U.S. Department of Housing and Urban Development, 2015). Phase 2 applications were deemed worthy of funding if they demonstrated how the proposal would help the target

community recover from the effects of the disaster, achieve community development objectives like economic development, and enhance the community's ability to remain resilient when confronted with a future extreme event or stressor. The implementation proposals were also required to include a benefit-cost analysis to further their case for funding (Taffet, 2014).

4.3 Plan Leadership Composition

4.3.1 Norfolk's Plans

4.3.1.1 Southside Hampton Roads Hazard Mitigation Plan

Planning Committee: Municipal Planning, Emergency Management, Administration, and Utility representatives from the cities of Norfolk, Portsmouth, Suffolk and Virginia Beach, county of Isle of Wight, and towns of Smithfield and Windsor.

Planning support from the Hampton Roads Planning District Commission and Salters Creek Consulting.

Sponsored by the Virginia Department of Emergency Management and the Federal Emergency Management Agency.

4.3.1.2 PlaNorfolk 2030

Contributions from Norfolk City Council, Norfolk City Planning Commission, Norfolk Design Review Committee, Norfolk Historic and Architectural Review Committee, City of Norfolk Administration, and the Norfolk Department of Planning and Community Development.

4.3.1.3 RE.invest Initiative

Planning comprised of team members from RE.focus Partners. Initiative supported by the Rockefeller Foundation.

4.3.1.4 Tidewater Rising Resiliency Challenge

Partnership between the Department of Architecture at Hampton University and the Department of Civil and Environmental Engineering at Old Dominion University. Support from Skip Stiles of Wetlands Watch.

4.3.1.5 Norfolk Resilience Strategy

Norfolk Office of Resilience.

Resilience Steering Committee: City Administration, non-profit leaders, business leaders, higher education, Hampton Roads Planning District Commission, City Planning Commission, City Council.

Coastal Resilience Working Group: Department of Public Works, Department of Planning, Department of Utilities, Department of Emergency Preparedness and Response, Department of Development, City Administration, Non-profits, Businesses, Higher education

Neighborhood Resilience Working Group: City Administration, Police Department, Department of Human Services, Department of Planning, Department of Public Health, Norfolk Redevelopment and Housing Authority, Department of Neighborhood Development, Department of Public Works, Department of Fire and Rescue, Social service organizations

Economic Resilience Working Group: Department of Economic Development, Economic Development Authority, Office of Budget and Strategic Planning, Commission on Poverty Reduction, Business leaders, Non-profits, Chamber of Commerce, Higher education

4.3.1.6 ThRIVE: Resilience in Virginia Phase 2 NDRC Application

Oversight from the Governor's Commission on Climate Change. Leadership from the Virginia Department of Housing and Community Development. Support from the City of Norfolk (Office

of Resilience), City of Chesapeake (Redevelopment and Housing Authority, Department of Public Works), and the City of Newport News (Fire Department, Division of Emergency Management, Engineering Department, Planning Department, Codes Compliance Department, Development Department).

4.3.2 New York City's Plans

4.3.2.1 *New York City Hazard Mitigation Plan*

Planning Team: Office of Emergency Management, Department of City Planning, Office of Long-Term Planning and Sustainability.

Mitigation Planning Council Steering Committee: Dept. of Buildings, Dept. of Environmental Protection, Dept. of Parks & Recreation, Dept. of Transportation, Metropolitan Transportation Authority, Regional Plan Association, Dept. of Health and Mental Hygiene, Mayor's Office of Housing Recovery, Police Dept., Fire Dept.

Mitigation Planning Council: 39 agencies, public authorities, non-profits, private utility providers from 2009 Hazard Mitigation Plan plus City University of New York, HRO, Mayor's Office of Environmental Remediation, Office of Management and Budget, Office of the Chief Medical Examiner.

4.3.2.2 *PlaNYC: A Stronger, More Resilient New York*

Building Resiliency Task Force: real estate owners, property managers, architects, engineers, contractors, utility representatives, subject matter specialists, city officials, code consultants, coast estimators, attorneys (steering committee, working groups, buildings committees)

Lead City Agencies: Office of Long-Term Planning and Sustainability, Dept. of Parks & Recreation, NYC Economic Development Corporation, Dept. of Environmental Protection, Dept.

of City Planning, Dept. of Small Business Services, Mayor's Office of Housing Recovery Operations, Dept. of Housing Preservation and Development, NYC Housing Authority, NYC Industrial Development Authority, Dept. of Citywide Administrative Services, Office of Emergency Management, etc.

4.3.2.3 BIG "U" Rebuild by Design Report

Co-leadership from Bjarke Ingels Group (BIG), and One Architecture. Support from private firms Starr Whitehouse, Buro Happold, Level Infrastructure, Arcadis, James Lima Planning & Development, Green Shield Ecology, AEA Consulting, Project Projects, and the School of Constructed Environments at Parsons the New School

4.3.2.4 Edgewater Park Resilient Neighborhoods Report

Leadership from New York Department of City Planning.

4.3.2.5 OneNYC

Project Director: Office of Sustainability

OneNYC Team: 70 leaders from deputy mayoral offices, mayoral offices, social service organizations, private sector boards, NGOs, non-profits, commissions, and municipal agencies representing health, economic development, housing, environment, transportation, utilities, technology, finances, sustainability, recovery, emergency management, and resident services.

Steering Committee: Deputy Mayor, Deputy Director, Office of Management and Budget, Deputy Mayor for Strategic Policy Initiatives, Advisor to the Mayor for Recovery, Resiliency, and Infrastructure, Office of Operations, NYC Planning Commission, Department of City Planning, Office of Recovery and Resiliency

4.3.2.6 Lower Manhattan Protect & Connect Phase 2 NDRC Application

Leadership from Mayor's Office of Recovery and Resiliency, Department of Housing Preservation and Development, New York City Economic Development Corporation, New York City Housing Authority, and the Trust for Public Land.

4.4 Vulnerability Assessment

Maps depicting social vulnerability, physical vulnerability, hazard exposure, and most importantly social impacts potential were created. All maps shared are of the social impacts potential, an index of social vulnerability, physical vulnerability and hazard exposure, in each respective city. In reaction to conducting content analysis, seldom did the plans of interest provide measures of vulnerability mapped equivalently to the maps to follow, much less rely on them.

4.4.1 Norfolk

The measure of potential for social impacts among each census tract not purposefully but coincidentally favors social vulnerability more heavily than physical vulnerability or hazard exposure. Each available type of geographic data was represented consistently across all used variables. There was more data available to illustrate social vulnerability. Variables included the 12 census data points, distance from facilities such as public transportation, emergency facilities, hospitals, and police and fire stations, housing age and cost, parks, population and building density, and distance from flood zones. Each variable was standardized by converting data points into percentile ranks to ensure each one has equal effect on social impacts potential.

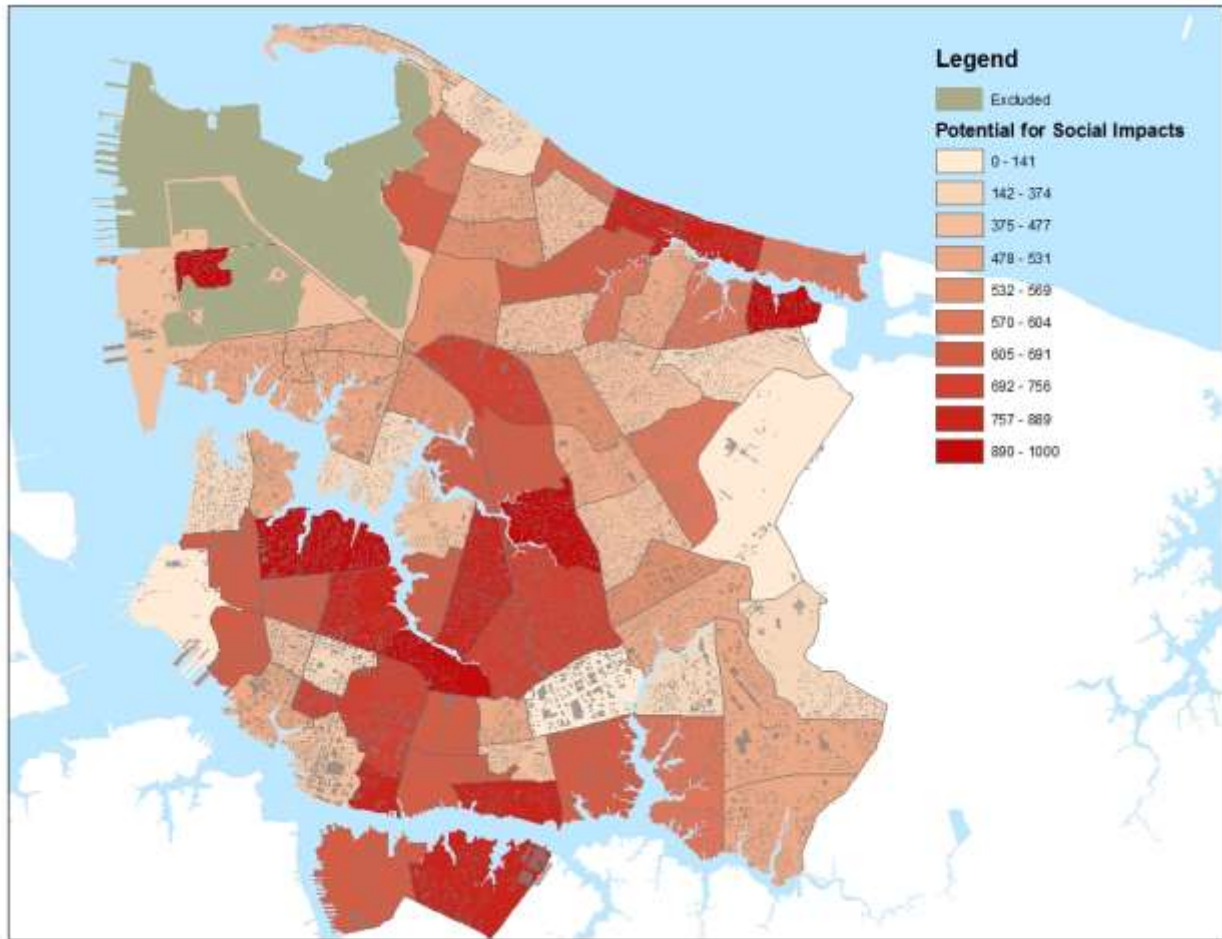


Figure 2. Norfolk's Potential for Social Impacts by Census Tract

All census and other geospatial data are mapped at the census tract level. Norfolk Naval Station is depicted as excluded for its absence of available data. Generally, areas of Norfolk with the highest impacts potential/vulnerability are those tracts located along the southern shore of the Lafayette River that cuts through the center separating northern neighborhoods from those to the south. Incidentally, a majority of neighborhoods with the highest level of vulnerability are synonymous with those having the greatest concentration of affordable housing and city-owned public or mixed-income housing. With 80 census tracts and as many individual neighborhoods, maps are separated into northern and southern halves to zoom in on and declutter neighborhood names.

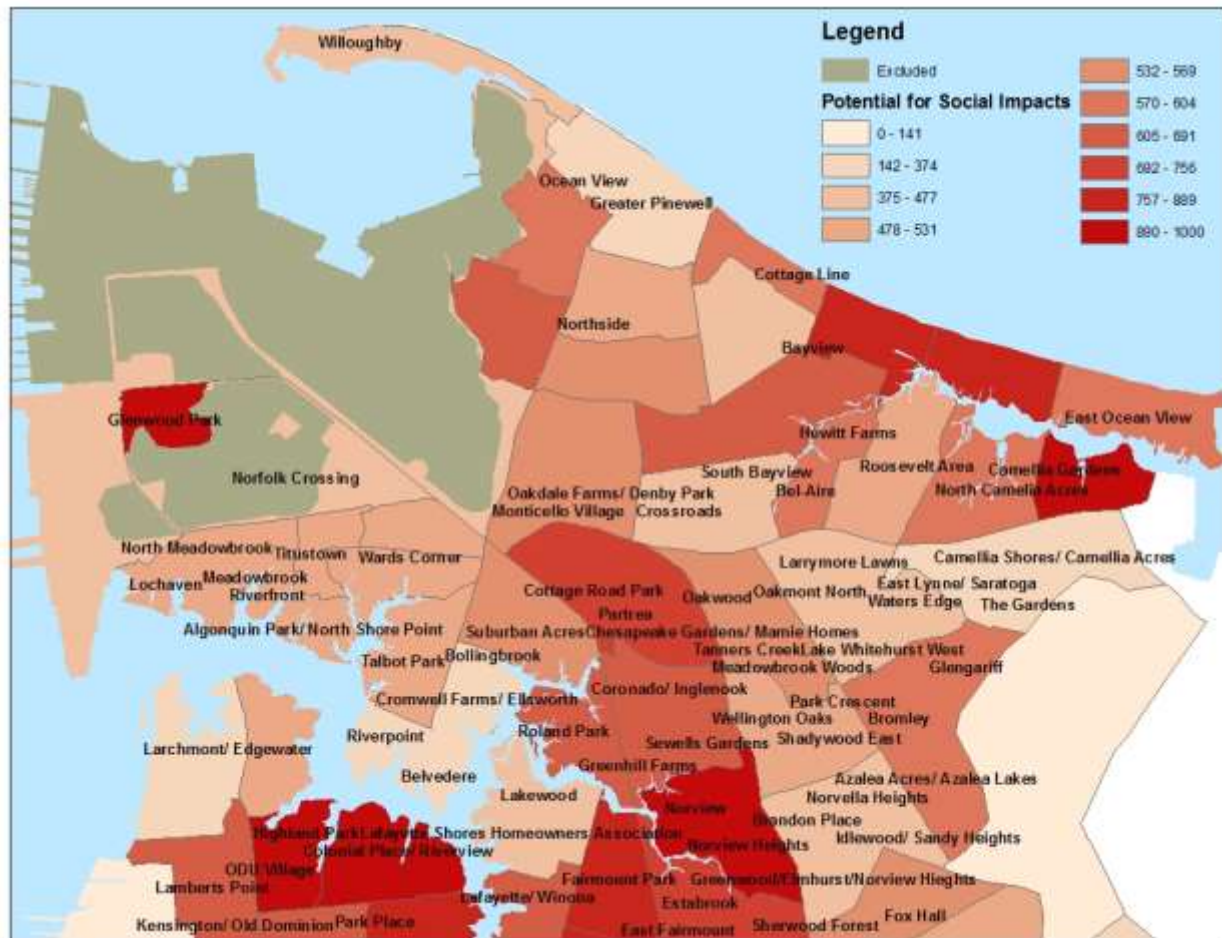


Figure 3. Norfolk's (North) Potential for Social Impacts, with Neighborhood Locations

Neighborhood labels overlaid on top of the vulnerability data represent names applied to civic league territories. Many are not identical in size and location to census tracts, although are useful in identifying neighborhoods nearest to and intersecting census tracts.

In far northern Norfolk, along the shoreline, areas of heightened impacts potential are concentrated on the eastern end. The western half of the East Ocean View, eastern half of the Cottage Line, northeastern section of the Bayview, and the Camellia Gardens neighborhoods all experience the greatest potential for social impacts. Despite the Willoughby Spit in the far northwest being almost entirely within the flood plain, its density is extremely low in comparison

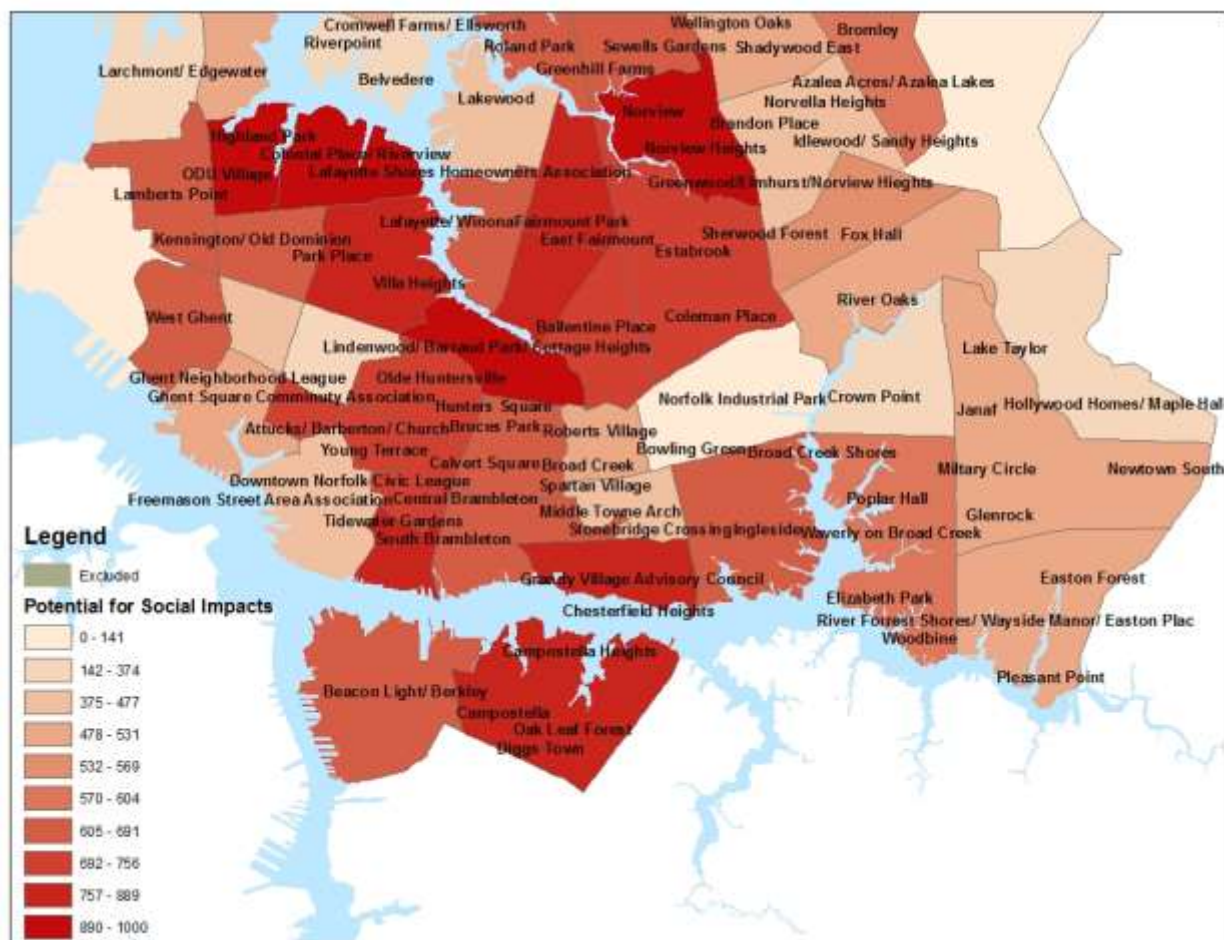
with the rest of Norfolk. Its population and building density being at the bottom causes its hazard exposure (1.4) to be well below average (29.4) despite the high probability of flooding.

Compounding this is the fact that almost all of its census-based vulnerability statistics are below average. However, since Willoughby and the rest of the shoreline neighborhoods are distant from many facilities, their facilities access is above average.

The worst social vulnerability in this region is in lower East Ocean View and Camellia Gardens.

Most noticeably, this high social vulnerability stems from housing and transportation, though also in every other category. Other neighborhoods in the northern half with high social vulnerability (between 85 and 90 compared to the average of 57) include all those bounded by I-64, Little Creek Road, and Military Highway such as Partra, Chesapeake Gardens, and Oakwood. In spite of the prevalence of minority and low economic status in these neighborhoods, impacts potential is less, between 550 and 750, than in the poorer shoreline neighborhoods, between 840 and 900. These inland neighborhoods have slightly better access to facilities and are less prone to flooding.

As noted before, many of the neighborhoods to the south and east of the Lafayette River have some of the highest levels of vulnerability. One neighborhood, bounded by Military Highway and Wayne Creek, Norview, has among the worst overall vulnerability. In particular, it is physically vulnerable. Norview consists of predominantly out-of-date single family homes with little open space to absorb the impacts of flooding. And while it is relatively average in most social vulnerability indicators, its hazard exposure is in the top tier with the combination of a high built density and close proximity to the flood plain.



To the southwest of Norview is Fairmont Park which stretches from Chesapeake Boulevard to Tidewater Drive east to west and from Wayne Creek to the Lafayette River north to south. Hazard exposure is above the average of 29.3 at 58.1 in the northern half and 54.5 in the southern half of the neighborhood, but it is not as high as in some other neighborhoods bordering the Lafayette River. The flood plain largely inundates peripheral areas of the neighborhood nearest to the two bounding waterways. Like Norview, there are many aging single-family homes, but also many older multifamily units. Similarly, Fairmont has little buffer against flooding with a high built density and a negligible amount of open space. On whole, Fairmont

Park has a potential for impacts that is well above the city-wide norm at between 850 and 890 that mostly accounts for its hazard exposure and physical vulnerability than social vulnerability.

The five most vulnerable neighborhoods of Highland Park, Colonial Place, Riverview, Lindenwood, and Barraud Park all border the Lafayette River to the north. Highland Park, Colonial Place and Riverview are all fairly compact low-lying neighborhoods meaning they are partially surrounded by the flood plain. Hazard exposure is expectedly high, especially in Colonial Place/Riverview where it is the highest in all of Norfolk at 93.7 due to the combination of high density and flood probability. Social vulnerability is relatively average in these three neighborhoods (slightly higher in Highland Park), but physical vulnerability is again high in Colonial Place/Riverview. Upstream in Lindenwood/Barraud Park, hazard exposure is also above the 29.4 average, though much less than in the downstream neighborhoods, at 47.9. Social vulnerability is instead the Achilles heel of Lindenwood/Barraud Park. A vast majority of residents are rent strained, poverty is substantially high, educational attainment is low, access to transportation is poor, and the neighborhood is almost entire made up of minority groups.

The three census tracts bordering the Elizabeth River that have an impacts potential value of 800 or above also have astronomically high social vulnerability. Neighborhoods in these tracts such as Tidewater Gardens, Grandy Village, Oak Leaf Forest and Diggs Town are all known for their public housing developments. South Brambleton, Chesterfield Heights, and Campostella/Campostella Heights are other neighborhoods inside of these tracts. Tidewater Gardens and South Brambleton together have the highest percentage in several census variables. They are also even more flood prone than Colonial Place/Riverview. However, because Tidewater Gardens/South Brambleton are fairly low density and have a subsequently high amount of open space, hazard exposure is only slightly above average at 38.5, and physical

vulnerability is on the low end. Grandy Village/Chesterfield Heights also have high percentages in census variables but not as high as in Tidewater Gardens/South Brambleton. Furthermore, even though poverty is prevalent, few residents are rent strained, as affordable single family homes are the dominant housing type especially in Chesterfield Heights. Chesterfield Heights/Grandy Village fare a little better in floods than Tidewater Gardens/South Brambleton with a hazard exposure of 31.7, but they are much more vulnerable physically. South of the Elizabeth River, Campostella/Oak Leaf Forest/Diggs Town actually have a hazard exposure that is less than average at 17.5. Due to both aged and poor quality housing, these neighborhoods have among the highest physical vulnerability, and score low in several socioeconomic indicators.

4.4.2 New York City

The geography of impacts potential in New York City is several times more complex than in Norfolk, although the vulnerability of many of these locations in the city surfaced during and after Hurricane Sandy. New York City dwarfs the number of census tracts in Norfolk with a total of 2,167. More geographic data exists for each census tract making it possible to measure certain variables that data did not exist for in Norfolk. Data employed for New York City not available in Norfolk include road conditions, wi-fi access, access to evacuation centers and homeless shelters, access to medical and care facilities, and access to food pantries/soup kitchens. Unlike the vulnerability maps created for Norfolk, these maps are further divided into one for each of the five boroughs. Trends in vulnerability are described more broadly as a result.

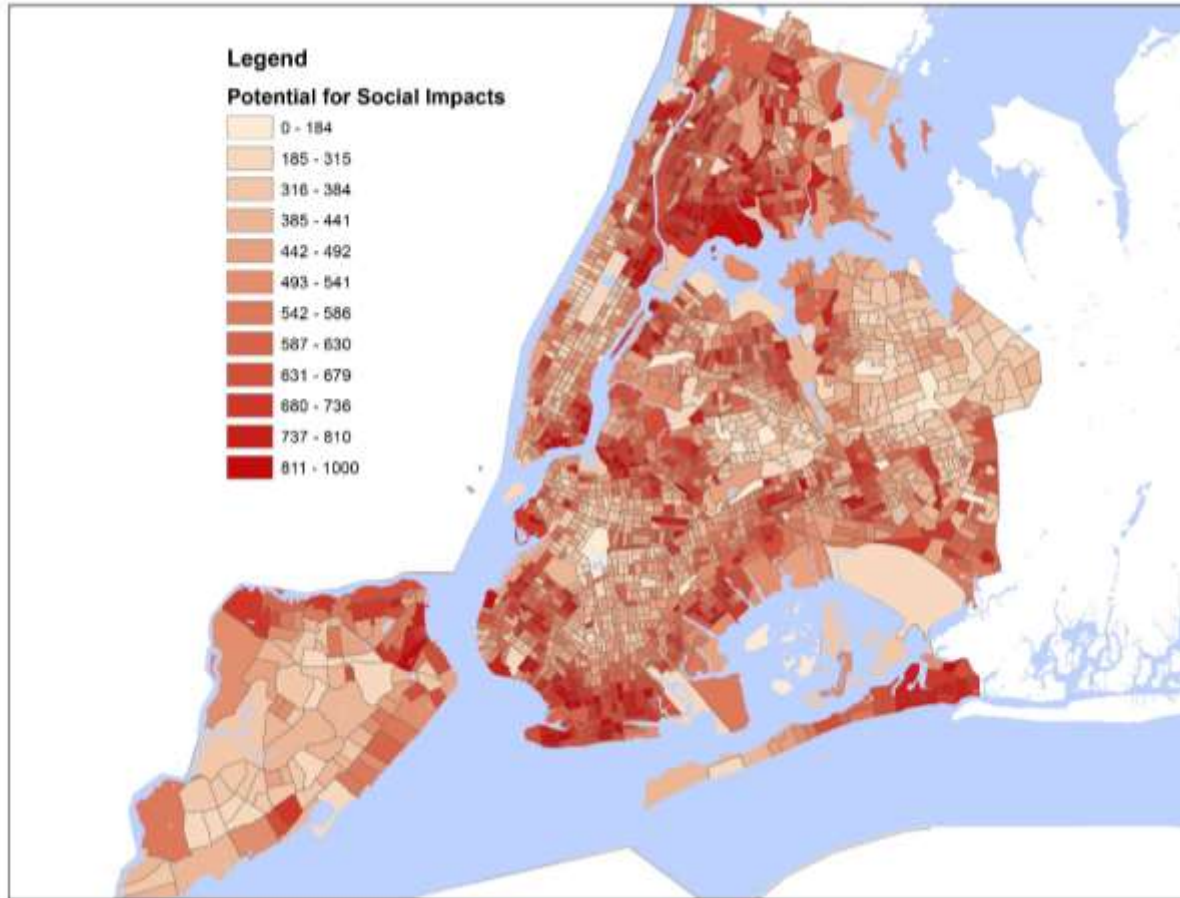


Figure 5. New York City's Potential for Social Impacts by Census Tract

Notable hot spots across the city with higher than average social impacts potential include much of the Bronx and northern Manhattan, eastern lower Manhattan, scattered neighborhoods along the Brooklyn/Queens riverfront, Southern Brooklyn, the far eastern shoreline, and northern Staten Island.

4.4.2.1 *Bronx*

On the whole, the Bronx is the most vulnerable borough of New York City, with the most prominent pockets of vulnerability located at the southern end nearest to Manhattan. Borough-wide, the Bronx has an average impacts potential of 623 compared with the average of 542 citywide. Specifically, the impacts potential from Hunts Points heading west and from the

Melrose neighborhood south is about 783 (among 32 census tracts). The social vulnerability averages at about 73.3 and hazard exposure around 55.7 in these neighborhoods compared to citywide averages of 52.3 and 36.1, respectively, and Bronx-wide averages of 62.5 and 37.9, respectively. Of the census tracts in the Bronx with impacts potential under 500, a considerable amount of them are of parks and open space. Many of these parks stand out as islands of low vulnerability in a sea of high vulnerability. Along the riverfront from Hunts Point to Marble Hill, these 16 census tracts have an average social vulnerability of 75.5. This scale of social vulnerability exists nowhere else along a waterfront. To illustrate the magnitude of vulnerability in the Bronx, 36.3% of its census tracts have an impacts potential above 680 compared to only 19.2% in all of New York City. At about 14% of the city's total territory, the Bronx contains around 30% of New York's extremely vulnerable tracts.

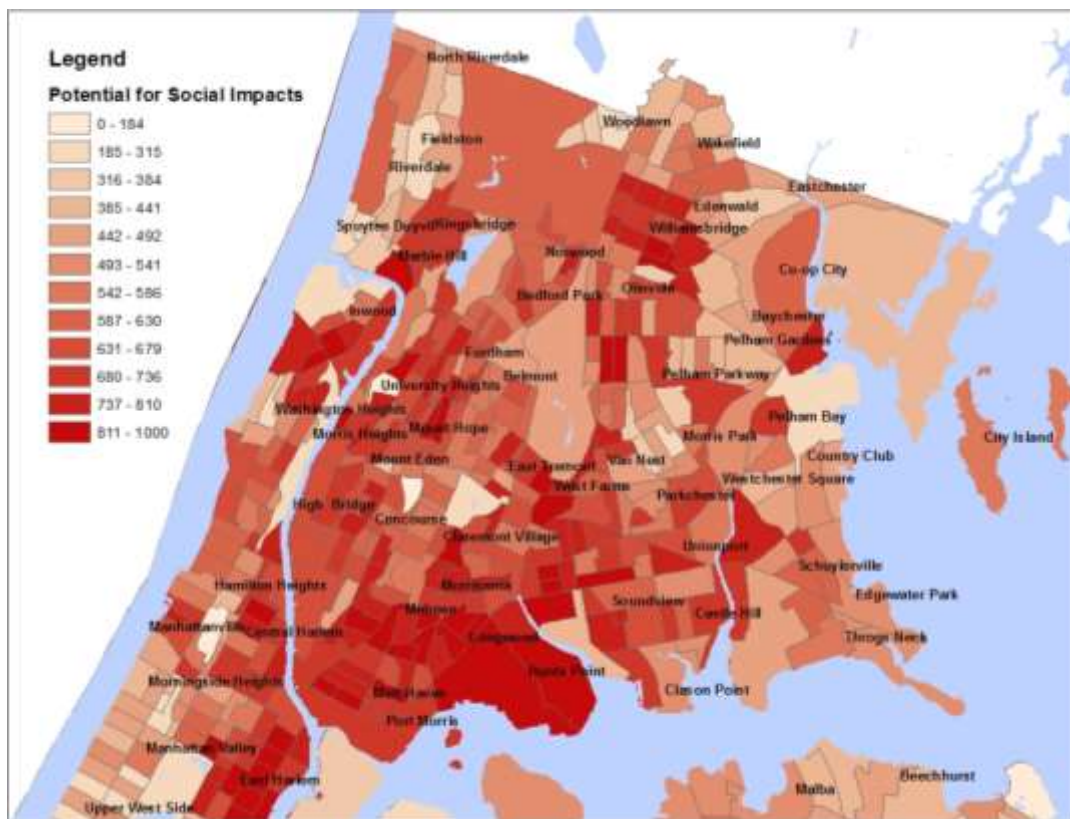


Figure 6. Bronx, NY Potential for Social Impacts, with Neighborhood Locations

4.4.2.2 *Manhattan*

Stark contrasts exist between less vulnerable and more vulnerable areas in Manhattan. From about Carnegie Hill north, high vulnerability is fairly concentrated. Meanwhile, from Carnegie Hill south to Stuyvesant Town none of the tracts here have an impacts potential as high as the average in the Bronx. About 34.7% of New York's tracts have an impacts potential either below 384 or above 680. In Manhattan, about 40% of tracts have impacts potential values at those two opposite ends of the spectrum. Thus, Manhattan has a higher inequality of impacts potential, mostly from the unequal distribution of social vulnerability. 44.8% of New York City census tracts have a social vulnerability above 62.4 or below 40.6. In Manhattan, 70.5% of census tracts have a social vulnerability in these two zones. Two hotspots of vulnerability in Lower Manhattan are the Lower East Side and Two Bridges below Chinatown. These two neighborhoods contain 12 census tracts with impacts potential above 750 yet they are located adjacent to the major economic hub that is Lower Manhattan. The East Harlem Neighborhood alone also contains 9 census tracts with impacts potential values this high. Overall, Manhattan has the highest hazard exposure of all of the boroughs with a value of 44.4. Specifically, from Midtown southward, in this densest of places, hazard exposure averages around 51.3.

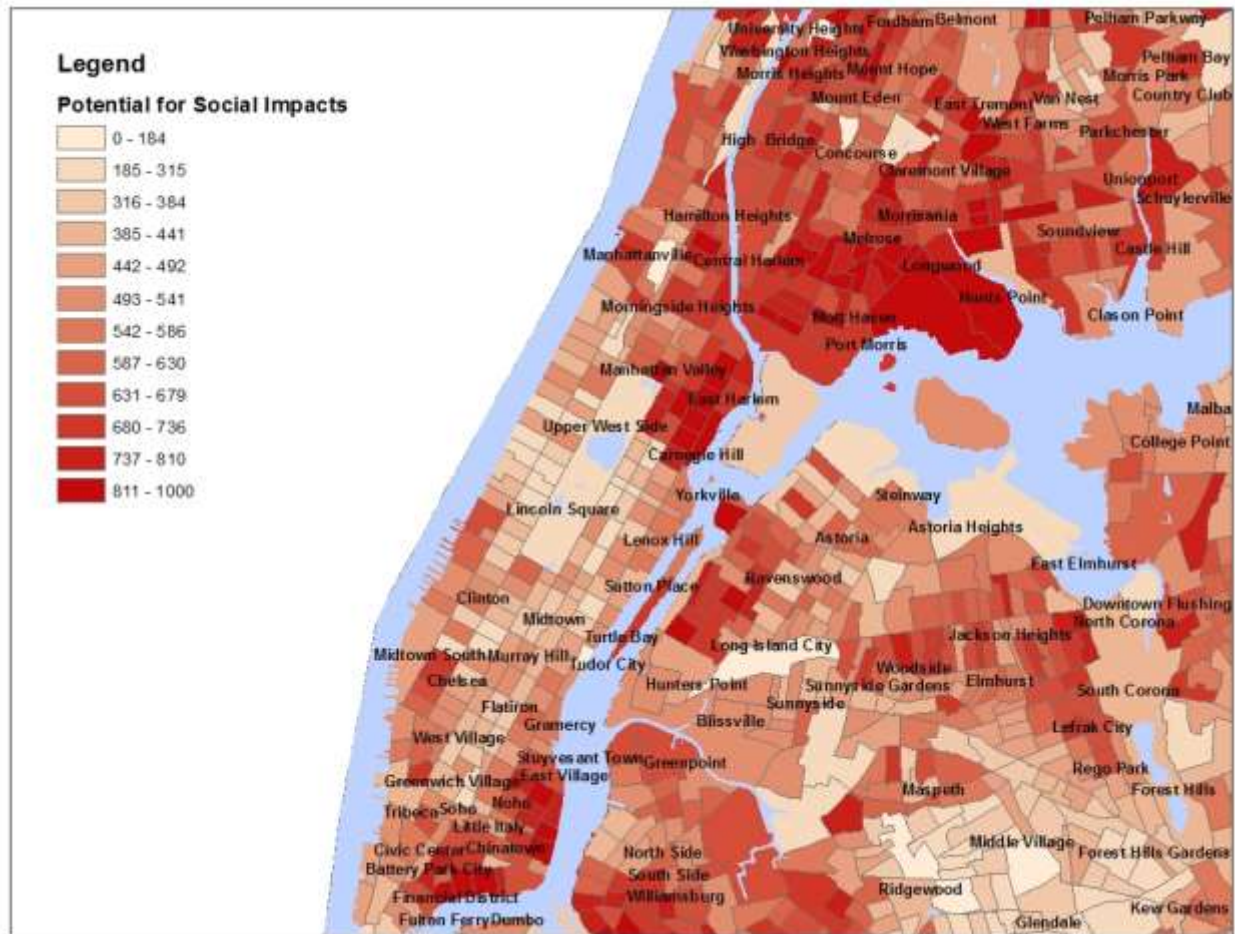


Figure 7. Manhattan, NY Potential for Social Impacts, with Neighborhood Locations

4.4.2.3 Queens

Unlike, Manhattan and the Bronx, Queens has a wider dispersion of vulnerability and few concentrations of extremely high vulnerability. As would be expected, generally the higher potential for social impacts occurs on the periphery nearer to bodies of water rather than in the interior. A couple notable vulnerable locations are in north and western Queens. The neighborhoods of North and South Corona has an average impacts potential of 694 and an average hazard exposure of 52.3. The Ravenswood and Long Island City neighborhoods, bordering the East River, have an average impacts potential of 635 and an average hazard

exposure of 55.7. Small pockets of high social vulnerability are in these four neighborhoods and also in Jackson Heights and Jamaica Hills, though the latter is far from any water.

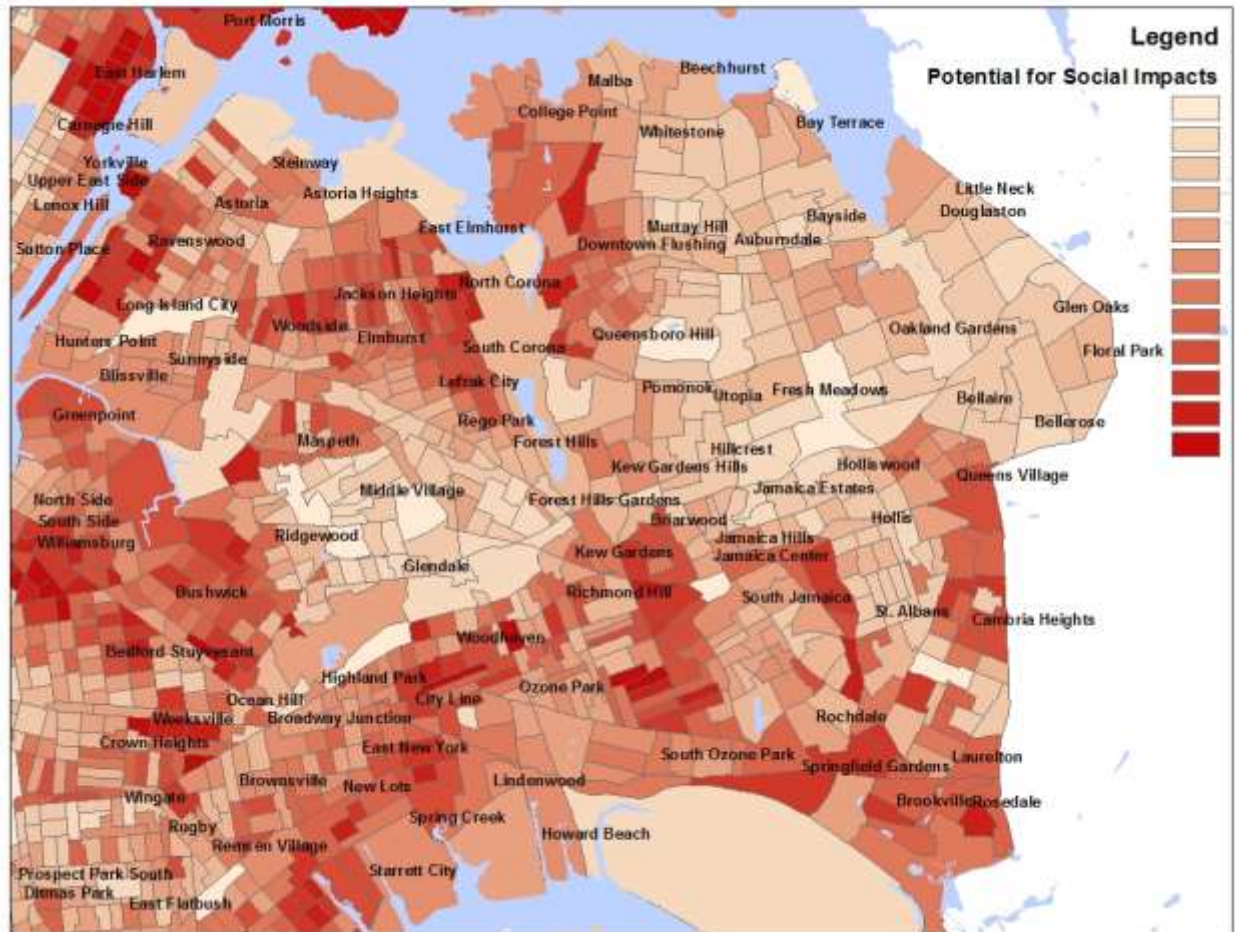


Figure 8. Queens, NY Potential for Social Impacts, with Neighborhood Locations

4.4.2.4 Brooklyn, and Queens Beachfront

Brooklyn is not unlike Queens in that of the vulnerable areas, most of them are nearer to the waterfront than the interior. However, unlike Queens, Brooklyn has several areas where the potential for impacts is more pervasive. Although the Rockaway Peninsula is part of Queens, the distribution of vulnerability follows the trend of Brooklyn. In northwestern Brooklyn Williamsburg stands out in an area of low to moderate vulnerability. Between the 25 census tracts of Williamsburg, the potential for social impacts averages around 701.4. Williamsburg is

relatively equally influenced by social, physical, and exposing characteristics. To the southeast is Canarsie that is not quite as distinctly vulnerable but is comparable in size. Canarsie is bordered by water on three sides and has an average impacts potential of 673.7 among its 24 census tracts. In far southern Brooklyn, where the Bath Beach, Gravesend, Homecrest, Gerritsen Beach, Sheepshead Bay, Manhattan Beach, Brighton Beach, Coney Island and Sea Gate neighborhoods are all located, the impacts potential is highest. The region, home to almost 285,000 residents, has an average impacts potential of 709.8. Like Williamsburg, southern Brooklyn has above average values across all vulnerability types but none that are astronomic.



Figure 9. Brooklyn, NY and Queens Waterfront Potential for Social Impacts, with Neighborhood Locations

On the Rockaway Peninsula, southeast of Coney Island, a deep division is present. The Peninsula transitions gradually from west to east, where impacts potential starts between 250 and 450 in Breezy Point and ends at between 650 and 900 in Edgemere and Far Rockaway. The entire peninsula is highly susceptible to flooding, but since the western tip is sparsely populated its hazard exposure is much lower, as is its social vulnerability.

4.4.2.5 Staten Island

Broadly speaking, Staten Island has a lesser potential for social impacts than any of the other four boroughs. Even still, it has its fair share of tracts holding high vulnerability, almost exclusively in the northern part of the island. Staten Island has an impacts potential that is lower than the 542 citywide average at 488 on average. Both its social vulnerability and hazard exposure are somewhat less than their counterpart citywide averages. Its hazard exposure averages close to 33.5 (2.5 less than the city) while its social vulnerability is close to 46.6 (5.7 less than the city). Focusing in on the 31 census tracts on the northern brim of Staten Island uncovers an average impacts potential misaligned to this overall average. The waterfront neighborhoods stretching from Howland Park in the northwest to Shore Acres in the northeast all boast a combined impacts potential of 640, slightly higher than the Bronx-wide average. Their average social vulnerability is 56.9 and their average hazard exposure is 47.8. As would be expected, no other series of census tracts have above average combined vulnerability.

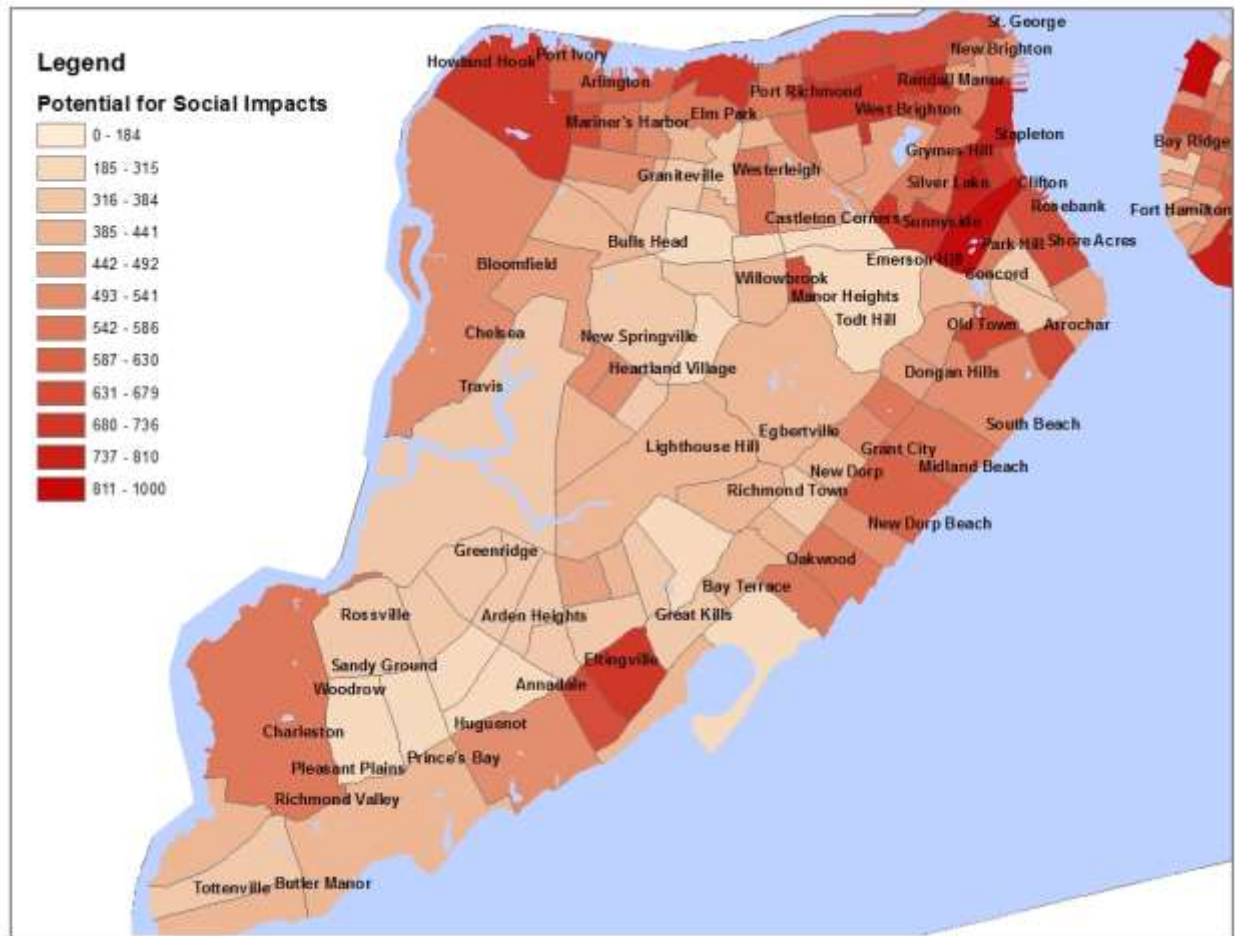


Figure 10. Staten Island, NY Potential for Social Impacts, with Neighborhood Locations

4.5 Spatial Coding

The results of the aforementioned vulnerability assessment served as the foundation to equate the spatiality of plan content with. Relying on the automatic divisions in the legends of each series of vulnerability maps, the top four categories counted as high vulnerability and the bottom four counted as low vulnerability. Those varying number of categories in between denoted medium vulnerability. On occasion, geographic references in plans would indicate areas larger than one or two neighborhoods, which in that instance, would sometimes render the level of vulnerability as undetermined. Only if more tracts implied higher vulnerability than otherwise, were broad references labelled as high vulnerability, and to the opposite effect, if more tracts implied lower

vulnerability, the reference was labelled as low vulnerability. The middle category had, in effect, no influence on spatial coding scores as it either represented an indistinguishable value or moderate value.

4.5.1 Norfolk Spatial Scores

The desired outcome from spatially coding the content of evaluated plans coming out of Norfolk and Hampton Roads would be the discovery that these plans are allocating their ideas, resources and processes to areas that most need them. If that were to be the case, then the plans overall should be scoring higher with the addition of the spatial coding scores than without. For Norfolk, on average, that is the case, however, only minimally.

Table 7. Spatial Coding Scores for Norfolk, VA

	RE.Invest Report	Southside Haz. Mit.	PlaNorfolk 2030	Resilience Strategy	Rising Resiliency	ThRIVe NDRC App	Average
Vulnerability Assessment						1	0.17
Awareness/Knowledge	-1				1	1	0.17
Smart growth & development			1	1	1	1	0.67
Preparedness & response	-1	-1					-0.33
Recovery & restoration			1		1		0.33
Households & individuals	-1				1		0
Community assets & services	-1		1	-1	1	1	0.17
Planning process	-1						-0.17
Public engagement techniques	-1	1			1		0.17
Stakeholders/Persons involved	-1		1	1	1		0.33
Responsibilities	-1				1		0
Monitoring implementation	-1			1	1	1	0.33
Self-monitoring					1		0.17
Total	-9	0	4	2	10	5	2
% Added to Score	-6.25%	0%	2.78%	1.39%	6.94%	3.47%	1.39%

After summing the total spatial codes awarded to all plan criteria for each plan and then averaging them across all plans for Norfolk, the end result is an added 2 points to each plan. This equates to a supplementary 1.39 percent added on to the total plan evaluation scores, after normalizing them to be out of 100. A total of 2 additional points also means that even though more plans received bonus points rather than penalties as a result of the process, the chance that any single plan criterion received one additional bonus point is roughly 1 in 6. While it is true that there were nearly as many negative points as positive points given, around 44 percent of eligible plan criteria received any score for spatial references. 19 of the 23 positive points given to plan criteria were distributed to only 3 of the 6 plans. PlaNorfolk and the ThRIVE NDRC received a modest 4 and 5 points out of 13, respectively. The Rising Resiliency Challenge Report collected nearly half of all positive scores given across the 6 plans in receiving 77 percent of the total possible bonus points awarded to a single plan.

The average spatial code value given to each plan criterion ranges from $-1/3$ to $+2/3$. Smart growth and development received by far the most positive coding scores with four to reach an average of $2/3$. Recovery and restoration, stakeholders/persons involved, and monitoring implementation were all 2nd with a total of 2 positive points granted or an average of $1/3$ among all 6 plans. Most other plan criteria received an insignificantly positive or negative value from spatial coding. The only two negative total values is planning process with $-1/6$ and preparedness and response with $-1/3$ or 2 out of the 6 receiving a negative point.

Certain plans commonly had multiple spatial references satisfying a single plan criterion. For instance, Table 7 above shows that a single point was awarded to the PlaNorfolk evaluation under Smart growth and development. It received that point because there were more spatial references describing smart growth and development in vulnerable neighborhoods than

invulnerable ones. The complete data table that was utilized during the coding process shows that there were actually 8 more spatial references in vulnerable neighborhoods (23 in high vulnerable neighborhoods and 15 in low vulnerable neighborhoods). PlaNorfolk did indeed have the largest average margin for points given. The ThRIVE NDRC Application was shortly behind in terms of margin, while all other plans only referenced a handful of neighborhoods total.

4.5.2 New York City Spatial Scores

Initial reactions assert that plans in New York City more often than not received positive values for a set of spatial references. Digging deeper, it is quite apparent that four plans collected all of the positive coding scores and the other two were coded minimally. Erasing those other two plans from the bunch and the New York City plans would add close to 11 points to their overall evaluation scores or about 7.5 percent. However, due to the inclusion of the Edgewater Park Report that is exclusively for a neutrally vulnerable neighborhood, and the city's Hazard Mitigation Plan, the average score added is 7.17 points or about 5 percent. Of the four plans that received the most positive spatial coding scores, all of them were relatively close to receiving the maximum number of additional points. Both the Lower Manhattan NDRC Application and One NYC received 77 percent of the maximum possible bonus points, PlaNYC received 85 percent of the maximum possible points, and the BIG U Rebuild by Design Report only missed out on one point in receiving 92 percent of the maximum total possible.

Average spatial code scores assigned to the plan criteria ranged from .17 to .83. No plan criterion had an average coding value of 0 or less meaning the spatial coding process ubiquitously aided the evaluation of vulnerability-specific criteria. The lowest average value of .17, for self-monitoring, was this low not because of negative values counteracting the positive but since spatial reference only existed for one plan. Two of the three average values that equaled 1/3 were

reduced from negative values in preparedness and response, and monitoring implementation in the city's hazard mitigation plan. The third, households and individuals, was positively coded in just two plans. The five criteria with values above half had a majority positive scores because there were spatial references in at least all four of the highest scoring plans. Smart growth and development, recovery and restoration, and public engagement techniques were most frequently associated with distributing to highly vulnerable areas. All three criteria had the highest average score of .83, with the city's hazard mitigation plan serving as the critical piece to bring them to this value.

Table 8. Spatial Coding Scores for New York City

	Lower Manh. NDRC	Edgewater Report	NYC Haz. Mit.	One NYC	PlaNYC	BIG U Rebuild	Average
Vulnerability Assessment	1		-1	1	1	1	0.50
Awareness/Knowledge				1	1	1	0.50
Smart growth & development	1		1	1	1	1	0.83
Preparedness & response	1		-1	1	1		0.33
Recovery & restoration	1		1	1	1	1	0.83
Households & individuals	1					1	0.33
Community assets & services	1			1	1	1	0.67
Planning process	1			1	1	1	0.67
Public engagement techniques	1		1	1	1	1	0.83
Stakeholders/Persons involved	1			1	1	1	0.67
Responsibilities				1	1	1	0.50
Monitoring implementation	1		-1		1	1	0.33
Self-monitoring						1	0.17
Total	10	0	0	10	11	12	7.17
% Added to Score	6.94%	0%	0%	6.94%	7.64%	8.33%	4.98%

Though New York City's plans evidently fared well in the spatial coding process, if the margin between high vulnerability and low vulnerability spatial references was taken into account, scores would have been even higher. All of the plans, with the exception of the Edgewater Park

referenced over 15 distinct locations in relation to content satisfying the 13 plan criteria. PlaNYC, the city's de facto comprehensive plan, referenced locations representing every vulnerable region of New York, in accordance with the vulnerability maps. Consequently, though PlaNYC received 11 of the 13 bonus points for spatial coding, the average margin for each set of references to warrant a point was an impressive 25.4. By comparison, the BIG U Rebuild by Design report had an average margin of 4.75, despite receiving an additional bonus point. OneNYC and the Lower Manhattan NDRC Application came in with a margin of 8 and 9.2, respectively.

4.6 Plan Evaluation Scores

Reiterating the coding process, the scores applied to plans for their content reflect the determined satisfaction for each coding indicator and the distribution of desirable content to expressed locations. The separately scored spatial codes were added after all indicators were properly scored to be included in the overall total and the totals broken down by plan principles and criteria. The following scores represent the raw data culminating from the plan coding and spatial coding processes prior to standardizing through weight. The highest possible score for each plan principle is as follows: goals – 44, fact base – 12, strategies – 66, coordination – 8, participation – 28, implementation – 16, monitoring – 26.

4.6.1 Norfolk Plan Evaluations

Goals are not vital in determining the quality of a particular plan per se, but, since they correlate with the accompanying content, can foretell the substance of a plan and its value. The goals in Norfolk's plans satisfied the requirements to receive between 15 and 31 points out of the possible 44. The 15 points met by the RE.Invest Report equals roughly one third of the possible points while the Resilience Strategy's 31 equals about 70 percent of the total. The scores given to

each plan for their goals turn out to be a mild predictor of the entire performance of plans in their evaluation. The total score applied to a plan according to the quantities in each section is essentially an average performance across all sections not accounting for the size of each section. Using this baseline, most plans performed exceptionally well in goals considering their final total. The RE.Invest Report, which performed worst in the evaluation, should hover close to 14 percent in each principle based on its total score, however, its 15 points in goals is nearly 3 times what would be expected. The two highest coding values for goals occurred with, coincidentally, the two best performing plans of the Resilience Strategy and the ThRIVe NDRC Application. The 31 points and 29 points the Norfolk Resilience Strategy and ThRIVe NDRC Application received for goals, respectively, is still above what their total scores would imply they might receive.

The two plans that performed best in fact base, which included existing conditions and the vulnerability assessment, received 75 percent and 83 percent of the total possible points. The coding values for the strategies principle more closely matched the overall plan evaluation scores than even goals. The proportion of possible points that each plan received for its strategies were all within 8 percentage points of their respective total score values. The Southside Hazard Mitigation Plan scored worst in strategies compared to its score with 33 percent compared to 37.35, while PlaNorfolk scored the best with 59 percent compared to 51.78. The percentages for coordination were ubiquitously higher than the average percentage across all plan principles.

Participation scores were fairly divided between the better scoring plans and the poorer scoring. The three overall highest scoring plans received just over double the amount of points (17.3) on average in participation than the three overall lowest scoring plans (8.3). Implementation and monitoring scores were low across the entire set of plans, ranging from 4 percent to 50 percent of

the maximum possible points. The two lowest scoring plans, the RE.Invest Report and the Rising Resiliency Challenge Report, scored about a quarter of the possible points or less. The lone plan that scored higher in implementation and monitoring than in other principles, on average, was the Southside Hazard Mitigation Plan, faring considerably better in monitoring than any other plan.

Table 9. Norfolk, VA Plan Evaluation Scores

Principle		RE.Invest Report	Southside Haz. Mit.	PlaNorfolk 2030	Resilience Strategy	Rising Resiliency	ThRIVe NDRC App
Goals	Score	15	20	20	31	22	29
	% of Possible	34%	45%	45%	70%	50%	66%
Fact Base	Score	2	9	5	7	6	10
	% of Possible	17%	75%	42%	58%	50%	83%
Strategies	Score	11	22	39	41	23	43
	% of Possible	17%	33%	59%	62%	35%	65%
Coordination	Score	3	4	8	8	4	7
	% of Possible	38%	50%	100%	100%	50%	88%
Participation	Score	3	9	16	19	13	17
	% of Possible	11%	32%	57%	68%	46%	61%
Implementation	Score	2	6	7	8	4	8
	% of Possible	13%	38%	44%	50%	25%	50%
Monitoring	Score	1	13	10	10	7	8
	% of Possible	4%	50%	38%	38%	27%	31%
Total Weighted Score		13.86	37.35	51.78	58.64	36.26	59.36

Together, the set of plans varied greatly in their overall performance from the plan evaluation process. The standard deviation of 17.41 reinforces the fact that none of the plans score within 5 points of the average overall score of 42.87. Even though the top three scoring plans are about 9 points or more higher than the average, the abysmally low score of 13.86 by the RE.Invest Report sways the average significantly. In a way, the spatial coding process sort of reconciles the

dismal performance. The RE.Invest Report was the only plan to have its score reduced, since its spatial references were exclusively for low vulnerability neighborhoods. Had the spatial coding not supplemented the plan evaluation scores, the report would have actually scored 9 more points than it did, increasing its total score to around 20.

Table 10. Norfolk, VA Plan Evaluation Descriptive Statistics

Mean	42.87	Standard Deviation	17.41	Minimum	13.86
Median	44.57	Range	45.5	Maximum	59.36

4.6.2 New York City Plan Evaluations

Of the six evaluated plans from New York, five of them received a total score of 60 or more, above the highest scoring plan from Norfolk. Rather remarkably, a majority of the plans did not score particularly high in goals, in comparison with their total evaluation scores. The plans generally scored better on the heart of the plan content than on this precursory content. Four of the six plans scored three quarters or more of the possible points in fact base, and the other two still scored a majority. With strategies, for the most part, the evaluated plans performed exceptionally well. Only one plan, the BIG U Rebuild by Design Report, scored a worse percentage in comparison with its total score on strategies. The top four scoring plans received between 77 and 86 percent of the possible points.

The highest minimum score of points received for a principle was with coordination. Like with strategies, five of the six scored better in comparison with their average scores across all principles, in coordination. Even the Edgewater Park Report, which scored only 36.99, received 63 percent of the coordination points. Participation saw the highest average point totals among the five top scoring plans. Other than the Edgewater Park Report that received just under half,

the plans collected between 79 and 93 percent of the participation points. The scores for implementation were more varied than with any other principle. The bottom half of plans received 25, 44 and 56 percent of points, whereas the top half received 75, 88 and 94 percent. The City's hazard mitigation plan was the only to receive over 90 percent of points in both participation and implementation. Monitoring was far and wide the worst performing principle after the results of the plan evaluations. The four plans that performed better than the average total score for all plans captured only between 31 and 50 percent of the points (three of them all receiving 31 percent). The BIG U Rebuild by Design report was the only to receive enough points to be close in comparison to its total score with 54 percent of monitoring points.

Table 11. New York City Plan Evaluation Scores

Principle		NDRC P&C	Edgewater Report	NYC Haz. Mit.	One NYC	PlaNYC	BIG U RbD
Goals	Score	30	18	27	22	20	20
	% of Possible	68%	41%	61%	50%	45%	45%
Fact Base	Score	9	7	9	7	9	10
	% of Possible	75%	58%	75%	58%	75%	83%
Strategies	Score	52	26	55	57	51	35
	% of Possible	79%	39%	83%	86%	77%	53%
Coordination	Score	6	5	7	8	5	7
	% of Possible	75%	63%	88%	100%	63%	88%
Participation	Score	22	13	26	22	24	24
	% of Possible	79%	46%	93%	79%	86%	86%
Implementation	Score	7	4	15	12	14	9
	% of Possible	44%	25%	94%	75%	88%	56%
Monitoring	Score	8	4	13	8	8	14
	% of Possible	31%	15%	50%	31%	31%	54%
Total Weighted Score		66.43	36.99	75.54	70.77	68.57	60.66

As further indication of the more successful performance of New York City's plans, the average score was roughly 20 points more than the Norfolk city average. The standard deviation of 13.73 would imply that the scores were valued slightly more tightly. This is reinforced when considering that four of the plans scored within 8 points of the average, a feat not one of Norfolk's plans can claim in regards to its average. The median value being four points higher indicates the skewness influenced mostly by the minimum score, put forth by the Edgewater Park Report that is over 20 points lower than the 2nd lowest score. Still, at 36.99 points, the Edgewater Park Report outperformed Norfolk's two lowest scoring plans.

Table 12. New York City Plan Evaluation Descriptive Statistics

Mean	63.16	Standard Deviation	13.73	Minimum	36.99
Median	67.5	Range	38.56	Maximum	75.54

4.7 Evaluation Statistics

The ensuing descriptive statistics are the result of the complete scores for all coding indicators for each set of plans. The mean, standard deviation, and minimum/maximum are calculated for each plan criterion in regards with the scores of the coding indicators contained within. The mean value would be the average score between 0 and 2 given to the division of indicators across a set of six plans. The standard deviation is the spread of those coding indicator scores, and the minimum/maximum are the lowest or highest single average coding indicator score. A plan criterion containing a single coding indicator would report the same value for minimum and maximum.

4.7.1 Norfolk

4.7.1.1 *Direction-Setting Principles*

The plan evaluation results revealed that Norfolk's plans performed well under goals. Goals are merely representative of a literal sense of direction-setting and can be pertinent to any amount of issues and populations. Investigating the breakdown of goals, it becomes apparent that the best performing segments of goals were the more interchangeable items. Goals – general was most frequently coded with the maximum value or close to it, with a mean of 1.5. As its name alludes, general goals includes common practice items such as tangibility, relevance and articulation. The types of goals that are counterparts to vulnerability-specific items like equity and cohesion, restoration, and adaptation/anticipation were coded with the minimum value most often, with averages all under 1.

The ever-important vulnerability assessment was one of the lowest average scoring criteria in the plan evaluation among Norfolk's plans. Two of the three indicators shared a maximum average value of 0.5 and the third indicator was rarely present with an average of 0.17. Existing conditions on the other hand inflated the average scores for fact base in each plan. The combined mean between existing conditions and vulnerability assessment of 1.08 conceals the low average value for the vulnerability assessment.

The strategies and actions in Norfolk's plans were coded more liberally on the front end of the nine criteria or groups of strategies. The high coding scores for coordination actions matches the prevalence of coordination in other parts of the plan and plan evaluation. The more traditional structural strategies were fairly frequent in the plans with a mean of 1.22 and maximum indicator score of 1.83. The two most prevalent vulnerability-specific strategies in the plans were awareness/knowledge and smart growth. Their respective averages of 1.25 and 1.39 were

bolstered by the high coding values for “data collection/assessment tools” and “community educational awareness” for awareness/knowledge and “preventative development” for smart growth/development. Design tools were the least prevalent generalized strategy type in the plans with an average of 0.58 and minimum indicator score of 0.33. Of the lowest scored vulnerability-specific strategies, preparedness/response and households/individuals both averaged 0.5 or less. Two of the coding indicators for households and individuals were not present in any of the plans and as such, have an average score of 0. “Flood insurance” slightly remedies the low scores with an average score of 1.33. The coding indicator scores were unanimously low under preparedness and response as only one of them, “emergency services and resources distribution”, had an average score approaching 1.

Table 13. Norfolk, VA Direction-Setting Coding Scores

Principles (# of indicators)	Mean	St. Dev.	Min	Max
<i>Goals</i>				
General (3)	1.50	0.71	1.00	2.00
Coordination (3)	1.11	0.76	0.50	1.83
Equity & Cohesion (4)	0.79	0.72	0.67	1.00
Restoration (3)	0.67	0.77	0.33	1.17
Adaptation/Anticipation (4)	0.92	0.83	0.17	1.67
Minimal Impacts (3)	1.33	0.59	1.17	1.50
Sustainability (2)	1.08	0.79	1.00	1.17
<i>Fact Base</i>				
Existing Conditions (3)	1.72	0.57	1.50	1.83
Vulnerability Assessment (3)	0.44	0.61	0.17	0.50
<i>Strategies/Actions</i>				
Awareness/Knowledge (4)	1.25	0.78	0.83	1.83
Coordination (3)	1.67	0.59	1.33	1.83
Smart Growth (3)	1.39	0.99	1.00	1.50
Preparedness/Response (4)	0.46	0.59	0.33	0.83
Structural (3)	1.22	0.73	0.67	1.83
Design Tools (2)	0.58	0.79	0.33	0.83
Recovery & Restoration (5)	0.60	0.57	0.33	0.83
Households & Individuals (4)	0.50	0.72	0.00	1.33
Community Assets & Services (5)	0.80	0.86	0.17	1.33

4.7.1.2 Action-Oriented Principles

The scores received by plans for their inter-organizational coordination were greatly boosted by the perfect score of “organizational and agency coordination” in horizontal coordination and formidable score for “coordination with other plans” under plan integration. The average score of 1.17 for nonprofit coordination lead horizontal coordination to have the highest mean of 1.58 among the action-oriented criteria.

Among participation scores, planning process was the lowest, although it only includes two coding indicators. Planning process consisted of “description of participation” that averaged 0.83 points and “participation schedule” that averaged 0.67 points. The average indicator scores for public engagement techniques varied greatly, likely in part due to the spread of seven indicators. “Practice emergency protocol” was seldom present with an average score of 0.17 while “public meetings/workshops” was much more common at 1.5 points on average. “Focus groups” was the 2nd most common indicator in the plans at 1.33 points on average. As a whole, between the seven indicators the average score was slightly below 1.

Implementation scores were rather low, with the exception of the single-indicator timeline and finances, compared with most direction-setting principles. Organizational responsibility scores were lowest of all, averaging just .28 and not including an indicator that scored on average more than 0.5. “Recovery responsibilities” did not exist in any of the six plans. “Immediate responsibilities” did not fare much better by scoring 0.33. As a criterion, individual responsibility averaged more than either of these two indicators, but it also included one that averaged just 0.17, volunteers.

On a criteria basis, monitoring was emblematic of poor performance. The single mildly prevalent criterion, monitoring implementation, averaged 0.97, though it constituted of an indicator averaging 0.17 – “review stakeholder membership” – and one averaging 1.5 – “monitoring performance of actions and policies”. No indicators averaged as high as 1 point within either self-monitoring or plan updating. “Manage conflicts/resolve disputes” was not present whatsoever, and both “review biases/assumptions” and “ensure accountability, transparency, equity” averaged just 0.17 points. Plan updating had two indicators that averaged 0.17 points – “update vulnerability assessments” and “update organizational makeup and responsibility” – and two that averaged 0.83 points – “review assessments and changing conditions” and “update goals and policies”.

Table 14. Norfolk, VA Action-Oriented Coding Scores

Principles (# of indicators)	Mean	St. Dev.	Min	Max
<i>Inter-Organizational Coordination</i>				
Plan Integration (2)	1.25	0.97	1.00	1.50
Horizontal Coordination (2)	1.58	0.67	1.17	2.00
<i>Participation</i>				
Planning Process (2)	0.67	0.75	0.67	0.83
Public Engagement Techniques (7)	0.90	0.74	0.17	1.50
Stakeholders/Persons Involved (5)	1.03	0.72	0.33	1.50
<i>Implementation</i>				
Organizational Responsibility (3)	0.28	0.46	0.00	0.50
Individual Responsibility (3)	0.72	0.67	0.17	1.00
Timeline (1)	1.33	0.82	1.33	1.33
Finances (1)	1.50	0.84	1.50	1.50
<i>Monitoring</i>				
Monitoring Implementation (5)	0.97	0.71	0.17	1.50
Self-Monitoring (4)	0.33	0.55	0.00	0.83
Updating Plan (4)	0.50	0.72	0.17	0.83

Collectively, the average coding score for general population action-oriented indicators was about 0.87 versus 0.81 for vulnerable-specific action-oriented indicators (with spatial codes added on). By comparison, the 33 general population direction-setting indicators averaged about 1.15 versus 0.76 for the 28 vulnerable-specific indicators. Clearly plans performed most successfully on general direction-setting items and only marginally better on all direction-setting items as opposed to all action-oriented. The scoring gap was close between vulnerable and general items among action-oriented indicators compared to the nearly half point difference between general and vulnerable direction-setting indicators. However, there are 62 direction-setting coding indicators and only 39 action-oriented indicators in total.

4.7.2 New York City

4.7.2.1 *Direction-Setting Principles*

The scores under the evaluation of New York City's plans started out in a similar manner to the scores for Norfolk's plans. The highest scores among goals were for the commonplace general goals (1.5). The indicator "objectives linked to goals", as evidenced by its perfect average score of 2, was universally present and the only one to be so in goals. The complete picture of coding values for goals, if relied on as a predictor of content to come, would foretell that the plans would score much better on the general population indicators than on the vulnerable-specific indicators. Together with general goals, the plans also scored well with minimizing impacts (1.39) and sustainability (1.42), both of which could arguably equate with content for the general population. The plans scored poorly in equity/cohesion and adaptation/anticipation goals with scores averaging 0.63 and 0.75 on average. Both "connecting with socioeconomic factors" and "accounting for all scenarios" scored just 0.33 on average and were never present as prescribed

in any of the plans. The scores for restoration goals were neither low nor high with an average value of 1 for all 3 of its indicators.

Fact Base is again a tale of two criteria. Existing conditions averaged a near perfect 1.89 points, influenced by the actual perfect score of 2 points by “land use and development trends” and the 1.83 points given to both “geographic extent” and “demographics and economic characteristics” on average. Vulnerability assessment received just shy of a point one average, with indicator averages ranging from 0.33 to 1.33. Socially and physically vulnerable populations were most often identified (1.33 points) while local knowledge was least often included in the vulnerability assessments (0.33 points). Maps depicting social and/or physical vulnerability were present in any form in only half of the plans and as such, that pertinent indicator scored 0.67 points on average.

Most strategies criteria scored fairly well or better. Coordination strategies fell just short of a perfect coding score with 1.94 points on average, supplemented by the 2 points received by both horizontal and vertical coordination. The two other general population criteria of structural strategies and design tools both scored somewhat less than coordination and close to the average scores for all strategy types of 1.39. The average coding score for general population strategies was 1.64 for only 8 indicators compared to an average of 1.31 points for 25 vulnerable-specific indicators. Both, however, are above the equivalent averages for the strategy scores in Norfolk’s plans. Awareness and knowledge (1.63), smart growth (1.72), and community assets and services (1.6) all scored higher than the overall strategies average, but their combined averaged scores were diminished by the coding values for preparedness and response (1), recovery and restoration (1.2) and households and individuals (0.79). Households and individuals, the lone strategy grouping that averaged less than 1 point, would have scored greater than 1 had it not

been for the two indicators that scored 0 in all plan evaluations, as they did for Norfolk plan evaluations. Like with Norfolk, “Flood insurance” again scored quite well in averaging 1.83 points.

Table 15. New York City Direction-Setting Coding Scores

Principles (# of indicators)	Mean	St. Dev.	Min	Max
<i>Goals</i>				
General (3)	1.50	0.79	0.83	2.00
Coordination (3)	0.94	0.80	0.83	1.17
Equity & Cohesion (4)	0.63	0.77	0.33	1.00
Restoration (3)	1.00	0.77	1.00	1.00
Adaptation/Anticipation (4)	0.75	0.74	0.33	1.17
Minimal Impacts (3)	1.39	0.78	1.17	1.67
Sustainability (2)	1.42	0.79	1.33	1.50
<i>Fact Base</i>				
Existing Conditions (3)	1.89	0.32	1.83	2.00
Vulnerability Assessment (3)	0.94	0.73	0.33	1.33
<i>Strategies/Actions</i>				
Awareness/Knowledge (4)	1.63	0.72	1.17	1.83
Coordination (3)	1.94	0.24	1.83	2.00
Smart Growth (3)	1.72	0.70	1.17	1.67
Preparedness/Response (4)	1.00	0.88	0.17	1.33
Structural (3)	1.61	0.78	1.33	2.00
Design Tools (2)	1.25	0.75	1.00	1.50
Recovery & Restoration (5)	1.20	0.72	0.67	1.50
Households & Individuals (4)	0.79	0.91	0.00	1.83
Community Assets & Services (5)	1.60	0.73	1.17	1.83

4.7.2.2 Action-Oriented Principles

Plans performed exceptionally well on certain action-oriented criteria, but not as much so on a couple criteria – mainly in monitoring. The coordination indicator scores ranged from medium to peak value. Plan integration’s average was formidable at 1.42 where “coordination with other plans” was more prevalent with a score of 1.83. “Coordination with housing/poverty reduction

plans” was less extensive in the plans with an average of 1 point. Both indicators within horizontal coordination performed well under the plan evaluations. “Coordination with other organizations” impressed in scoring 2 points in every plan while “coordination with nonprofits” was shortly behind at 2 points in two-thirds of plans to average 1.5 points.

At face value, it appears that, in participation, planning process scored perfectly on both indicators. However, participation criteria benefited greatly from the spatial coding process. Seven-tenths of a point on average was added to all of the participation criteria, resulting in a larger effect on the two indicators of planning process. The spatial code additions had a lesser effect on the average scores for the seven public engagement technique indicators and the five stakeholders/persons involved indicators. Still, “description of specific outreach and participation: averaged 1.83 points and “participation schedule” averaged 1.5 points. The results for the public engagement scores were quite mixed. While overall, the scores averaged 1.4, including the spatial coding, “practicing emergency protocol” scored 0.83 on average and “volunteer opportunity” averaged just 0.67 on average. The best performing public engagement indicators were “focus groups” at 1.83 points, “public meetings/workshops” at 1.67 points, and “information distribution” also at 1.67 points on average.

The sole vulnerable-specific criterion of implementation performed moderately well in comparison with the average implementation scores. All implementation indicators combined averaged 1.27 points. Meanwhile, the three indicators contained within individual responsibility scored 1.44 points on average after including the 0.5 point average added from the spatial coding. Organizational responsibility and timeline hovered around a point, and finances scored 1.83 points on average. The most popular indicator other than finances was individual responsibility’s “public officials and employees” with an average score of 1.67 points. Also

under individual responsibility, “volunteers” and “public participants” scored 1 and 1.17 points on average, respectively.

The six evaluated plans were most deficient in monitoring by a sizable margin. Whereby none of the criteria under coordination, participation, or implementation averaged less than a point in their evaluation scores, two of the criteria in monitoring averaged less than 0.6 points.

Monitoring implementation, the only criterion to average greater than 1 point, ranged from averaging 0.17 points with “reviewing stakeholder group membership” to 1.67 points with “monitoring performance of actions and policies”. “Ensuring progress is clearly communicated” also fared well, scoring 1.5 points on average. Self-monitoring’s score of 0.54 was this low zeros across the board for “reviewing biases and assumptions” and “managing conflicts/resolving disputes”. “Assessing community engagement and reactions” prevented self-monitoring from dipping any lower by averaging 1.67 points and being present to some degree in all six plans. Plan updating received the lowest scores on average of all criteria, direction-setting or action-oriented. None of its indicators scored 0 points on average, however, both “updating vulnerability assessments” and “updating organizational makeup and responsibility” scored 0.17 points and “updating goals and policies” scored 0.5 points on average.

Table 16. New York City Action-Oriented Coding Scores

Principles (# of indicators)	Mean	St. Dev.	Min	Max
<i>Inter-Organizational Coordination</i>				
Plan Integration (2)	1.42	0.79	1.00	1.83
Horizontal Coordination (2)	1.75	0.62	1.50	2.00
<i>Participation</i>				
Planning Process (2)	2.00	0.65	1.50	1.83
Public Engagement Techniques (7)	1.40	0.75	0.67	1.83
Stakeholders/Persons Involved (5)	1.60	0.78	0.67	2.00
<i>Implementation</i>				
Organizational Responsibility (3)	1.00	0.97	0.83	1.17
Individual Responsibility (3)	1.44	0.67	1.00	1.67
Timeline (1)	1.00	0.89	1.00	1.00
Finances (1)	1.83	0.41	1.83	1.83
<i>Monitoring</i>				
Monitoring Implementation (5)	1.03	0.76	0.17	1.67
Self-Monitoring (4)	0.54	0.78	0.00	1.67
Updating Plan (4)	0.46	0.72	0.17	1.00

Altogether, the action-oriented coding indicators were coded with scores of 1.22 on average. The 13 general population action-oriented indicators scored below this average at 1.08 points, and the 26 vulnerable-specific action-oriented indicators scored above this average at 1.29 points (with spatial codes added on). The first half, in effect – the direction-setting indicators – was coded on average with a score of 1.27 overall. The first half of the evaluation’s 33 general population indicators scored almost identically at 1.26 points on average and its 28 vulnerable-specific indicators scored exactly 1.27 on average.

4.7.3 Plan Quality by Initiative/Approach

Plan quality scores can also be grouped by the plan design or approach as a method to convey the general advantages of each. Average scores are taken by plan principle and overall evaluation score for each approach that comprise of one plan from Norfolk and one from New York. Not all pairs of plans carry the same exact approach under each initiative/type, but they are

overwhelmingly similar. Each pair shares a common characteristic that binds them together to be analyzed as a combination against other all other attached pairs. Characteristics like type are shared by the hazard mitigation plan, comprehensive plan, and private-sector report pairs; approach shared by the hazard mitigation plans; sector or organization type by the private-sector reports; scale by the neighborhood reports; and initiative shared by the 100 Resilient Cities initiative plans and NDRC applications.

Table 17. Plan Commonalities by Matched Pair

Initiative/Type	Hazard Mitigation	Comp Plan	Private-Sector Design	Neighborhood Scale	100 Resilient Cities	NDRC Application
Norfolk plan	Southside	PlaNorfolk	RE.invest report	Rising Resiliency	Resiliency Strat.	ThRIVe
NYC plan	NYC Haz Mit	PlaNYC	BIG U RbD	Edgewater Park	OneNYC	Lower Manh P&C
Commonality	Type/Approach	Type	Sector/Type	Scale	Initiative	Initiative

The gap in performance among the duos of plans dominates the story. The scoring disparity is more pronounced from the plans in Norfolk than those in New York. Although none more so than with neighborhood plans that both plans score poorly, because of the impact that the RE.invest report's score has on private-sector plan performance, both plan types fall far behind all others.

Again, the RE.invest Report deserves the bulk of the blame, but the private-sector reports fared worst in goals, fact base and strategies in comparison with other plan pairs. In other words, they scored lowest on the direction-setting half of the plan evaluation. The low average score in fact base is entirely because of the outstandingly low performance by the RE.invest Report.

Ironically, the BIG U Rebuild by Design report had the highest total fact base score of all plans. The BIG U does in fact contribute to the low private-sector scores in goals and strategies, however.

On the other hand, the neighborhood plans scored worst on average in the action-oriented half of the evaluation. Thus, they exhibited the lowest scores in coordination, participation, implementation and monitoring alike. The pair of plans scored worst, out of all plan principle totals, on the two that would occur post-planning phase – implementation and monitoring. Implementation received only about a quarter of the total points on average and monitoring received even less, only 21% of the total points on average. Participation also received a slightly troubling score, with 46% of the total points between the pair.

Then, the hazard mitigation, comprehensive, 100 Resilient Cities, and NDRC plans were more triumphant in their measured quality. The only plan that did not receive at least a decent evaluation score (above 50 points) was the Southside Hampton Roads Hazard Mitigation Plan. At only 37.35 points in total, it counterbalanced the 75.54 points total, highest overall, by the New York City Hazard Mitigation Plan. Unlike the neighborhood plans, the hazard mitigation plans scored well in the post-planning phase principles of implementation and monitoring. In what is widely a poor performing plan principle, they were the only pair of plans to average half of the possible points in monitoring. Together with the pair of comprehensive plans, the mitigation plans also scored two-thirds of the available implementation points.

Of all the plan combinations, the two pairs that received the most significant guidance and funding were on average the best performing. The 100 Resilient Cities scored the highest with 64.7 points on average, and the NDRC applications scored inconsiderably less with 62.89 points on average. Both pairs scored exceptionally well on strategies, collecting over 70% of the possible points. They specifically performed well on awareness, smart growth, preparedness, and community asset/service strategies. Between the two pairs of plans, the average score for smart growth strategies was actually greater than 100% of the possible points by virtue of favorable

spatial coding outcomes. The 100 Resilient Cities reports were completely coordinated, accruing 100% of the available points in inter-organizational coordination. Both pairs also received 70% or more of participation points, though were average or slightly below in their monitoring performance.

The Hazard Mitigation and Comprehensive Plans scores, though above average, rely on higher level mandates and local revenue for success in plan quality. The Comprehensive plans scored best in coordination and participation and worst in goals and monitoring. The comprehensive plan, with a versatile approach, also scored fairly well in strategies, with an average score just below that of the 100 Resilient Cities and NDRC application reports. Averaging all twelve of the plans together, the hazard mitigation, comprehensive, 100 RC, and NDRC plans exceeded the private-sector and neighborhood plan scores by almost 25 points.

Table 18. Plan Evaluation Scores by Matched Pair

Principle		Hazard Mitigation	Comp Plan	Private-Sector Design	Neighborhood Scale	100 Resilient Cities	NDRC Application
Goals	Avg. Score	23.5	20	17.5	20	26.5	29.5
	% of Possible	53%	45%	40%	45%	60%	67%
Fact Base	Avg. Score	9	7	6	6.5	7	9.5
	% of Possible	75%	58%	50%	54%	58%	79%
Strategies	Avg. Score	38.5	45	23	24.5	49	47.5
	% of Possible	58%	68%	35%	37%	74%	72%
Coordination	Avg. Score	5.5	6.5	5	4.5	8	6.5
	% of Possible	69%	81%	63%	56%	100%	81%
Participation	Avg. Score	17.5	20	13.5	13	20.5	19.5
	% of Possible	63%	71%	48%	46%	73%	70%
Implementation	Avg. Score	10.5	10.5	5.5	4	10	7.5
	% of Possible	66%	66%	34%	25%	63%	47%
Monitoring	Avg. Score	13	9	7.5	5.5	9	8
	% of Possible	50%	35%	29%	21%	35%	31%
Total Avg. Score		56.45	60.18	37.26	36.62	64.70	62.89

4.8 Plan Status & Progress

4.8.1 Hazard Mitigation Plan

4.8.1.1 Southside Hampton Roads Hazard Mitigation Plan

Each year following the 2011 update of the Southside Hampton Roads Hazard Mitigation Plan, each locality that contributed to the plan must report on the progress they have made in implementing the actions recommended for themselves as a part of their continued membership in the Community Rating System (CRS). Norfolk's report is provided to the National Flood Insurance Program and their City Council to serve as the implementation actions within the city's Flood Mitigation Plan (Tajan, 2014). Norfolk's most recent update report came in 2014, as the HRPDC began the process of producing a regional hazard mitigation plan to be completed by late 2016 the year after. The implementation report by the City of Norfolk was published on their flood awareness webpage for citizen review and also provided to the NFIP. Goals and objectives from the 2011 plan are reiterated in the 2014 update so that actions detailed toward reaching those goals can be more understandable to the public. Progress made on all 14 of the proposed mitigation actions for the City of Norfolk are summarized throughout the report (Tajan, 2014).

4.8.1.2 New York City Hazard Mitigation Plan

The annual updates to the New York City Hazard Mitigation Plan are less of a progress report and more of an amendment to the plan. The 2016 Annex was issued with the intention of keeping the 2014 plan up-to-speed with the latest changes, public input, risks, and strategies. Like an implementation report, it does include the monitoring of activities that had occurred since the approval of the plan by FEMA in 2014. Since the 2015 version of the hazard mitigation plan annex all of the new information and edits occurred with the planning process, the risk assessment, and mitigation strategies. Updates to the planning process exhibit continual meetings to inform about new mitigation tools and overlapping with other plans. The risk assessment had

events added that occurred since the 2015 update. The strategies update summarizes the results of the first phase of mitigation actions that had since completed, and introduces the mitigation actions database (Office of Emergency Management, 2016).

4.8.2 PlaNorfolk/PlaNYC

Both cities have issued implementation/progress reports showcasing the work completed toward meeting certain milestones or benchmarks as specified in the initially released reports.

4.8.2.1 *PlaNorfolk 2030*

Norfolk conducted a two-year metrics analysis and implementation analysis of the PlaNorfolk2030 comprehensive plan adopted on March 26, 2013. The implementation status report and metrics report were both published in March 2015 and summarized in the Implementation and Metrics Evaluation. The city tracked the implementation progress of all 542 of the actions proposed in PlaNorfolk. Each action was categorized based on its status in March 2014, as complete, continuing if it was an ongoing action and had commenced, underway if the action had a specific timeframe and had commenced, or not started. Actions were then categorized as complete or underway, not started – immediate or ongoing timeframe, or not started – short-term, mid-term and long-term timeframes, as of March 2015. Of those 542 total actions, at the two-year point, 84 percent of them were on target, 4 percent were lagging behind schedule, and the remaining 12 percent had not started (Department of Planning and Community Development, 2015).

The metrics analysis performed by the city served as a platform for measuring the success at achieving the outlined goals. PlaNorfolk included 102 separate metrics distributed throughout. Metrics are subsidiary to outcomes that are then grouped by goal. Actions are also divided up amongst outcomes, but are generally more populous per outcome. Of the 102 plan metrics, 35

percent of them were making progress (best possible rating), 23 percent were lacking progress, 24 percent were making unclear progress, and the last 18 percent did not have any available data (Department of Planning and Community Development, 2015).

4.8.2.2 PlaNYC: A Stronger, More Resilient New York

Because New York uniquely approached its comprehensive plan from two different vantage points that work reciprocally but with two vastly different purposes, it released two versions of PlaNYC – one emphasizing a more sustainability approach and the other a resilience one. Both PlaNYC: A Greener, Greater New York and PlaNYC: A Stronger, More Resilient New York are painstakingly examined for their implementation progress. Though they represent two different causes and two different reports, their symbiotic relationship is stressed in being combined into a single implementation report.

The implementation analysis of A Stronger, More Resilient New York inhabits the second half of the report, remaining consistent with the chronological order of the plans' releases. The analysis tracks the progress of all 257 of the coastline defense, building upgrade, infrastructure protection, and neighborhood protection actions recommended in the comprehensive report. 29 of those actions had already been completed and 202 of them were currently underway at the time of the progress report. In the first phase of implementation, A Stronger, More Resilient New York proposed \$3.7 billion worth in coastal protection across 37 initiatives. The plan addressed building-level improvements through code legislation, regulations, incentive programs, and best practices. Since these proposals in 2013, the implementation report identified multiple pieces of legislation passed on that front and a Flood Resiliency Text Amendment as successes. Beyond those, other achievements are appropriated amongst economic recovery, insurance, utilities, fuels, healthcare, community preparedness, telecommunications, transportation, parks,

environmental protection, water/wastewater, food, waste, and various coastal locations across the city, in emulation of categories in the original plan.

4.8.3 RE.invest Initiative

Following the release of the RE.invest Report commissioned by RE:focus Partners in March 2015, Norfolk's City Council agreed to incorporate the findings and recommendations for the Hague/Ghent neighborhood and the Arts District into their suite of coastal resiliency strategies. The flood barrier projects and other engineering upgrades proposed in the report were submitted to the U.S. Army Corps of Engineers to be included in their Section 205 Flood Management study for implementation. Those that were recommended to the U.S. ACE have completed implementation and have no further federal funding or interest as of the City Council meeting on December 8, 2015. Other proposed strategies for The Hague remain speculative but are still on the radar of Norfolk for future capital investment and/or requests for federal funds (Williams, 2015). Soon after the publishing of the infrastructure-driven report, RE:Focus Partners outspread their resilience effort to model economic, insurance and property losses under different scenarios to leverage catastrophe bonds supplementary to the protective structures they designed in the RE.invest Initiative. The multidisciplinary team completed the modelling scenarios under its RE.bound Program for three of its eight RE.invest Initiative partner cities – Hoboken, NJ, Miami Beach, FL, and Norfolk (RE:focus Partners, LLC, 2015).

4.8.4 Rebuild by Design – BIG U

The project developed under the collaboration between Bjarke Ingels Group (BIG), One Architecture and several other private-sector stakeholders, the BIG U was awarded \$335 million by HUD for being among the 7 winners of the Rebuild by Design contest. Since the initial award, HUD has dedicated an additional \$176 million from the National Disaster Resilience

Competition funding, toward the implementation of The BIG U. The City of New York committed \$305 million of its capital funding to start the first phases of the East Side Coastal Resiliency (ESCR), and Lower Manhattan Coastal Resiliency (LMCR) projects. Both the ESCR and LMCR projects evolved out of two of the original three compartments of the BIG U. In the BIG U plan, the ESCR was known as East River Park, while LMCR was Two Bridges and Chinatown. A third compartment in the BIG U, Brooklyn Bridge to the Battery, is scheduled to be implemented last, but is excluded from NDRC funding (Rebuild by Design, 2016).

4.8.5 Rising Resiliency Challenge

Since the Tidewater Rising Resiliency Challenge was not a formal planning initiative but a collaborative academic endeavor, implementation was limited to the capabilities of those involved and whatever grant funding was available. The Dutch Dialogues sessions, that produced conceptual resiliency designs for the Newmarket Creek, Newtown Creek, and Ohio Creek watersheds, coincided with the completion of the designs from the Rising Resiliency Challenge. The neighborhood that the challenge dedicated its efforts on, Chesterfield Heights, is located in the Ohio Creek watershed. Due to this overlap, the Dutch Dialogues borrowed the students' design work and credited them with contribution. The collective design from the two efforts was then included in the region's grant proposal for the National Disaster Resilience Competition. As will be further revealed later, some of the funding that would be received from the HUD competition would be allocated toward the implementation of the designs for the Ohio Creek Watershed/Chesterfield Heights (Stiles Jr., Andrews, & Erten-Unal, 2015).

4.8.6 Resilient Neighborhoods – Edgewater Park

The Resilient Neighborhoods initiative represents a micro-based endeavor enabling the City's Planning Department to work with neighborhood groups and community boards for arriving at

site-specific strategies. In all, ten communities were selected to be the subject of neighborhood scale studies aimed at supporting their continued vitality and resiliency. The Edgewater Park study was the prototype for those to follow. The main goals of the work in the neighborhood were to: renew the local land use and construction code in such a way as to not impede on character but allows for flood resilient buildings; and communicate climate risk and associated resiliency measures for residents to adopt. A month after the release of the neighborhood report, flood resilient construction was already underway for a few homes in Edgewater Park, as the Edgewater Cooperative planned to continue its collaboration with the Department of City Planning (Wirsing, 2015). Within a year of the planning work in Edgewater Park, studies were completed for nine other neighborhoods across all five boroughs by virtue of federal funding. The Department had already located 16 other neighborhoods to be addressed in the future under the initiative pending further funding (Department of City Planning, 2015).

4.8.7 100 Resilient Cities

4.8.7.1 *Norfolk Resilience Strategy*

Announced in late 2013, Norfolk was selected as a member city among the tens of other cities in the 100 Resilient Cities challenge to manufacture a comprehensive report on engendering and celebrating resilience. Part of the membership involves the hiring of a Chief Resilience Officer. In Norfolk's case, this was Christine Morris, who had been employed in various roles and capacities across Hampton Roads (Applegate, 2014; Norfolk's Resilience Challenge, 2015; Nyczepir, 2015). Morris, whose position was funded by the Rockefeller Foundation, was tasked with championing a whole-community approach focused on hazard mitigation, preparedness, response and recovery from catastrophic events and chronic stresses. Complex issues identified as most relevant to be addressed in the city's resilience strategy include flooding, sea level rise

and coastal erosion, violence, poverty, unemployment, and transportation (Norfolk's Resilience Challenge, 2015; Sweet, 2014).

According to the contract agreement with 100 Resilience Cities, Norfolk is obligated to participate in monitoring activities to enable Rockefeller Philanthropy Advisors, the consulting arm of the Rockefeller Foundation, to monitor and evaluate aspects of the city's project. 100 Resilient Cities was also permitted to conduct an evaluation of operations under the grant, including possible visits by personnel, discussion of the grant, and review of grant related financial and other records. The 100 Resilient Cities team had continuously issued a quarterly report card to the Chief Resilience Officer, Morris, to provide their assessment of the progress and development of strategies or activities under the grant. The grant to fund Christine Morris' position and all third-party resources last for two years from June 2014 to June 2016 (Sweet, 2014).

4.8.7.2 OneNYC: The Plan for a Strong and Just City

Joining Norfolk and many others in the first wave of 100 Resilient Cities participants, New York City honed in on its insufficient transportation system, flooding threat from sea level rise and coastal erosion, and the present and future perils associated with tropical storms as its pillars of resilience challenges. Its Chief Resilience Officer, tasked with finding and highlighting solutions to these challenges, had ample experience in leveraging resilience to solve the city's problems. Daniel Zarrilli was appointed the position of Director of the Mayor's Office of Recovery and Resilience by New York's sitting mayor, Bill de Blasio, in March 2014. With entry in the 100 Resilient Cities challenge, he quickly became the CRO. Zarrilli lead the development and implementation of the city's resilience strategy, OneNYC after having assisting in the

implementation of PlaNYC: A Stronger More Resilient New York in 2013 (New York's Resilience Challenge, 2015).

For the \$20 billion in identified funds covering over 1,000 individual projects outlined in the report, the plan includes both City and non-City assets and programs, and assumes both expense and capital funding from the City and other sources. Many of the strategies addressing infrastructure and coastal protection are incorporated into the Ten Year Capital Strategy whilst others, specifically \$5 billion worth, are at last reported, currently unfunded. The additional costs would need to be incurred from increased federal or other funding and increased City capital or expense funding (Stringer, 2016).

Since New York was one of the earliest to release its resilience strategy of the first batch of 100 Resilient Cities participants, it has had the opportunity to track the progress made since its participation. The City released a 2016 progress report to its OneNYC report. The progress report is organized in the same manner as the full report – broken down by its different visions for the city - except each vision is instead inundated with milestones for each initiative and the progress made toward reaching the milestone. The latest available accomplishments are compared with the corresponding figures from the original report. According to the 2016 report, 95% of the 202 initiatives outlined in OneNYC had been launched and underway. Moreover, 90% of indicators signaling progress are on track as intended (Department of City Planning, 2016).

4.8.8 NDRC – ThRIVE/Lower Manhattan Protect & Connect

The state of Virginia and New York City were among the 40 finalists selected to participate in the second round for implementation. Since the entire state of Virginia did not experience the brunt of the effects of Hurricane Irene, the state application honed in on Hampton Roads

(ThRIVE: Resilience In Virginia, 2015; Gonzalez, 2016). Virginia's ThRIVE: Resiliene In Virginia and New York City's Lower Manhattan Protect and Connect Phase 2 Applications were both announced as winning entries in January, 2016 and thus had access to the \$1 billion in disaster funding, alongside 11 other communities. New York City was awarded the largest funding amount of \$176 million to aid in the recovery from Hurricane Sandy, while Virginia came in shortly behind with the third largest pay amount of \$120.55 million (Gonzalez, 2016).

Both projects under the guidance of the NDRC were estimated to begin in September 2015 and last through September 2019 (Taffet, 2014). Funding to Virginia and Hampton Roads was to support efforts to grow the economy through water management and community revitalization tasks. Virginia's ThRIVE application drew largely from Norfolk's resilience strategy under the direction of Christine Morris. \$5 million of the award, in conjunction with \$7 million in state committed funds, are directly for the Coastal Resilience Laboratory and Acceleration Center. The Center was set up as an independent nonprofit to serve as a hub for technological, organizational and innovation around community revitalization, water management and resilience measurement (Rodin, 2016).

Funding to New York City was in support of the Dryline, a coastal protection system envisioned to incorporate retail and recreational space along Lower Manhattan. The project idea was inspired by the Rebuild by Design competition, the precursor to the NDRC (Rodin, 2016). In sum, New York City received \$4.2 billion in CDBG-DR funding from HUD for the 2015-2016 fiscal year. A portion of the funds were dedicated to the implementation of resiliency/hazard mitigation programs like Rebuild by Design and the NDRC project while the remainder was mostly distributed amongst home restoration and replacement programs, and small business assistance programs (Stringer, 2016).

Chapter 5. Discussion

5.1 Introduction

Emerging directions in research on planning to adapt to and prepare for events such as worsening coastal storms and sea-level rise suggest that the breadth and complexity of quality is more than meets the eye. In the past, studies investigating the quality of plans with the intention of determining their value in regards to coping with development pressures, hazards, and climate change have produced a legitimate argument and conclusion. When it comes to planning for extreme flooding and coastal storms, with the acknowledgement that certain demographics are compellingly vulnerable, the argument that content of a particular quality being present in plans is evidence for superior adaptability and preparedness is not as decisive. Though it is immensely supportive and implicit of exceptional plans, it does not unanimously ascertain resilience among those that are least resilient to these worsening events. The ensuing passages aim to surmise at the potential of these two sets of plans for Norfolk and New York City by piecing together the various avenues of collected information and objectifying their implication using evidence of past performance of related plans, factors that have affected these plans, and ideals for future plans, found in recent literature.

5.2 Trends and Influences in Plan Quality

Few cities in the U.S. have integrated climate adaption and disaster preparedness and recovery into normal planning and development activities. The plan evaluation protocol itself was designed to measure the quality of both typical planning efforts and specialized efforts up against the ideal plan to prepare for and adapt to the hazards of sea-level rise, extreme flooding and coastal storms. The protocol was purposely idealistic and exhaustive with the assumption that no planning effort would even nearly perfectly satisfy all of the content indicators. Several of the

evaluated plans and reports exceeded the quality and capabilities of past efforts as implied in recent studies of recovery, risk reduction and climate adaptation plans, especially in a social capacity (Berke, Cooper, Aminto, Grabich, & Horney, 2014; Shi, Chu, & Debats, 2015; Berke, et al., 2015). The results nevertheless still demonstrate that recent and current research is an instructive voice that planning efforts, via the perspective of Norfolk and New York City, are short of keeping pace with. Though, Norfolk and New York City are accompanied with certain internal and also external circumstances that have contributed to their mildly prolific range of efforts in recent years. Along with the internal trends in the plan quality data, external influences are equally as important to address.

5.2.1 Motivations

In their own interest, both Norfolk and New York City have placed ample attention toward combating the adverse impacts of a changing climate on their city, but also because of independent circumstances. Inland cities do not as readily experience the immediate effects of climate change, specifically sea-level rise and more intense storms. In recent surveys, of cities that engaged in adapting to the effects of climate change, three-quarters had experienced climate impacts, were in a state with a plan of their own, and many were at or near the coasts (Chu). Neither Norfolk nor New York would be as motivated to understand the personalized impacts of climate change, let alone combat them were it not for their geographic position and readily apparent impacts. Both cities are clear anomalies in their experience of climate impacts. New York City suffered from the most costly recent coastal storm in Sandy and Norfolk witnesses at the very least nuisance flooding on a regular basis.

Despite the broad acceptance among academia of socioeconomic action as a more powerful tool to minimize vulnerability to worsening climate threats, minimal evidence has indicated that plans

are moving away from tradition because (1) social justice is an emergent theme in hazard and adaptation planning, and (2) studies focusing on the integration of social justice into climate and hazards plans are sparse (Shi, Chu, & Debats, 2015).

For independent reasons, Norfolk and New York have been coerced into taking action on social and physical vulnerabilities, and exposure all concurrently. Not that New York City needed a major catalyst to motivate it to tackle environmental hazards, but Sandy exposed the social inequities that the city likely would not have been as adamant about otherwise. As for Norfolk, it is no coincidence that the areas that experience the worst flooding are also those most overrun with low-income affordable and public housing. Other more common motivations for initiating action toward climate change among cities at large – demonstrating leadership, promoting sustainable and resilient development, and improving community quality of life – all likely equally apply in the case of Norfolk and New York (Aylett, 2014). Considering New York City had been modelling the impacts from and strategies to adapt to climate change years prior to Sandy whilst most cities only began mitigating climate change impacts based on international research, it was an early national leader. Ensuring development is sustainable and resilient is of critical importance for both cities with their coastal location and thus finite developable space. The combination of these motives has thrust climate adaptation and flooding resilience into the foreground of most planning activities between the two cities since 2011.

5.2.2 Connections

The rapid emergence of flooding and sea-level rise as a prime focus in planning domains previously reserved for development, growth management and revitalization has manifested into previously unaccustomed associations. As climate change vulnerability is increasingly emphasized in practice and research, efforts previously operating in different spaces, like

mitigation, adaptation, and preparedness are beginning to see overlaps (Lesnikowski, Ford, Berrang-Ford, & Heymann, 2015; Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015). While the social justice issues of climate change have been merely conceptual in most cities, Norfolk and New York City are evidence that progress is being made toward climate equity (Berke, Cooper, Aminto, Grabich, & Horney, 2014; Schrock, Bassett, & Green, 2015).

Prescriptive and investigatory studies call upon transformative goals as means to further more equitable action (Berke, Cooper, Aminto, Grabich, & Horney, 2014). Through evaluation of hazard plans, they discovered that goals have been all too often confined to standard convention like efficiency and public safety to be considered transformative. They have neglected what has recently been declared more essential to disaster and flooding resilience, social equity (Berke & Lyles, 2013). Goals might seem inconsequential toward the overall performance of plans specifically in accounting for measures of social vulnerability, but in fact the makeup of goals observed in the plans for Norfolk and New York City were predictors of equitable action. It is worth noting that with a future portended as being littered with extreme climatic scenarios, breaking from conventions is of utmost importance.

A plan evaluation exclusive to goals would be negligible at best. However, the scope of the goals present in Norfolk's plans indicate that this foundational content might truly carry planning efforts on a trajectory of success or lack thereof in accounting for the whole picture of vulnerability and susceptibility. That New York's plans display a weaker correlation between the makeup of goals and subsequent propositions and actions does not repudiate this connection. As a trendsetting global city, New York hardly represents a typical American city, and as is reinforced in its plan performance. It is not the sheer level of overall performance that seems to

separate New York from a city with typical capabilities but the manner in which it outperformed Norfolk.

New York's plans that were facilitated through federal and nationally-renowned partners, its NDRC application and 100 Resilient Cities report, slightly outperformed that average of its plans. Its hazard mitigation and comprehensive plans outperformed the average by an essentially equal margin. In Norfolk, while its 100 Resilient Cities report and pertinent NDRC application outperformed its average, they did so by a wide margin, and likewise of its hazard mitigation and comprehensive plans. This trend underscores the possibilities available through strong top-level influence and more flexible municipal capabilities to rectify complex situations. If latter content exceeds the scope of goals then it is perhaps an indication of experience and familiarity whereas if goals eclipse tangible ideas then it is a sign of inexperience and sometimes complacency or overconfidence.

When organized effectively, goals can serve as benchmarks to hold plans accountable for their aspirations. Thus, they can be prophetic of progress without symbolizing progress. To aspire for equitable progress and resilience is to facilitate a process and plan that is inclusive, democratic, audacious, and studious. The studious component consists of open-mindedly inquiring about the complexities and characteristics of appropriately scaled communities. The vulnerability assessment is the cornerstone of this inquisition. As social structures and processes have become pervasive in understanding of vulnerability and inequality, research has urged for this to reflect in assessments of vulnerability. Vulnerability assessments are intended as diagnostic tools to effectuate the appropriate actions in appropriate locations (Van Zandt, et al., 2012; Baussan, 2015; Berke, Cooper, Aminto, Grabich, & Horney, 2014).

Norfolk's 100 Resilience Cities report and NDRC application boast the most wide-ranging and equitable goals, but only the NDRC application is able to effectively diagnose contributors to inequality and vulnerability. If Norfolk's Resilience Strategy were to be self-sufficient, this finding would severely discount the legitimacy of its proposed actions, but because of its superior inter-organizational coordination and collaboration it can be relieved of some of the responsibility. Multi-directional coordination in this way is conducive to the interchange of information and ideas such that the weight of legitimacy and responsibility is shared among other plans and initiatives. Both 100 Resilient Cities reports, Norfolk's Resilient Strategy and New York's OneNYC embody this trend of shared responsibility. Though not stating it outright, perhaps one element of the 100 Resilient Cities initiative was to maximize the immediate impact by relying immensely on preconceived assessments of vulnerability and already tailor-made strategies. Given the initiative is run by the financially endowed Rockefeller Foundation it is highly possible that investments in cities had been decided strategically based on the existence of efforts and resources in place rather than on absolute need.

Shifting back to assessments of vulnerability – the NDRC applications were not the only efforts that adequately identified and inventoried social and physical vulnerability. The more traditional hazard mitigation plans also sufficiently mapped and apprehended local vulnerability, but evidently as a matter of requirement. Neither hazard mitigation plans set equity and cohesion as a goal to achieve yet they both significantly accounted for social measures of vulnerability. That is about all the two hazard mitigation plans had in common. Whether or not Norfolk and the other Southside Hampton Roads jurisdictions sought to accomplish the bare minimum or to focus on other planning efforts more fervently is unclear, but the Southside Hazard Mitigation plan is certainly emblematic of the wide disparities in municipal capabilities between Norfolk and New

York City. An unexpected implication is that New York City's Hazard Mitigation might actually be its most socially impactful plan in delving into more typical place-based strategies, embracing diverse engagement, and being the most implementable. Of particular note is that the Southside Hazard Mitigation plan was published in 2011, a whole year earlier than any other evaluated plan. New York's, contrarily, was published at the start of 2014, roughly 15 months after the city's experiences with Hurricane Sandy. The more than two-year span between plans could be enough to explain the large gap in quality given the recent chronology of disasters and research/planning focuses. An obvious conclusion to make would be that Norfolk can learn immensely from New York's so-called hazard mitigation effort, but it could also be that that is not a suitable blueprint for Norfolk.

The city of Norfolk seems to have made the decision to invest greatly in its comprehensive planning effort to serve as an appropriate home for all complex issues including flooding of the nuisance and storm-related variety. Though Norfolk's Southside Hazard Mitigation plan is of lesser quality than the evaluation average, its comprehensive plan is just a step below the two robust initiatives. One study, after evaluating the adaptive and preparedness quality of several plan types including comprehensive plans for eight states all located in the Southeast, determined that comprehensive plans were the least equipped to support content related to hazards and disasters (Berke, Cooper, Aminto, Grabich, & Horney, 2014).

Considering the pair of comprehensive plans outperformed the hazard plans, Norfolk and New York City clearly debunk that judgment. Perhaps reinforcing the post-Sandy effect, the average date of publication and adoption for all four plans converges on around 2013. The aforementioned study evaluated plans that were adopted between 2007 and 2012. Ordinarily it might be surprising that a plan evaluation searching for content that contributes to adaptability

and resilience would favor comprehensive plans over hazard mitigation plans, but given the experience of these two cities and the current landscape of research since 2012, it is hardly a surprising result. Structural and infrastructural investments are still common in hazard mitigation plans because they are viewed as more sound and tangible compared with socioeconomic investments. Socioeconomic investments also do not attract as much buy-in amongst hazard mitigation since they are perceived as a trade-off from tangible actions that are subject to federal and state requirement (Berke & Lyles, 2013).

5.2.3 Influencing Factors

Undoubtedly much is gained from the results of the plan evaluation and the explicit content contained within the two sets of plans, but external factors also greatly contribute to their performance as can be assumed from other sources and the plans themselves.

5.2.3.1 *State & Federal Influence*

To the advantage of both Norfolk and New York City, some of the innovative practices and investment to combat the effects of flooding and coastal storms can be attributed to federal commitments and state-level leadership. Though most federal funding to local jurisdictions following a disaster declaration manifests as assistance and recovery funds to provide relief from the major financial setback that ensues, recent commitments have opened up new possibilities. During disaster relief, the federal government follows its own protocol under the Stafford Act to assist with a laundry list of priorities like deploying emergency support and response teams, public facilities and public housing, insurance losses, etc. Research has found that the ability of cities to plan for climate adaptation and preparedness does indeed depend on state and federal policies (Chu). Adaptation at the local level does not occur independent of federal or state government (Baker, Peterson). Consistent with the case of New York City, research also states

that environmentally progressive cities have excelled in planning to prepare and adapt (Shi, Chu, & Debats, 2015).

If the comprehensive plans represent local government's best efforts to prepare and adapt to coastal climate threats, then the 100 Resilient Cities reports and NDRC applications represent the current capabilities of state and federal governments. The two pairs fully demonstrate the top-level influence effect. It has also been cited that local government can lack the dedicated capacity undertake certain specifics of climate adaptation and preparedness without the support of foundations like the Rockefeller Foundation, that operate at the national level (Shi, Chu, & Debats, 2015). The obvious influence of HUD and the Rockefeller Foundation on the two initiatives, while incalculable, does not even represent the full scope of vertical influence, at least on Norfolk. The leadership under Virginia's Department of Housing and Community Development, as appointed by the governor, on the ThRIVe NDRC application centered on Norfolk certainly contributes to the application's elevated potential. The agency was likely selected based on the competition's diverse requirements for recovery, revitalization and development given their track-record in those areas. The combination of state and national stake does not account for the entirety of the superior performance of the 100 Resilient Cities and NDRC reports, but as has been repeatedly uncovered in other cities, it makes an impact.

5.2.3.2 Financial Streams

In what might be attempts to keep the federal response to future disasters as modernized and mistake-free as possible, the government has dedicated billions in leftover disaster recovery funds to coax impacted locations like New York City and to a lesser extent Norfolk to explore creative solutions to the problems they have faced as a result of extreme flooding and coastal storms. Rather than remain in the background as cities surge past state and federal governments

in understanding the complexities of the various stages of disaster planning, the federal government has taken on a listening role so that municipalities can return the favor for the funding and resources they received. The quality of efforts that have emerged out of this give and take has been bar none above the rest likely because of the high standards the federal government imposes on its subsidiaries, and for the desire to constantly improve outcomes for other locations in a manner not unlike the 100 Resilient Cities initiative.

Ordinarily, even with supplementary funds, because of political bureaucracy and prioritized recovery needs, the two cities would be unable to devote labor and investment into exploring radical alternatives let alone implement them. There are tradeoffs to investing in one area of need over another as cities must prioritize certain actions over others. In many instances, cities choose development priorities over environmental or social priorities because they are indebted to those priorities (Shi, Chu, & Debats, 2015). The state, federal and nongovernmental initiatives that have surfaced since the publicity of climate-related events have provided the motivation and resources enough for local governments to overcome this dilemma. Certain decision-makers and representatives of vulnerable communities might advocate for transformational change, but without grants and other outside resources, willpower is too weak, and the opposition holds too much weight.

5.2.3.3 Regulatory Framework

Both hazard mitigation and comprehensive plans have certain requirements that they must meet in order for the jurisdiction that is the subject of the plans, to qualify for certain state and federal government funding. Hazard mitigation plans at the local level often conform to state hazard mitigation plans that determine the amount of funding the locality may receive. These FEMA-approved hazard mitigation plans may receive funding directly for mitigation projects in non-

emergency situations, as a condition under the Stafford Act. These plans are thus of better quality in areas that FEMA and the Stafford Act require of them for approval and funding eligibility. Under the Stafford Act, all hazard mitigation plans for a jurisdiction in the U.S. must identify hazards, risks and vulnerabilities, describe actions to mitigate them, and establish a strategy to implement those actions (FEMA, 2013). Hence the better performance in those types of actions in the plans themselves.

Also at the federal tier, several executive orders have been signed since 2013 regarding climate adaptation at the local level. Particularly, FEMA has received the directive to require state-level hazard mitigation plans to include future climate scenarios and projections, but they have yet to enforce that at the local level (Shi, Chu, & Debats, 2015; Small & Laporte, 2015). Overall, for the purposes of this study, the regulatory framework for hazard mitigation would have been a hindrance since for instance structural controls only accounted for less than one percent of the possible score. Studies have even found that federal and state programs for hazard mitigation have had only a marginally positive effect on plan quality (Berke & Lyles, 2013).

The DMA, the successor to the Stafford Act, had intended to diffuse authority by emphasizing intergovernmental collaboration. Instead of reliance on formal mandates and imposed standards by the federal government, local governments could have more control over their hazard mitigation approaches. In reality, state governments coordinated risk assessment, strategy identification, implementation and monitoring. Unfortunately, even recently, state hazard mitigation plans have underperformed under measures of the same plan quality principles, boding poorly for local plans. Specifically, state plans the responsibility of emergency management agencies are of the poorest quality because they view hazards differently and pay

less regard for the uncertain impacts of climate change, or economic development and environmental protection (Berke, Smith, & Lyles, 2012).

The Southside Hazard Mitigation Plan was in fact prepared and updated in partnership with FEMA and the Virginia Department of Emergency Management (VDEM). On Hampton Roads' end, the local planning committee is representative of in addition to emergency services, planning, zoning, public works, healthcare, and environmental offices. Since the committee is compliant to VDEM and their coordinating of risk assessments, strategy approaches, and implementation methods. By contrast, New York City's hazard mitigation plan was far less reliant on state government, though it was supported by the equivalent New York State Division of Homeland Security and Emergency Services. The plan was instead co-developed through the city's Office of Emergency Management and Department of City Planning in coordination with the Mayor's Office of Long-Term Planning and Sustainability. The self-autonomy and lack of a dominant regulatory body with New York City's hazard mitigation certainly would explain the distance in hazard mitigation quality after accounting for the city's planning capacity.

Comprehensive plans, like hazard mitigation plans, can serve as a symbol of qualification for a locality, though in a secondary role. They usually do not themselves entitle a locality to funds to implement actions proposed in the plan like with a hazard mitigation plan. On a state by state basis, comprehensive plans can have consistent structure so that they are officially recognized by their governing state authority. Requirements can vary immensely for comprehensive plans depending on the rules written in the state's code. When state comprehensive planning mandates do include funding and other incentives, hazards typically receive higher priority (Berke, Cooper, Aminto, Grabich, & Horney, 2014). Certain components of the comprehensive plans for Norfolk and New York City may be contingent on the requirements from Virginia and New

York State, respectively, but more than likely, an overwhelming majority of the quality pertinent to this particular evaluation is dependent on the jurisdiction itself. As an example, an added requirement under New York state law is for comprehensive plans to comply with state environmental quality requirements and to allow for full citizen comment through public hearings during adoption (Coon, 2015). While this is negligible given New York's capacity combined with its progressiveness, it is still a requirement that is not equivalently enforced on Norfolk.

In sum, absent regulations can either allow more freedom to plan flexibly under a multidisciplinary effort or withhold the accountability necessary to integrate certain essential planning qualities. Regulations in place can also ensure that these essential planning qualities are accounted for or, if outdated and overly restrictive, can themselves serve as an unbreakable barrier to more improved planning efforts.

5.2.3.4 Scale

As hypothesized, downscaling planning efforts would improve outcomes for vulnerable communities. As the plan closes in on a smaller geographic area, so too would its contents. It would be expected that with less geographic responsibility, assessments of vulnerability might be correspondingly more complex and wholesome, proposed strategies might be most compatible and constructive, participation might be all-inclusive and recurrent, implementation might be shared and convenient, and monitoring might be ingrained. Contrarily, the two examples of neighborhood-scale plans did not display these traits to much avail. The efforts seemingly contracted in quality as they concurrently honed in on planning territory. One explanation for the decrease in quality after the downsizing scale is a narrowed and more focused scope. The evaluation process is set up to reward those plans that incorporate a variety of actions and content, and for good reason. As communicated throughout, each criteria has its own function

and benefit that contribute to the overall potential of a plan to incite resilient transformational change in vulnerable communities. Since there were fewer stakeholders and fewer constituents, preferences were most likely more concentrated. Likewise, one single neighborhood may have numerous issues and vulnerabilities, but as a fraction of the total in an entire city. Proposed solutions and actions taken would accordingly reflect this condensed realm of problem-solving.

5.2.3.5 Iteration

The main similarity between a city's comprehensive plan and its hazard mitigation plan is that each are updated every so many years, typically around five. A major difference between them is their source of funding to develop the plan. Given the latest version of a city's hazard mitigation was approved by FEMA and thus subject to the rules of the Stafford Act, the mitigation planning committee made up of representatives from planning and zoning, emergency preparedness/services, and utilities would have allocated the contributions from FEMA directly toward the future development and updating of the plan. Comprehensive plans forged by the planning department do not have that same luxury. Rather, they are often a periodic responsibility of certain members of the planning staff whose positions are paid for through public revenue. Yet, due to the fact that both imminent plan types are recurring, they bear certain qualities that other perhaps unfamiliar planning endeavors might elude.

Research has indicated that planning leaders have learned incrementally at different rates depending on the initial quality of the plans and the extent of state mandate and regulation. Plan series have improved over time in areas such as emergency preparedness, public engagement and policy-making (Brody, 2003). The hazard mitigation and comprehensive plans likewise revisit themselves and the areas they are planning for each time they undergo a regular renovation. The

community conditions that factor into vulnerability assessments and critical decisions are usually representative of the latest data and information available.

If each time the plan update process commences, officials revisit their public constituents, barriers to participation and implementation like reluctance, distrust and opposition may degrade over time. Thus, the equitable and implementation capacity of the plan would have been enhanced. Again, since the plans are always building on the preceding version, they are also constantly realizing past mistakes and errors and correcting them for future versions. Over time, unless local bureaucracy prevents progress on the plans or a deviation from the bare minimum, hazard mitigation and comprehensive plans should gradually make improvements in quality. Their iterative nature, nevertheless, is more auspicious than an impediment. Of all the external influences on plan quality, the iterative nature of these plans has the least certain effect, but as according to research it is likely the long duration of hazard mitigation and comprehensive planning processes has had a positive impact.

5.3 Overcoming Traditional Obstacles

Similar to external influences that have either bolstered or hindered the quality of these sets of plans, there are certain underlying barriers that have plagued the progression of all planning for adaptation and preparedness. Studies have chronicled the deficiency of plans in effectively accounting for the whole sphere of remedial environmental, social and economic actions and criteria. While these barriers may be deflating and seem overbearing, research has proposed ways to overcome them – some of which is in practice in the plans of Norfolk and New York City. The interlacing theme of the ensuing passage is not to argue that the subject plans have successfully overcome these longstanding obstacles and that other cities can view New York and Norfolk as utter successes, but that they have made headways. Perhaps certain proposed

groundbreaking strategies that were adopted by either city are more practical than others that were not put into practice but are equally supported in research.

These barriers that have continuously threatened the efficacy of planning efforts only complicate already desperate situations for vulnerable communities. Embracing recommended tools and tactics to alleviate and eliminate barriers to municipal planning can improve the future prospect for these communities, but only in an anticipatory sense. As the literature and this evaluation has established, adaptation and preparedness undertakings also need to seize socioeconomic and equitable action to whittle away at the incessant shortcomings of vulnerable households. Otherwise, a vicious cycle of defeat and failure at the hand of extreme flooding and coastal storms will persist.

5.3.1 Local Leadership

5.3.1.1 *Political Prioritization*

Consistent with leadership demonstration as a motivation to pursue adaptation and preparedness to climate change, local leadership is a critical indicator of far-reaching support for adaptation planning. Leadership also serves as the foundation on which cities are able to tackle environmental as well as socioeconomic risks. Encouragement from local leaders for climate commitment early on has correlated with robust coalitions and sweeping political support. A history of climate change denial, unpredictability of climate impacts, and hierarchy of government operations have all been cited as deterrents to local leadership embrace of planning for climate change impacts. Just a quarter of cities have reported that elected officials are highly committed to adapting to climate change. Inadequate support from mayors and city councilors translates into challenges in supporting personnel capacity, acquiring enough funding, and coordinating with other departments and agencies (Shi, Chu, & Debats, 2015; Aylett, 2014).

Of course leadership has been more receptive over time as momentum has shifted in favor of climate and social progress, but the underliers behind lack of support still persists in those cities notably without local leadership. Most common has been a shortsightedness or a political focus on short-term goals linked to electoral cycles. Other city governments cite lack of leadership at regional or national levels of government as reason to not take initiative. There will always be competing priorities at the local level, but some cities still view adaptation and preparedness as at odds with economic expansion and improvements in community facilities. Even cities that have been declared more at-risk to climate-induced weather events and sea-level rise, action has been occasionally sluggish because of other priorities on their list receiving precedence (Berke & Lyles, 2013).

All of these political barriers have been most pervasive in the U.S. Of all nations participating in a 2014 global survey of action on climate change by ICLEI, U.S. respondents reported the highest frequency of mitigation only response. Norfolk and New York are among the 58% of American cities that are taking mitigation and adaptation action, but 41% of 141 participating cities is still a substantial chunk that has been unable to break through (Aylett, 2014). Local leadership can be seen as both an external and an internal challenge. Influence and endorsement from mayors and city councilors is less tangible plan content and more procedural and integrated into background and authority. Norfolk and New York City are indeed special cases in that social interests and climate change are already intertwined and immediate rather than off in the distant future, as it pertains to being adaptive and prepared. Still, they have been governed by leaders that have championed the fight against the social, economic and environmental impacts of climate change. In the future, this continuous commitment to socioeconomic and climate

adaptation will hinge less on local leaders as momentum will have already been realized even as new individuals occupy leadership positions.

5.3.1.2 Local Coalitions

The Climate Change Adaptation Task Force, launched by then Mayor Bloomberg and made up of city and state agencies, is still one of the only in existence at that capacity and scale. The task force has served as an empowering voice behind much of the mitigation and adaption work on climate change prior to and since Sandy. Coincidentally, the Panel got off the ground thanks to a grant from the Rockefeller Foundation's Climate Change Resilience Program (Loeser & Post, 2008; Department of City Planning, 2015). The Foundation, which has been a partner in around half of the resilience initiatives involving Norfolk and New York City, happens to be headquartered in New York – further solidifying the city's status as a trailblazer in combating climate change. It would be imperative that New York City had created better quality plans to foster resilience to flooding and coastal storms since it has far greater political will, capacity and experience.

Concurrently, the Hampton Roads Planning District Commission has served as the regional liaison on climate action through support from the Virginia Department of Environmental Quality via NOAA and the Coastal Zone Management Program. The HRPDC with representation from local leaders across the region were able to commence a climate adaptation process relying on a three-year focal area grant beginning in 2009 and extending through 2013 (McFarlane, 2013). To opportunistically unite the multiple municipal entities and levels of government, the Hampton Roads has since piloted an organizationally inclusive approach to sea level rise preparedness and resilience planning. The purpose of the two-stage project was to assemble intergovernmental arrangements and procedures comprised of federal, state and local

government agencies, the private sector, and the public. After the conclusion of the project the region now has an institutional framework of mutual accountability so that there is universal leadership indefinitely.

Circling back to the evaluated plans, each set would not have been possible without the political approval to pursue the 100 Resilient Cities and NDRC initiatives or the adoption of the plans and reports by local mayors and city council members or even state political leaders. Each city's mayor has delivered personalized visions and perspectives to reports like Norfolk's Resilience Strategy or New York's PlaNYC: A Stronger, More Resilient New York as a way to enunciate their leadership role in the process. If research is accurate about the advantage to vigorous local leadership in the fight against climate change, then the NDRC application and 100 Resilient City reports were of superior quality because, not only did they incur federal support, but they provided spaces for leadership roles from nontraditional sources. For instance, alongside Norfolk's mayor, city council members, and city manager, representatives from all sorts of agencies, nonprofits, community organizations, municipal services, and academic institutions serve in an influential capacity among four different working groups.

5.3.1.3 Leadership in Flood Management

A further indicator of local commitment to adaptation and preparedness is participation in the Community Rating System (CRS) under the National Flood Insurance Program (NFIP) (Berke, Cooper, Aminto, Grabich, & Horney, 2014). At face value it appears as a specific example of an action taken to prepare for flooding threats, but is actually a sign that a municipality has gone above and beyond what is considered acceptable requirements for flooding in communities regardless of income. The program just happens to benefit low-income communities more as a matter of proportional impact. The program is entirely voluntary in providing discounts to flood

insurance premiums for floodplain management activities that minimum NFIP or freeboard requirements (Berke, Cooper, Aminto, Grabich, & Horney, 2014). New York City proposed participating in the program in 2013 with its comprehensive plan and started the process later in its 100 Resilient Cities report in 2015 (Department of City Planning). Norfolk has been a participant in the program since its inception, but is among one of the lowest classes and so only receives a small decrease in flood insurance premiums. Even though Norfolk and New York City have not taken full advantage of the rating system that serves as a measure of overall flood excellence, they stand to improve their status as likely leaders in managing coastal flooding and sea-level rise.

5.3.2 Local Information & Knowledge

5.3.2.1 *Risks*

In comparison with long-acknowledged and familiar phenomena, climate change impacts are far more pervasive, complicated and thus often misunderstood. Phenomena like housing shortages, infrastructure failures, or business closures are complex and unpredictable in their own right but none of them compare to the intricacy and rootedness in all facets of cities and segments of society as climate change. Sea-level rise and extreme flooding events, much the concern of coastal cities, pose a myriad of risks depending on the structural and physical characteristics, but also based on demographics, health, mobility, resources. Because of the all-encompassing and inscrutable nature of climate change, even on the coasts, modelling of these impacts and risks has taken place mostly at the top – internationally and nationally. Cities might have been able to effectively plan for coastal hazards like flooding and coastal storms before realizing the influence of climate change, but since, it has become an insurmountable task for many.

Consequently, in the U.S., those federal and state agencies responsible for assembling models of climate impacts share place-specific fragments of their data with those cities that do not possess the technical abilities to develop the data for themselves. This saves local governments and organizations time and resources to create the climate data, but as a tradeoff, existing staff are unable to discern and interpret the newfound information. Thus, cities often still need to hire technical consultants to interpret these models into specific impacts on the population, services, and infrastructure. Compounding matters, data on the cost of natural hazard losses are reported by storm, state, or county, but not by city. This makes it unnecessarily difficult to systematically examine the tactile impacts of climate and incorporate that into existing planning (Shi, Chu, & Debats, 2015). The main issue though with climate change and vulnerability data is not the breadth of information but the interpretation of that data and how the risks can be misconstrued in regard to how they impact vulnerable populations. Particularly, over half of cities report a lack of understanding and awareness among local government. Since this scientific data is collected and extrapolated at larger scales and disseminated to beneficiary cities, the processes through which the data is transformed into knowledge and action and integrated into local information is more critical than the data itself (Aylett, 2014).

Nonetheless, the extent to which planners have been able to both access necessary information and decipher that information to supply to their adaptation and preparedness efforts is difficult to pin down (Shi, Chu, & Debats, 2015). Still, there have been tactics employed at the local level to sidestep these knowledge barriers and enhance the ability of municipal governments to comprehend information regardless of whether they fully understand. It is not possible to grade the abilities of Norfolk and New York City to interpret their localized experienced of climate

change through the plans themselves, but the plans can provide insight into whether they are more likely to have understood the impacts on their cities.

As it takes time to fully discern a largely complex issue like climate change risks and local vulnerability, both cities have surely benefited from the prolonged commitment to grasping and being well-informed of the local impacts. In the first stage and on through the end of their multi-year climate adaptation process, Norfolk and the Hampton Roads Planning District Commission relied on local information from Virginia's Governor's Commission on Climate Change, the Virginia Institute of Marine Science, collaborative studies between state and federal agencies, and other studies centered on the region. Instead of being bestowed a package of information to discern on their own, the adaptation planning team representative of each municipality was able to engage directly with the authors of the information being assessed and with local leaders to pass along what was learned (McFarlane, 2013). The region certainly benefited from government buy-in early on to be able to take on the sweeping assessment approach to adaptation. The planning commission subsequently bypassed the middlemen that would be necessary to translate information acquired from far-flung sources.

New York City went above and beyond to alleviate the potential problems associated with receiving and interpreting heaps of convoluted information. As implied several times, the city is an anomaly and does not embody the capabilities of a typical American city. The city was still exceptional at the time in appointing local organizational leaders and relevant experts to its Climate Change Adaptation Task Force and Panel on Climate Change. The panel body of scientists and risk management experts briefed the Climate Change Adaptation Task Force to generate momentum on climate action related to sustainability back in 2008 (Loeser & Post; Office of Long-Term Planning and Sustainability, 2014). Coincidentally, the city's Panel on Climate

Change became a permanent entity in September, 2012, a month before Hurricane Sandy. The NPCC was then able to greatly influence the city's recovery and rebuilding report following the storm, PlaNYC: A Stronger, More Resilient New York (Office of Long-Term Planning and Sustainability, 2014).

The synthesized scientific information and climate risk analyses were not incorporated into the content analysis simply because of their marginal relevance in directly affecting vulnerable communities. Contrary to that belief, the long-term cross-examination of climate risks in-house and locally has in fact contributed to the level of adaptation and preparedness for vulnerable communities. The interpretation of the plethora of incoming information has been a barrier to cities even being able to continue on the right path to addressing the vulnerabilities of communities. Since Norfolk and New York have apprehended the local sea-level rise and coastal storm risks that climate change poses on their cities they have had the foresight to conceive these initiatives and reports. Understanding the risks of climate change is a segue and precursor into perceiving and addressing the vulnerability of those at-risk to these threats, but it is not a direct correlation.

5.3.2.2 Vulnerability

Poor understanding and acknowledgement of the distribution of citizen vulnerability has not been a barrier for planning to adapt to a climate impacts, it has been a barrier to climate justice and for planning to reduce the susceptibility of those most at-risk (Highfield, Peacock, & Van Zandt, 2014; Van Zandt, et al., 2012). Given the scientific limitations of climate-change research, and the uncertainties of how different population groups, and stakeholder interests are affected by climate change, many kinds of knowledge will be important for ongoing problem-solving (Berke & Lyles, 2013). When municipalities unpack the impacts posed in information on

climate risk, whether it is received by external sources or locally, they can synthesize the knowledge with an awareness for what constitutes vulnerability to those risks. Research repeatedly has affirmed that those communities that are most resource scarce and underprivileged demographically are quintessentially socially vulnerable. Incidentally, it has also uncovered that socially vulnerable neighborhoods have not only been susceptible for those socioeconomic characteristics, but because they have tended to be more often physically vulnerable and exposed to climate risks (Highfield, Peacock, & Van Zandt, 2014; Van Zandt, et al., 2012; Mearns & Norton, 2009; Ross, 2013). This has not always been the case, but nevertheless has been deemed significant enough to consider as a trend. Hazard exposure is of course more pronounced in coastal cities due to the tangible proximity to surge and flooding, posing as an endemic threat.

The interdependent relationship between the three modes of vulnerability prompts the need for them to serve as the foundational basis of facts in plans to minimize the risk to coastal threats (Highfield, Peacock, & Van Zandt, 2014). Municipalities have either been unable or unwilling to address the inequities in vulnerability (Weiss, Weldman, & Bronson, 2012). Unlike climate change modelling, vulnerability is more familiar and even observable. Within planning for identified risks, efforts either identify vulnerable groups but disregard the geography of vulnerability, do not adequately identify vulnerability, or lack the resource capacity to address the underlying causes of vulnerability. Simply not having the capacity to take a vulnerability-centric approach comes with a caveat. Cities that have the ability to pursue adaptation planning then have the ability to pursue vulnerability (Rumbach & Kudva, 2011). Unfortunately, many have not, as evident in the prevalent intersectionality of vulnerability.

A likely outcome of successful integration of measurement and mapping of vulnerable populations would be more geographically organized and impactful action. Disparities in the quality of vulnerability assessment and mapping between Norfolk's and New York's plans back this theory but differences between individual plans do not. The information most frequented in Norfolk's plans is the foundational planning knowledge of geographic extent, land use and development trends, and demographics/economic characteristics. Where social capital, mobility, living conditions, risk perception, and a host of other socioeconomic variables are absent in its comprehensive plan and resilience strategy, the variety and quantity of action distributed to vulnerable neighborhoods was low. Except only the other planning documents that were conscious of more insightful knowledge did not fare better. Among its high performing plans, New York City actually allocated a variety of actions to vulnerable neighborhoods consistently and effectively. This result seems to accentuate the distributed characteristics of local and regional information. That the plans for both cities excelled in being coordinated strategically and informationally could point to the productive distribution of plan action as being dependent on the overall local quality of vulnerability assessment and mapping.

Consistent with the trend unveiled in Norfolk's and New York City's comprehensive and mitigation plans, comprehensive plans have been recently remarked as having a prominent role in reducing vulnerability to a variety of risks. They mesh well because of their coordination of community programs, development and land use, and legal standing. Hazard mitigation plans are more logically befitting of vulnerability reduction, but FEMA has in the past incentivized treatment of risks as a symptom of inadequate structure and infrastructure rather than as socially constructed (Berke, et al., *Evaluation of Networks of Plans and Vulnerability to Hazards and Climate Change: A Resilience Scorecard*, 2015). A subset of the aforementioned data result

indicates that, although vulnerability assessments were a more dominant feature of the two hazard mitigation plans, the comprehensive plans overwhelmingly distributed action and proposed action to vulnerable communities, and in a more holistic manner.

Reshaping communities whether through land use, development and/or assets has a positive impact on reducing vulnerability (Berke, et al., 2015; Highfield, Peacock, & Van Zandt, 2014). Plans that incorporate place-making and quality of life like comprehensive plans are directed to target specific locations rather than solely develop programs and policies to apply broadly. All of New York's plans that placed land use, development, and quality of life actions in the foreground, including its comprehensive plan, distributed those actions to vulnerable neighborhoods. Although place-making strategies held a more enhanced function in its hazard mitigation plan than in the mitigation plan for Norfolk, still far fewer actions were distributed to specific neighborhoods let alone vulnerable ones. New York's recent experiences with Hurricane Sandy certainly has helped to illuminate specific needs in locations across the city, but the better quality of information and knowledge in the plans still insinuates part of the responsibility.

Now that place-making and quality of life strategies have been repeatedly affirmed as important vulnerability reduction approaches, land use and development documents can serve to complement or even outdo hazard mitigation plans in planning to adapt to and prepare for future coastal threats, especially when they integrate the risks into the decision-making process.

Although, without a keen awareness for a wealth of possible threats and underlying causes at an appropriate scale, planning action would not be able to maximize its impact. This reinforces that coordinating hazard exposure and physical and social vulnerability can bridge the gap between planning approaches to effectively collaborate and ensure the most productive and symbiotic use of resources (Highfield, Peacock, & Van Zandt, 2014; Rumbach & Kudva, 2011).

5.3.3 Public Indifference & Marginalization

5.3.3.1 *Awareness & Priority*

The public has held a similar sentiment toward climate change and climate disasters as public officials. They are aware of the threats but do not place them with high regard in place of circumstances and situations that are viewed as more immediate rather than perceived as distant or improbable. Planning efforts that have focused solely on infrequent hazards and unpredictable threats have faced considerable difficulty in exciting or even engaging constituents in comparison with development, community enhancement, or economic development efforts (Burby, 2003; Berke & Lyles, 2013; Behr & Diaz, 2014).

The public itself is not to blame for their relative indifference toward climate action and reducing disaster risk. Inadequate leadership on taking action has meant that information on risk and vulnerability has been poorly communicated to those that are most affected. Planners and officials, unknowingly, may have also misconstrued climate information and the exact severity of risks locally. The intimacy of experiencing a large-scale climate event like Hurricane Sandy would assumedly raise the awareness and precedence of such threats universally, but planners and researchers have described the phenomenon as a narrow window of opportunity (Aylett, 2014; Shi, Chu, & Debats, 2015; Schwab, 2014).

A healthy combination of awareness, training, education and capacity building programs can greatly improve the risk perception of participants and save the lives of participants' neighbors. By involving civic and community leaders and other trusted members of the community, plans can create a domino effect of public understanding and persuasion of the need for action. Norfolk and New York both effectively involved neighborhood groups and civic/community based

organizations. These gateways to vulnerable residents can relay information regarding strategy proposals, preferences, and risks back and forth between residents and planners.

Awareness strategies like warning systems and preemptive warning can alert the general public of imminent danger, but if risk perception is low, investment in these warnings are counterproductive. Norfolk and New York were advantageous in investing more in education awareness campaigns in neighborhoods first over warning strategies. Engagement techniques like information distribution and emergency drills can also disseminate knowledge, spread awareness, and train leaders of the community to ultimately build confidence in risk-averse behavior. Training activities were seldom practiced, especially in Norfolk, but teaching materials, demonstrations, and use of social media were more often used to inform a broad audience and also augment awareness strategies.

Evacuation and sheltering procedures are indispensable lifelines in vulnerable communities, but many households are not able to make intelligent critical decisions unless they had been educated far ahead of time. Decisions made under disaster scenarios are partly dependent on familial and social networks, and vulnerable households have fewer of them. Risk/strategy awareness campaigns are not only effective in informing risk but also of informing vulnerable households of the best options for them during extreme events. In Norfolk, the Rising Resiliency Challenge and the ThRIVE NDRC application were the only to channel their awareness strategies to vulnerable neighborhoods, which both efforts centered on the north shore of the Elizabeth River. Its Resilience Strategy and Hazard Mitigation plan had equally laudable awareness campaigns, but discredited their cause in not productively targeting any vulnerable neighborhoods like those fronting the mouth of the Chesapeake Bay or the south side of the Lafayette River. All of New York's plan with proficient awareness campaigns with the exception of its Hazard Mitigation

plan did target vulnerable neighborhoods like in the Lower East Side of Manhattan and the Brooklyn/Queens waterfront, that were also impacted by Sandy.

Planners can incite enthusiasm by underscoring problems tied to a specific place or site. The most logical method of arriving at such site-specific knowledge to disseminate concern is through vulnerability assessments accompanied by information distributed accordingly.

Residents are universally more interested in contributing to the process when they can personally perceive the potential impacts on their property and safety as opposed to more abstract policy-based issues that are less tangible (Brody, 2003). Plans generate the most buy-in among affected communities when they draw from human nature in demonstrating emotional intelligence and the ability to empathize (Schwab, 2014). More than just teaching/awareness strategies, but also capacity-building exercises can improve the planning process and decision behavior of the public. Capacity-building is predominantly relied on as a tool to involve the public more.

5.3.3.2 Influence & Involvement

Vulnerable groups, especially those that live in poverty, do not possess the capacity to influence planning that their less vulnerable and wealthier counterparts do (Baussan, 2015). Many minority groups in low-income neighborhoods feel abandoned by planning processes and are subsequently disengaged. They are especially dispassionate toward preparing for and mitigating coastal storms and flooding. Their distrust of decision-makers is rooted in their persistent discrimination and unequal treatment from urban investments, resources and services (Berke, Cooper, Salvesen, Spurlock, & Rausch, 2011). Mirroring their inequities, vulnerable households have been vastly underrepresented politically and by stakeholders in planning processes (Burby, 2003). Isolated and underserved residents have also been less likely to have their experiences,

needs, desires or concerns included in plans, contributing to their lack of control over their own circumstances (Aldrich, 2014).

Given their distrust of and suspicion toward their public officials, this inability to self-govern and an apathy toward more abstract issues like disasters and climate change can contribute to general cynicism (Berke, Cooper, Salvesen, Spurlock, & Rausch, 2011; Baussan, 2015). Feeding off that apathy and distrust, officials, not demonstrating an awareness for the benefit of involving isolated residents, have been ineffective in improving mutual trust (Burby, 2003; Berke & Lyles, 2013). The inclinations of municipal leaders and employees combined with the low political capacity and cooperation of vulnerable residents has been a daunting barrier for both sides (Green, Kouassi, & Mambo, 2013).

Involving a variety of demographic groups and social service providers can establish trust and cooperation. Mistrust and apathy may be formidable barriers but they can be transformed into opportunities to augment the political effectiveness of planners (Burby, 2003; Berke & Lyles, 2013). Special needs groups and impoverished households, often not mutually exclusive, represent those that have been least involved in planning yet are most socially vulnerable. In Norfolk, special needs groups like youth, elderly, and disabled were involved alongside the rest of the public, but not in any greater capacity. The plans did not target their outreach and participation efforts toward specific vulnerable neighborhoods. In fact, the only targeted area was in downtown which is of lesser vulnerability. Although, PlaNorfolk 2030, Norfolk's Resilience Strategy and the Rising Resiliency Challenge involved residents and their community organizations in the Park

Place, Kensington and Chesterfield Heights neighborhoods – all socially vulnerable – or at least indicated that they were included in some form. Generally, despite the advantage for vulnerable

neighborhoods, outreach, engagement and involvement was not disseminated well, or rather specified as such. Of course, quality-wise Norfolk's Resilience Strategy and the ThRIVe NDRC application had sufficient engagement and involvement, but simply introducing it as content and not as action taken in specific neighborhoods does not imply a commitment to reducing marginalization and disenfranchisement in vulnerable neighborhoods.

Social service, childcare, and welfare providers were all consulted with and contributed to the New York planning process in more than a couple plans. Norfolk involved just a few of its social service providers in its planning process. New York demonstrated a commitment to engaging its vulnerable isolated and apathetic residents through its planning processes. New York did manage to coordinate its planning outreach efforts in demographically diverse and socially vulnerable neighborhoods like in Brooklyn's riverfront, the Brooklyn/Queens waterfront, and Lower Manhattan. The efforts did however notably seem to gloss over neighborhoods in the Bronx, the most socially vulnerable Borough overall. Norfolk may have connected with residents in a few of its more vulnerable neighborhoods, but it did not actually specify it as a priority. As a design-oriented strategy, New York often proposed communal spaces to enhance social opportunities and interactions among vulnerable groups as a way to build mutual capacity and trust. It is not equivalent to granting residents the authority to shape the image of their community, but it can result in positive social capital outcomes.

Socially-driven policies and capacity building activities are holistically remedial in vulnerable communities. They can drive up wealth, social capital, health outcomes, interdependence, local enthusiasm and self-governance. Strategies that satisfy other calls for action like awareness, preparedness, housing and involvement can secondarily build capacity and collective action. Volunteerism, focus group meetings and social events, visioning/charrettes, and community

layout planning are primarily exercised to foster capacity and equitable communication in disenfranchised communities. Volunteerism as a form of capacity building exercise that was not readily advocated for in either city. They most certainly did not enforce incentives like time banking and community currency to reward those who volunteer. Focus groups were much more popular, especially in New York, to give marginalized groups greater representation in moderator-led discussion of personalized planning topics. Planning workshops were most familiar as vision exercises for vulnerable communities between the two cities as described in their plans. Norfolk and New York both employed at times creative and inviting visioning exercises for participants to visualize proposed ideas in their community and share their own to influence future action. Like with its outreach, New York, rather than present its workshops and focus groups as applying broadly, specified those vulnerable areas of the city that were particularly engaged.

Ultimately, capacity-building and educational awareness go hand-in-hand. Committing to increasing the awareness of vulnerable communities might ease some of their apathy toward adaptation and preparedness and would enhance their desire to be more involved in planning efforts. Similarly, deepening the capacity of these groups to influence naturally subjects them to a heightened awareness and understanding and thus the ability to make wiser decisions under critical scenarios. With the exception of the Rising Resiliency Challenge which was locked on the Chesterfield Heights neighborhood, not one of Norfolk's plans indicated that they conjointly increased the awareness and built up the political capacity in vulnerable neighborhoods. In New York City, only Lower Manhattan under the BIG U Rebuild by Design project, benefited from both educational awareness and hands-on engagement/involvement concerted, though

OneNYC and PlaNYC are both investing in awareness and capacity, just in differing vulnerable neighborhoods.

5.3.4 Resources

5.3.4.1 *Planning Resources*

In face of planning to prepare and adapt to worsening coastal hazards and also generally, resources are both a government and a constituent obstacle. In municipal planning, the chief resources needed are will and revenue. Political will is especially critical for climate adaptation and preparedness planning, as had been outlined earlier. The resource obstacle for planners directly relates to the influence of state and federal government, financial streams, and local leadership. For instance, cities that have not had influence from higher levels of government or strong local will have found it especially difficult to obtain the financial and personnel resources to pursue climate adaptation and disaster preparedness (Shi, Chu, & Debats, 2015; Baker, Peterson, Brown, & McAlpine, 2012). Fairly recently, even some large cities have equally reported the difficulties of securing enough resources in light of competing priorities. Around three-quarters of cities cited insufficient funding to hire enough staff for a unit to combat climate change and over three-quarters of cities in fact identified short-term and long-term funds provided by local government itself as the most substantial source of funding for staff working on the local response to climate change (Aylett, 2014). Securing funding, and reallocating staff time and resources for climate adaptation has generally been found to be more menacing an obstacle than obtaining current information, communicating to the public, or garnering interest from businesses (Shi, Chu, & Debats, 2015).

Many cities have had to resort to of reallocating responsibilities and time of existing staff to integrate climate adaptation into ongoing planning (Shi, Chu, & Debats, 2015). New York has

had the luxury of employing several dedicated teams, and Norfolk, while not having its own dedicated department or office, has benefitted from personnel assistance regionally. A secondary benefit both cities received as a part of their membership in the 100 Resilient Cities network was the creation of a new municipal staff position, the Chief Resilience Officer. The CRO was specifically hired to take on the challenge of developing a multifaceted approach to adapting to the specific social and environmental threats faced. The officer worked directly with leadership staff and also coordinated with pertinent departmental staff to act as a linking force for adaptation and preparedness planning. Norfolk certainly gained the most out of the inaugural resilience government position. Being a knowledge capital, New York City, in addition to its competitive planning department, has government departments specializing in recovery and resiliency, long-term planning and sustainability, and even a housing recovery operation. It also immensely benefitted from the flood of disaster recovery funds in response to Sandy. Still, every plan was developed by city government employees except for the BIG U Rebuild by Design report. Considering Norfolk nearly competed with New York in sheer volume of projects and reports to adapt to the imposing risks is a testament to the reliability and generosity of staff and organizations across the Hampton Roads region and the state of Virginia. Only PlaNorfolk 2030 and the city's Resilience Strategy can truly be mostly credited to municipal government staff.

The duration of financial and staff resources is also an indicator into how plans have progressed during implementation. If there have not been enough resources available to adequately pursue climate planning then there most certainly has not been enough available to implement recommendations. Surveys have found that to be true, with nearly nine in ten cities reporting lack of funding for implementation of projects and programs to help combat climate risks (Aylett, 2014). That fifteen percent of cities that have been currently engaged in climate

adaptation are in the implementation phase serves as a parallel (Shi, Chu, & Debats, 2015). Fortunately, Norfolk and New York City have surged past the resource barrier in regards to adoption and funding as evident by their implementation work. They diffused the load of funding and staff needs for implementing actions. The success in funding and implementing policies and programs could be attributed to the level of plan integration and horizontal coordination whereby plans like Norfolk's comprehensive plan, resilience strategy and the ThRIVe NDRC application maximized their regional cooperation with other plans and organizations. The interoperability between organizations and levels of government is characteristic of flexibility and adaptability in implementation (Serrao-Neumann, Crick, Harman, Schuch, & Choy, 2015). Because decision-making authority is distributed across departments, fewer tradeoffs ensue as implementation is decentralized (Schwab, 2014).

Personnel and organizational decentralization has not been the only tactic that has been employed to abate the resource barrier. With cities leaning on their own internal revenue sources, Norfolk and New York City have explored the applicability of unconventional revenue bonds. Norfolk had been recently exposed to social impacts bonds through one of the 100 Resilient Cities platform partners, Social Finance. The social impact bond behaves similarly to conventional revenue bonds except that instead of banking on the revenue generating prospects of project investments, it is contingent on successful qualitative outcomes. Social impact bonds marry government, philanthropic organizations, nonprofits and investors around a common goal of success that drives social progress (Social Investment, 2016). The bonds could have been a useful concept if deployed simultaneously alongside, to bet on the fiscal stabilizing effects of environmental progress, precisely in protection against climatic events.

More environmentally, New York City, specifically its Metropolitan Transportation Authority, explored a first of its kind risk evading form of bond, a catastrophe bond. The catastrophe bond as the MTA has envisioned in response to Hurricane Sandy, had little in common with social impact bonds and their pay for success model. Instead of depending on action that engenders the agreed upon positive impacts, catastrophe bonds depend upon whether a disaster of a certain magnitude occurs over the life of the issued bond. Immediately following Sandy in 2012, New York City's MTA worked with financial entities to design and issue the first catastrophe bond through a reinsurer with the purpose of protecting against storm surge flooding. The bond does not truly protect against flooding – it provides much needed support for insurance companies in instances of irreparable insurance losses triggered by an event of similar magnitude to Sandy (Levenson Keohane, 2014). Basically, the bond serves as a sedentary emergency fund rather than a source of usable funding to redirect into resilience-enhancing investments.

Since this conception, the RE.bound program, born out of the RE.invest initiative, has envisioned a repurposing of catastrophe bonds. The RE.invest initiative devised a financing tool to fund the mildly advantageous recommendations in the report so as to not place unmanageable financial strain on the city of Norfolk. It introduced a concept for catastrophe bonds that drew inspiration from the healthcare industry's insurance policies that captured funds for upfront risk reduction measures on top of reducing potential insurance losses like traditional catastrophe bonds (RE:focus Partners, LLC, 2015). Commonly, catastrophe bonds are triggered once a certain threshold of total insured or economic losses is breached, meaning the bond issuer retains the bond value and investors lose their invested principal, like with the MTA-sponsored bond. The RE.bound program's version of a catastrophe bond integrates these insurance-based protection together with infrastructure project finance. The argument behind this couple model is that

resilience projects funded through bond investors that generate social value and environmental benefits increase the financial benefit to investors over time and reduce the associated risk (RE:focus Partners, LLC, 2015). Both the catastrophe and the social impact bonds can not only serve to supplement existing revenue to implement projects but also as contingency funds for the private and public sectors to use in response to emergencies like from extreme flooding and coastal storm events.

5.3.4.2 Public Resources

Unlike municipal governments, where resource deficiencies affect their ability to pursue action in the burgeoning realms of climate adaptation and disaster preparedness, vulnerable communities have resource deficiencies that govern their quality of life and ability to survive. With the high financial strain that housing costs places on lower-class families, it is essential that planners, on top of tackling risks, help expand their assets and reduce the everyday costs that are deep-seated in their underserved neighborhoods. Many quality of life indicators are in fact direct measures of vulnerability to coastal storms and flooding. Wealth is the most inherent indicator of vulnerability. Impoverished families often live erratically from month to month with fragile assets, and thus have poorer access to the life-sustaining resources that their financial superiors do (Behr & Diaz, 2014; Baussan, 2015). For many low-income households, rent or mortgage payments comprise of the largest portion of their monthly finances (Baussan, 2015).

Even among families that have fixed rent payments, they are unable to absorb the financial strain of major disruptions because of the high priority of being able to maintain a home.

Unfortunately, housing assistance whether through recovery funds or flood insurance tends to benefit those that both own a home and are at least lower middle class (Ross, 2013). All too often, the quality of housing that a family can afford determines the safety and appeal of their

environment, the structural integrity of their buildings and infrastructure, the transportation options at their disposal, and the resources they have access to (Highfield, Peacock, & Van Zandt, 2014; Mearns & Norton, 2009; Ross, 2013; Van Zandt, et al., 2012). Their social resources then compound matters. Mirroring the indifference and priority of vulnerable households, they frequently have shallow networks with which to rely on during financial difficulties and also emergency situations. Thus, their ability to seek shelter or evacuate is severely compromised. Even when there are distant familial and social ties with which to rely on, if families reside in a detached neighborhood with poor public access their decision behavior is equally compromised. As has been made evident, inadequate resources is essentially equivalent to a potential for catastrophic impacts. Improvements to all of these resolvable resource disparities is equivalent to making reductions in physical and social vulnerability.

The vulnerability of powerless families manifests both as a shortage of necessary resources to thrive, but also as a fragility of resources where they can most easily be stripped away. Climate displacement is an explicit consequence of this chain of vulnerability fueled by an inherent shortage of resources and decimation of fragile resources. Minimizing long-term displacement is accomplished through the enhancement and fortification of resources, but also through the more practical salvaging of resources – relocation assistance and permanent housing recovery.

In Norfolk, relocation assistance programs were either nonexistent or widely deficient and did not reflect the ideas or preferences of those that would be most affected by them. The equivalent programs described in New York's plans are an improvement but still lack adequate prior consulting with vulnerable households and enough detail to determine whether they are effective. New York's permanent housing programs are collectively a step up, while Norfolk's programs are virtually of the same poor quality as its interim housing programs. None of New York's are

admittedly citizen-desired options, but few of them do imply a range of options to satisfy the needs of its diversity of resident types – homeowner, renter and landlord. Likely in response to the exposed deficiencies during the Sandy recovery process, there were several instances of strategies to improve disaster housing programs where disaster housing assistance is more economical and accelerated. It is also recommended that they are better coordinated with community support services and long-term recovery efforts.

With housing losses relevant and fresh in the mind of many New Yorkers, it would be surprising that housing recovery programs were not set up in vulnerable neighborhoods across the city. After all, the vulnerable neighborhoods are most likely the ones with the highest number of property loss from Sandy. In fact, recovery programs were fairly evenly itemized in the plans for the Brooklyn/Queens waterfront neighborhoods, riverfront neighborhoods in Brooklyn/Queens/Manhattan, and in Staten Island. For Norfolk, only two neighborhoods that readily experience flooding from the Elizabeth River, St. Paul's and Chesterfield Heights, were the only to specifically have the support of a housing recovery program. Norfolk has luckily not experienced an event triggering a large-scale exodus from residences or widespread damage like New York City has and especially New Orleans. Norfolk might perceive itself as eluding major coastal storms, but research has insinuated that it is equally as susceptible to such displacing events.

Planners can alleviate the pressures placed on interim and permanent housing recovery programs following a disaster by investing in affordable housing and weatherization strategies before the next strike. Housing is the greatest asset to many and to vulnerable households it is often the only financial asset if they even happen to own their home. Regardless, a rented or owned residence – through their structural-integrity, location and value – has the single largest weight in individual

vulnerability of any facility or resource (Ross, 2013; Baussan, 2015). Projects proposed by local housing authorities were found to be worthy of being integrated into coastal resilience plans for their potential to reduce the vulnerability of residents. Smart growth strategies to deconcentrate poverty and reduce homelessness like housing revitalization and mixed income development when successful can increase the wealth and social capital of the most vulnerable. The amount of involvement of each city's housing authority in the planning processes was a sort of gauge of the level of integration of affordable housing strategies. New York consulted with its housing authority regularly and explored a range of cooperative housing strategies. Norfolk involved its housing authority a little less and thus had a lesser diversity of housing strategies in its plans.

Those smart growth strategies that were borrowed from housing authorities would logically apply to low-income neighborhoods where there is a high concentration of public and affordable housing. Smart growth strategies were not quite evenly dispersed amongst all vulnerable neighborhoods, but as a whole they were the most distributed in Norfolk. Both the Elizabeth River and Lafayette River watersheds benefitted. Notably, the shorefront neighborhoods were also included, despite being distant from any developments within the jurisdiction of the Norfolk Redevelopment and Housing Authority. Unlike its recovery programs, New York's smart growth strategies were representative of vulnerable neighborhoods fairly equally including those in the Bronx, rather than only those that fared the worst from Sandy. This is, as a matter of fact, a promising prospect as research is in agreement that smart growth and preventative development is among the most auspicious long-term solutions to flooding and disaster vulnerability (Brody, 2003; Berke & Lyles, 2013; Smith, 2015; Berke, Cooper, Aminto, Grabich, & Horney, 2014; Berke, et al., 2015).

To address the burdens placed on families in vulnerable neighborhoods on top of personal burdens, improving community design, local amenities, and access to resources and facilities has been repeatedly affirmed as constructive. Yet, all of those strategies are far from groundbreaking. Both cities invested in strategies to expand community assets and services, and to improve quality of life. Blight removal and beautification programs were somewhat sporadic in plans for Norfolk and slightly more consistent in New York's plans. Strategies varied from prolonging or expanding upon existing blight removal programs to initiating programs to beautify gradually deteriorating vulnerable neighborhoods. Plans that reflected the highest standard in quality for their respective city overwhelmingly had the full capacity to improve access to services and quality of life. In plans that expanded public transportation options, recreational space, and other community assets, they occasionally proposed economic development strategies for underserved areas to prevent the gentrifying of residents that would exacerbate their already horrific vulnerability.

In the past, equity was incorporated in plans where climate or environmental hazards was the primary impetus when planners recognized the disparities in livability and amenities in communities that affects their vulnerability (Schrock, Bassett, & Green, 2015). Either through the experience of planners or an expanded focus in climate and hazard plans or both, strategies to enhance community assets and services were well represented. So much so that the level of detail for this type of strategy within the protocol was not conducive to the whole assortment of particular strategies. Interestingly, they were frequently enacted for vulnerable neighborhoods, as much so as smart growth strategies. Smart growth strategies like preventative development and affordable housing existing in neighborhoods with poor exposure and/or high social vulnerability is most sensible. But less of a case can be made, at least from a typical planning standpoint, for

quality of life enhancements to be unequivocally targeted in vulnerable neighborhoods as they are for both cities.

That certain waterfront neighborhoods were saturated with numerous quality enhancement proposals additional to preventative code changes for instance is perhaps an indicator of the approach the two cities were often able to resort to. Both are rather conventional and thus more favorable to a range of stakeholders, but also are effective at addressing underlying factors of neighborhood vulnerability. Of the particulars, social and welfare services saw a larger investment in New York while pedestrian infrastructure received a larger investment in Norfolk. The earlier detailed capacity building exercises can secondarily improve social connectivity in neighborhoods, but so too can physical connectivity and quality of life.

5.3.5 Accountability & Responsibility

5.3.5.1 *Implementing Action*

It is without question that the actual actions that are implemented as a result of a plan is more momentous than any component of the originating plan. Each successive section of any plan let alone a plan for adapting to stresses, breathes life into the next section. Specific to coastal storm and sea-level rise adaptation, strategies to resolve local vulnerabilities would not have been envisioned without successfully identifying and mapping the intricacies of vulnerability. They also would not have been possible without the involvement of those that are vulnerable.

Heightening the awareness of vulnerable groups to both to prioritize and be more involved is a process of relaying information on risk and vulnerability. Lastly, none of it would have been achievable without securing resources to pursue planning and local leadership coalitions. Any momentum built through commitments to each aspect of the process can of course be halted with mismanagement of implementation.

Everything considered, the elements of implementation are nearly universal across all plan types. Without assigning appropriate organizational responsibility, identifying viable sources of continuing funding or managing it all through organized timelines, no matter the circumstances, a plan will fail to reach its desired potential (Berke & Lyles, 2013). Plans have fallen fate to both disregarding the aforementioned outlets to implement actions but also articulating implementation frameworks in a simplistic manner. Many planners do not work out enough operational detail or provide estimates of the monetary costs of implementing actions merely from not consulting with those that would offer expertise (Baker, Peterson, Brown, & McAlpine, 2012). Some local governments have managed to assemble the necessary parts to complete a plan to adapt to and prepare for the effects of climate change, but have been incapable of implementing them (Shi, Chu, & Debats, 2015; Baker, Peterson, Brown, & McAlpine, 2012). Failure to implement proposed actions is not only a management problem but it also stems from the impact of deficient resources, collaboration, engagement and leadership.

Both Norfolk and New York City had developed finance mechanisms and capitalized on federal and state funding opportunities to support the incremental implementation of proposed actions and also actions for emergency scenarios. They had coordinated with every level of government, most government departments, all sectors, and a diverse collection of stakeholders. By virtue of robust local leadership, both cities were able to understand the risks and the impacts they could create. Also, expectedly, the awareness and enthusiasm that was instilled in communities was enough to serve as an ally rather than an opponent to implementation. In terms of implementation, community-based organizations have proved to be instrumental in raising the concern for equitable action. When local government collaborates with community groups and other organizations their capacity to convert lofty goals, such as those for social equity, into

mechanisms for action is enhanced (Schrock, Bassett, & Green, 2015). Consequently, even though precise organization of responsibility and timetable is evident of potentially seamless implementation, the interplay between all of these indirect factors are clear prognosticators of transformative implementation over resistance and maintenance. All in all, both cities have instituted a favorable environment to be able to overcome foretold tradition on unavailing implementation specifically of adaptation and socioeconomic policy.

Between Norfolk and New York City, plans that were high performers in overall quality did regularly boast active implementation. Many of them have formed a network of implementation where policies and programs are intersectional – that is, they have been borrowed from and by other planning efforts. A prime example is New York’s hazard mitigation plan, which, unlike the Southside Hampton Roads plan, coordinated with and involved community, social service and housing organizations, and engaged with vulnerable members of the public through capacity-building exercises. As a result, instead of conforming to mitigation needs that largely satisfy FEMA requirements by incrementally carrying out a small set of actions, New York’s plan has moved a multitude of individual policies and programs into various phases of implementation (Tajan, 2014; Office of Emergency Management, 2016). The projects are the responsibility of a large portion of local agencies that overlap with other citywide resiliency and capital initiatives. Also, the plan has demonstrated an openness to including new projects that satisfy different needs for capital planning, resiliency and recovery (Office of Emergency Management, 2016).

While both hazard mitigation plans made financial estimates, outlined sources of funding, and organized actions with a timeline, New York’s effectively divided up different types of roles amongst personnel, volunteers and the public. The discrepancies between the two identical plan types does not describe the entire picture, but represents a microcosm of the factors that come

into play to restrict or bolster implementation. It is too early to determine the effects that different factors have on implementation progress for several initiatives, but a common theme that left Norfolk's plans a step behind New York City's was the inability of decentralizing roles in the process and in implementing actions.

In the heat of extreme flooding and coastal storm events, it is the facilitation of responsibility to execute actions and differentiate individual roles that is put to the test. Although vulnerability is a primary determinant of the impacts that will occur from a major event, some impacts that bypass safeguards are still mitigable and preventable through the response and recovery actions taken by officials, trained individuals, volunteers, and members of the public (Schwab, 2014; Berke & Campanella, 2006; Corbin, 2015). Recalling that Norfolk has not incorporated a prominent focus on recovery or simply being prepared for recovery when the moment arises, there is a noticeable gap in the instituting of response and recovery roles. The city's plans might be making lucrative progress on implementing projects, but during times of coastal emergency, impacts are partly contingent on the organization of decision-making under pressure.

5.3.5.2 Monitoring Uncertainty

Planning to combat the convoluted and often overlooked phenomena of climate change and inequality compels planners to be able to recognize and react to evolving conditions. Drastic shifts in political and environmental conditions can and have derailed preconceived notions toward progress (Brody, 2003). If planners remain in a rigid predict-and-plan approach through process and implementation regardless of their effective quality, plans are subject to underperforming. Even the scientific and local knowledge that guides problem-solving is prone to malleability. Plans and planners can identify and solve these roadblocks as they occur by maintaining flexibility with monitoring programs (Berke & Lyles, 2013; Brody, 2003).

Monitoring not only implementation, but the various stages of the planning process and through response and recovery is paramount to ensure that all planners', stakeholders' and public participants' efforts are not squandered. Successful monitoring of activities institutes indicators and sources of data to track progress toward meeting goals, and responsibilities for data collection. Moreover, those responsible continue to pursue monitoring programs, release publicly available progress reports, and constantly update while accounting for changing conditions (Berke & Lyles, 2013; Berke, Smith, & Lyles, 2012; Brody, 2003; Schwab, 2014).

The two cities interpreted the monitoring of planning processes as straightforward, with elaborate setups to monitor the progress being made through the implementation of policies and programs. A more innovative-minded interpretation would entail the monitoring of each phase of the planning process, not just that proposed actions were implemented, during a specific time-frame, and by those that were supposed to be responsible. This is a harsh interpretation of the strategies the two cities employed to track uncertainty. In fact, monitoring implementation can be a sensible way to observe changing conditions at their terminus. The only issue is, without monitoring obstacles to success as they arise, the benefit of monitoring implementation is discounted because planners are unable to utilize strategies to overcome obstacles if specific ones are even in place. Devoting monitoring efforts mainly to implementation progress also restricts the ability to learn. Monitoring different phases of the planning process can provide planners with useful knowledge for the future, especially considering many of these plans represent uncharted territory. Ultimately, uncertainty presents itself in many different forms.

When those narrow windows of opportunity are capitalized on to generate political momentum following an extreme event, planners can further benefit planning efforts by closely tracking the progress made in all planning facets (Shi, Chu, & Debats, 2015; Schwab, 2014). New York City

had experienced the Sandy effect as an opportunistic source of interest and priority, but also as an event that could have undermined planners' efforts with the resource commitments that accompanied it. One method of remaining up to date following chaotic change has been to reassess conceptions of knowledge. An expressed need in dealing with climate change and other data, building on the earlier described information barrier, has been to jointly analyze changing information (Berke & Lyles, 2013; Schwab, 2014). New York City has incorporated the impacts of Sandy into its latest planning efforts not as only a source of information as many hazards are treated, at least in the hazard mitigation process, but as a testing ground for experimentation. The action could be considered a part of the PlaNYC process, but in any event the city reconvened its Panel on Climate Change shortly after Sandy to generate new understanding and analyses on risks and vulnerability (Office of Long-Term Planning and Sustainability, 2014).

Monitoring enables actions taken after an extreme event and beyond to hold relevance and purpose by investigating damage and economic loss assessments and evaluating actions accordingly. The new sources of information, however, threaten to increase the complexity of already complex matters, further dividing experts from the uninformed. Thus, decision-makers and members of the public would greatly benefit from cooperation around shared perceptions and experiences of changing conditions. If plans are updated before or shortly after a major event, they can then articulate and embody the learning that has occurred within organizations and also of the public for a unified agenda and so that mistakes are not repeated (Brody, 2003; Schwab, 2014). For the sake of planning, Norfolk has not had the advantage of a source of rapid growth and learning like Sandy has been for New York. Still, recognizing and overcoming internal contention and inertia can provide growth and preserve momentum. A major key to climate and social progress amidst political bureaucracy and complexity is accountability.

The extent to which decision-makers were held accountable in Norfolk and New York peaked at inter-departmental accountability. Community groups, non-profits and members of the public were largely rejected their ability to hold officials accountable. Most of the planning efforts implemented benchmarks and indicators to easily assess the progress of strategies and actions toward meetings goals and proposed timelines. A few of the plans reported on the progress in annual progress reports or updates that were released to the public, more so in New York. In most cases, however, the public was only satisfactorily able to monitor the progress toward their own stated desires. More commonly in Norfolk, process participants were given some jurisdiction over holding decision-makers accountable, but were not urged or empowered to act in this role. New York had disclosed more of the successes in implementation and meeting benchmarks, but whatever obstacles that might have emerged along the way certainly did not reveal remotely intricate strategies to overcome them, and nor did Norfolk. Neither city took the necessary steps to truly ensure accountability, transparency and equity in planning nor in recovery processes.

Monitoring is a necessary and valuable tool to establish multiple layers of accountability. Performance-based monitoring and evaluation systems hold planners and decision-makers accountable to each other. The public, specifically the vulnerable public monitoring progress on proposed action in their own community or toward meeting their own needs and desires holds policymakers and decision-makers accountable to their constituents. In order for the public to even have the ability to hold their local officials accountable, decision-makers need to both communicate progress and results to members of the community and empower residents to become more involved in positive change. If it were the case that officials were not meeting their marks in vulnerable communities and those residents were becoming displeased, it is up to

planners and decision-makers to iteratively review stakeholders, analyze obstacles to inclusion and success, and devise strategies for overcoming those barriers along the way (Schwab, 2014; Brody, 2003; Berke & Lyles, 2013). And if decision-makers trust citizens enough to grant them responsibility over their own preparative action, the public can relieve some of the pressure on their leaders and hold each other accountable. Only members of the public, including vulnerable ones, would know whether strategies proposed in early decision-making processes and the actions being implemented are what they most desire. After all, those actions that prove to be most advantageous are also those outcomes that vulnerable communities most prefer.

Though communal accountability may not have been pronounced in the sets of plans, at least there is one silver lining, embedded in inter-organizational coordination and accountability. Those plans like those arisen out of the 100 Resilient Cities initiative and NDRC that employed more decentralized strategizing and implementation would likely reap the most benefit. The free sharing of ideas that is encouraged in this organizational arrangement also lends itself well to implementation and monitoring. The disparate actors and stakeholders that bind together over the planning processes can share perspectives on challenges faced and solutions they devised or witnessed to forward implementation and monitoring. On the other hand, participants should be able to engage in the post-planning phase to offer their own perspectives on what they have experienced as obstacles to implementation in their own communities in the past even if the type of actions are not comparable to before (Berke & Lyles, 2013).

The ability to influence leaders be it through accountability during implementation should be equivalent to the level of engagement and involvement in the planning process for those that are historically uninformed and resource-deficient. Interestingly, two of the initiatives that targeted a specific area and yet did not necessarily produce the highest quality plans were able to provide

some transparency and to a degree, ensure equitable participation. Residents of Chesterfield Heights in Norfolk and the Lower East Side in Manhattan, New York City can at least feel some satisfaction that their voices were heard and affected the direction of the Rising Resiliency Challenge and BIG U Rebuild by Design projects, respectively. Whether due to insufficient personnel resources/expertise or unawareness, planners did not devote efforts to monitor the discourse and action that occurred from within the planning process by themselves and those they engaged. Compromising the ability to self-monitor and monitor the influence of participants and stakeholders leaves the planning efforts susceptible to biases, unfair conflict, and mischievous activity.

Individual and behavioral unpredictability is one obstacle that Norfolk and New York City have not prepared themselves to overcome. Not to assume that certain planners and decision-makers will inevitably make critical errors or diverge from their commitments; nor that certain stakeholders will curtail the political drive generated in vulnerable communities, but all of these are potential outcomes, and neither city has put the tools in place to recognize these and subsequently mediate them. Despite all of the progress made on barriers to being adaptive for members of vulnerable communities, the inherent authority of political leaders and stakeholders can instantaneously put a halt to momentum.

In light of these shortcomings in accountability, equity and transparency, any expectations for monitoring activities are out of maintaining a certain standard. The monitoring activities that either city abided by would in a sense be improvisational. There is little precedence with which to base the capacity to monitor various stages and players in the planning process. So far, few adaptation planning efforts have pursued monitoring programs whether for implementation or otherwise, and many have been in the early stages of developing structuring monitoring activities

(Berke & Lyles, 2013). The same can be said of several of the initiatives facilitated in these two cities. The quality of monitoring activities was contingent on their descriptions within the plans themselves, but for plans in particular stages or facing uncertainty with funding at the time of their release like the 100 Resilient Cities reports and NDRC applications, monitoring, especially of implementation, may have been in limbo.

5.4 Implications for Planning and Future Research

Recent events and discoveries have shifted the thinking on the role of planners in the urban context. Researchers have integrated the influence of climate impacts and experiences into their prescriptive inquiry of planning, and so naturally have turned the dial from focus on solely the urban and environmental realms to the people that inhabit them. Certain coastal cities have experienced tangible climate impacts while others have not as much so, but, regardless, individual planners have expressed a desire to ensure their jurisdictions remain prepared and adaptive to the potential threats faced. Unfortunately, in the early going, factors at all scales, independent of concerned planners' interest, combined with the novelty of the resilient lens had thwarted pursuits to put local conceptions of researchers' visions into practice. Plan practitioners have not had the ability, the knowledge nor the tools to overcome these incessant obstacles and often still. These obstacles have paled in comparison with the hurdles residents of specific communities experience regularly to climb out of a state of deep-seated vulnerability. For coastal cities where socioeconomic disparity overlaps with climate impacts that are most evident, because of the adaptive adversity, the prospects for planning are perhaps most encouraging.

An unintentional outcome of this wave of coastal planning is a shift in some of the conventional thinking for urban planning. The broad implications of planning to adapt to and prepare for extreme flooding and coastal storms have indirectly bridged the gaps between organizational

divisions, scales, and sectors. This is by no means revolutionary news for Norfolk or New York City, but for those cities that expect that they are able to take on all matters of planning through their planning departments they are wasting opportunities presented by all of their other agencies. Similarly, each plan, whether for a specific purpose or series of purposes, need not act independently of other plans. The coveted shift in planning for coastal cities is to leveraging and repackaging of policies and programs under, for instance, social service organizations or housing agencies. These policies and programs can be repurposed for this emergent planning approach, as after all, resilience and adaptation have not surfaced as new planning realms. Rather they are a coalescent lens on formerly disassociated domains. Often times, these malleable strategies inhabit already existing plans, thus stimulating the rise of a system of plans. While evaluating the content in plans for both cities, duplicate policies and programs cross-referenced across plans was a frequent occurrence. In the near future, planners facilitating comprehensive planning processes might pull all local and regional projects into a single policy document to showcase a municipality's strategies for tackling rising waters, or a shortage of affordable housing options, and everything in between. Strategies devised in one planning process will influence another planning process and vice versa.

Before either city repurposed existing programs and envisioned new ones, they were building the foundation for future adaptation and preparedness. Cities that have not made the conscious effort to commit to combatting the impacts of and vulnerability to climate change early on are at a severe disadvantage. Norfolk and New York bypassed some of the traditional adaptation barriers because the groundwork had already been in place from years of investment on that front before carrying out these recent plans. Of course, those that have not garnered any momentum have grim prospects for fending off planning obstacles, but there is immense incentive in expanding

awareness and motive proactively instead of waiting for disastrous impacts when it becomes imperative.

Proactive adaptation planning with diverse stakeholder support and collaborative energy can propel planning forward through previous obstacles. Once these obstacles are overcome, which research suggests are beatable with the right pieces in place, planners have a clear path to reducing the vulnerability of those that have long been powerless. The pieces were in place in both Norfolk and New York City, but only have been for a short time. As both cities become more accustomed to united planning for all urban issues under the umbrella of resilience and adaptation, they will over time likely improve the imperfections in their approaches.

Tracking the progress that has been and will continue to be made in adaptation and preparedness planning has become increasingly complicated. No longer is simple plan content evaluation sufficient to convincingly substantiate the performance of plans produced. In planning to adapt to climate events, specifically sea-level rise and coastal storms, geography and posterior progress matter. In land use planning, for instance, content evaluation was effective without regard for spatiality because the emphasis was not on the characteristics of the people per se but on the land, its use, its regulation, and the overall population. The impacts of climate change require a humanizing approach to combat them and that ought to seep into planning evaluation as well. A plan for sea-level rise and storms in particular can only be effective if it not only employs adaptability and preparedness, but if it employs it in locations where the people are most vulnerable. Content evaluation might capture the quality of adaptation and preparedness but it ignores the most important aspect, that the most urgent communities benefit the greatest.

Accounting for the geography of plan content certainly injects more complexity into the plan evaluation process, but it also allows for more constructive assessment of quality. One study completed and published in late 2015 reinforced this notion by formulating a resilience scorecard that pits positive and negative content among a series of plans for one coastal city, Washington, NC, against the social and physical vulnerability to flooding of that city's individual planning districts. By determining how the plans improve or infringe upon the preparedness across the city, the study was able to critique their justification for the actions taken. The scorecard devised in the study also evaluated the degree of coordination between local planning programs to further question the merits of the planners' decisions. The scorecard was much more condensed since it only concentrated on land use type strategies, but still exemplified the need for modification of plan evaluation for coastal hazards vulnerability (Berke, et al., 2015). The outcomes of such reformative plan evaluation research would help inform planners in cities that might be unaware of the implications of their planning actions with regards to the hazard-prone areas versus the more secure locations.

The next steps in research would be to assess the merits of recommendations for the field of planning for adaptation and preparedness by tracking the actual changes in social and physical vulnerability and hazard exposure. Because hazard exposure is partly a function of the proximity to hazard prone areas like floodplains, changes in it would solely reflect a change in population and building density. At the moment it is far too early to observe any significant changes in the vulnerability of communities in cities that have taken initiative considering the only recent emergence of this planning realm onto local agendas. Even Norfolk and New York City that have been leaders have only been able to begin implementing progressive work in response to their susceptibility in the last several years.

Speaking of which, the success in terms of overall planning output since 2012 in both cities has been intelligible through the host of influencing factors that operate outside the means of planning, but their exact effect is unquantified. Perhaps future research might examine the intangible factors like scale of disaster or favorability in local government to further explain the reasoning behind the progress made in cities like Norfolk or New York City rather than declaring that they are simply outperforming others for certain reasons. Other cities would be left in the dark about why they are unable to overcome certain obstacles that have plagued them all along even while exerting effort toward informed solutions, as their situation might not be entirely equatable to those in more prolific cities. Future research ought to be able to prescribe solutions and tactics for cities of all shapes and sizes as they continue to try to combat the complicated phenomena of climate change and the human vulnerability to it.

Chapter 6. Conclusions & Recommendations

Have the recent adaptation planning efforts of Norfolk and New York City accounted for the vulnerability of local communities to sea-level rise and coastal storms? Research affirms that certain demographics are inherently more vulnerable to these threats and are concentrated in particular neighborhoods. Planners can relieve the risks by reducing the social and physical vulnerability, and exposure of these highly susceptible communities proactively. No study examined has determined that plans that attempt to adapt to and prepare for these climate-induced hazards have proactively reduced the vulnerability of communities enough to prevent the unjust impacts of a disaster. The results of this analysis has not convincingly shifted prior convictions of planning practice.

New York City and, to a lesser extent, Norfolk have made significant progress toward reducing the vulnerability of neighborhoods to future coastal events except in a reactive sense. New York's vulnerable neighborhoods are prepared for a disaster of a conceivable magnitude after having already experienced the impacts of Sandy. Although the actions taken in New York's plans more often benefitted vulnerable neighborhoods than safer ones, they were predictably responsive to the impacts of Sandy and not necessarily always the deficiencies embedded in communities. These targeted communities will most certainly fare better from storms like Sandy in the future, but perhaps those neighborhoods that were not targeted in recent efforts because they sustained fewer impacts even though they are equally as vulnerable will not. The experiences of New York City imply that the quality of plans that aim to reduce future vulnerability is contingent on an encounter with a disaster-declared event and federal influence.

Norfolk has technically encountered a couple disasters in recent years, but not the full brunt of east coast storms. Unlike in New York, the storms to impact Norfolk have mostly grazed by or

been weaker and thus not capable of illuminating the disparities in safety and risk between neighborhoods and demographics. Its non-invasive brushes with recent coastal storms have allowed the city to make consistent progress due to its well-known susceptibility but have eluded its need to prioritize neighborhoods that have seen flashes of severe impact potential. Norfolk has demonstrated that it has committed as much effort as it is capable of given its experiences and amount of outside investment. The unfortunate reality is that transformative change, essential to convert vulnerable neighborhoods into prepared and adaptive, is not obtainable without enough incentive and motivation given existing fiscal obligations and political landscapes. Norfolk did make some inroads in neighborhoods fronting the Elizabeth River in part because of its ability to secure the funding from HUD's National Disaster Resilience Competition after experience a qualified federal disaster. Had it not, two of its more admirable planning efforts from a neighborhood perspective would have stagnated having no future in sight.

Essentially, if you remove the coastal storms the two cities have had to endure, the highest performing plan the cities produced would have never come to fruition. Also, if neither city had been awarded participation in the 100 Resilient Cities initiative, neither would have had an Office of Resilience, and Norfolk's best plan, according to this research, would have been its comprehensive plan. It is almost a coincidence that Sandy inflicted New York with high winds and intense flooding in 2012 meanwhile attention to adapting to these climatic events had been ramping up. Thus it is unclear the extent to which the city would have invested in adaptation and preparedness minus Sandy, but it is certain it would have been less without excess funding from disaster recovery.

Given typical sources of funding for adaptation planning in other cities and the details of Norfolk and New York's recent planning involvements, federal and state governments have sent a message that their level of assistance is more dependent on the disaster experiences than present and future vulnerability at the local level. Until state and federal government funnels more resources into vulnerable coastal cities in the pre-disaster phases, jurisdictions like Norfolk with limited budgets will only be able to make progress at their own bounded pace. If Sandy is any indication of the next leap forward in state and federal adaptation initiatives, it will likely require another large-scale event to impact a highly populated city. Norfolk and other cities that may not have experienced a galvanizing event still benefitted from the collateral action incited by Sandy that FEMA and HUD took to spread the wealth of ideas being generated. However, although it is true that many of the initiatives that Norfolk and New York City were able to take advantage of were in response to or inspired by the Sandy relief effort, they were intended to be replicable as constantly updated renditions.

The overall performance of New York City's collection of planning efforts does not warrant much criticism especially given the extent of potentially transformative planning that occurred, but among the abundance of funding and personnel at the city's disposal, certain investments could have been put to better use. The Resilient Neighborhoods initiative in particular was an insightful concept, but did not always target the neediest neighborhoods or employ very groundbreaking solutions to localized issues. As a whole, in fact, neighborhoods in the Bronx, even some of the most underprivileged and vulnerable ones, were underrepresented in the set of plans. This is another case of chasing the impacts of Sandy alone and not the actual vulnerability to future events in addition. The Bronx, in light of its social vulnerability and exposure, largely evaded some of the worst impacts. Again, because of Sandy, New York was far more effective at

identifying actions in most of its vulnerable areas than was Norfolk. Since Norfolk's neighborhoods have at least managed through recent threats, it has of course not been as compelled into action, but it is still not a justifiable reason to gloss over certain vulnerable areas of the city. With all the progress made in its resilience strategy, comprehensive plan and the NDRC application, Norfolk's planners could have devoted more effort to addressing the vulnerabilities present in the Lafayette River watershed and the eastern parts of Ocean View.

Where coordination of planning activity with communities of pressing vulnerability was an area for improvement, operational coordination was the most prized asset in both cities. Planning processes utilized effective coordination on multiple fronts – with different sectoral representatives, scales of government and organization, and plans of seemingly divergent subject matter. If the actions taken and proposed in the plans turn out to be overvalued or mismanaged, at least there will have been diverse coalitions in place to ensure an all-inclusive plan of attack in the future. Initiative efforts in Norfolk and New York, with some direction, paired community organizations with municipal agencies and institutions of education with business leaders, whom likely have never worked together before, in equivalent planning roles. The barriers to cooperation and awareness among these dissimilar groups that were lowered is itself a testimonial of progress.

There is still a drawback, however, to the structure of responsibility. The roles of planning and implementation responsibility may have been distributed well amongst all stakeholder representatives, but the public was still underrepresented in certain regards. The one common miscue between Norfolk and New York's plans is the inability to grant members of the public enough authority over the future of their communities. In an era of adapting to and preparing for a changing climate, it is not enough to inform and engage the public. It is now necessary to

assign greater responsibility to hold decision-makers accountable and have meaningful influence on processes in order to minimize existing vulnerability. This is accomplished, through citizen advisory committees, and representation of citizen leaders on planning, implementation, and oversight committees, or at least greater recognition. Plans like New York's OneNYC 100 Resilient Cities report incorporated advisory boards into the planning structure to add some level of accountability but these were comprised of organizational leaders as opposed to community leaders.

Research released since 2012 has converged on the prescription of preparedness, adaptability and community resilience prior to the onslaught of a disaster. Norfolk and New York City may have met these recommendations to varying degrees but rarely in conjunction and never in all vulnerable areas or in the pre-disaster phase. Sandy to no surprise has been the greatest impetus for New York City and the greatest indirect influence in Norfolk. The 100 Resilient Cities initiative may have also been inspired by the Sandy relief effort, but regardless, it was actually a promising proactive formula to combat local threats like inequality and sea-level rise. The next wave of multi-jurisdiction initiatives should combine the intercommunal and pre-disaster focus of the 100 Resilient Cities initiative with the blueprint of the National Disaster Resilience Competition. Rather than correcting faults in neighborhoods that have been splintered by climate events, efforts should monitor the system of factors at play and resolve weaknesses as they transpire before they have the chance to materialize as impacts. This approach might seem overly resource-intensive, but in actuality it is reserving resources for optimal use. Instead of wasting precious resources on marginally impactful solutions, it is channeling them into their most productive outlets.

Now that the effectiveness of initiatives like the 100 Resilient Cities and National Disaster Resilience Competition approaches have been graded in areas they intended to thrive in, it will depend on the operationalization of their proposed actions and the growth in successive initiatives for increasingly positive outcomes in the future.

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Appendix A. Plan Coding Protocol

Table 19. Plan Coding Protocol

I. Identification and Vision				
1.1 Identification		Data		
1.1.1	Evaluator			
1.1.2	Date of Evaluation			
1.2 Vision		Score	Page #	Comments
1.2.1	Overall vision or mission statement			Stated vision of an ideal outcome of the plan or future plans
1.2.2	Increase resilience/reduce vulnerability			Mentions vision for a place that is resilient, able to bounce back, withstand, emerge from threats etc.
1.2.3	Promote sustainability			Stability, resilience, thriving over long-term; sustained for future generations, minimal impact, etc.
1.2.4	Foster equity and cohesion			Equal opportunity for all, especially low-income; social connectedness; minimized risk, regardless of status
1.2.5	Approach/response defined			Identification of how strategy is original; what influences strategies and actions, ties together (e.g. hazard mitigation, risk reduction, etc.)
2. Goals				
2.1 General		Score	Page #	Comments
2.1.1	Objectives linked to goals			Connection, similarities, commonalities between objectives in individual sections and goals of entire plan
2.1.2	Clearly articulated			Understandable, straightforward depiction of what is to be achieved
2.1.3	Neighborhood specific goals			More detailed goals that correspond with specific neighborhoods/districts
2.2 Coordination				
2.2.1	Increase information			To spread current knowledge and information and expand, as a part of goals
2.2.2	Continuously collect information			As circumstances change, remain up to date to perform assessments, not to cease collecting information; part of goals
2.2.3	Internal coordination			Acknowledges need to maintain a cohesive package or elements within so that everything works together and remains coordinated
2.3 Equity and Social Cohesion				
2.3.1	Connect with socioeconomic factors			Goals to be consistently aware of and revisit socioeconomic factors to meet other goals for equity in the planning process
2.3.2	Prioritize least advantaged and most vulnerable			Serving needs of individuals and households, further emphasis on those that have been traditionally underserved and marginalized, on top of being vulnerable
2.3.3	More equitable distribution of services and facilities			Goal to redistribute essential facilities and services for highest need and greatest return
2.3.4	Beautifying neighborhoods, and promoting diversity and connectedness			Goal to remove blight and better the appearance of declining and vulnerable neighborhoods, while enhancing diversity and making them whole socially and physically
2.4 Restoration				
2.4.1	Resumption and build back better			Goal to restore housing and structural conditions following a disaster to a more improved state of safety, protection and function; return local economy into full working order

2.4.2	Replace/repair development			Goal to completely restore communities and repair new deficiencies as swiftly and appropriately as possible rather than piecemeal
2.4.3	Regenerative design			Goal to adopt design practices that behave restoratively in face of hazards and disasters

2.5 Adaptation & Anticipation

2.5.1	Account for all scenarios/multiple visions			Goal to be aware of extreme scenarios of unseen caliber no matter the unlikelihood, to ensure that no scenario will breach the capability of the plan; account for different visions rather than single
2.5.2	Flexible to change and learn from change			Goal to observe and assess changing conditions from a multitude of factors and to adjust accordingly rather than retain a rigid perspective
2.5.3	Smart growth			Goal to adopt smart growth practices or those that enhance the lives of people and the environment all the while allowing for inevitable growth
2.5.4	Collaboration			Goal to include as many people and resources and as many minds to solve a problem and to bridge off of others ideas and existing resources

2.6 Minimal Impacts

2.6.1	Minimize fiscal impacts			Goal to adopt practices that increase the probability of lesser economic damages prior to the onset of a disaster and management during with the same positive result
2.6.2	Maintain and enhance public safety			Goal to adopt practices that maintain the safety and protect the lives of people in the path of hazards and storms
2.6.3	Minimize damage to private and public property			Goal to adopt practices that increase the probability that private and public property will endure lesser damage from hazards and storms

2.7 Sustainability

2.7.1	Ensure continuity			Goal to adopt protocol and practices so that a gap in the continuation of the planning process or all other related processes does not occur
2.7.2	Promote resilience for future generations			Goal to not only cultivate a thriving culture around unpredictable scenarios for the current generation but for future generations as well – think forward in addition to present

3. Fact Base

3.1 Existing Conditions	Score	Page #	Comments
3.1.1 Geographic extent			Conveys and acknowledges the planning area and all populations included in the extent
3.1.2 Demographics and economic characteristics			Illustrates and assesses general demographics and economic characteristics of the planning area absent of the vulnerability assessment itself
3.1.3 Land Use and development trends			Demonstrates an assessment and understanding of the characteristics of land use and patterns of development

3.2 Vulnerability Assessment

3.2.1	Identify socially and physically vulnerable populations			Distinguishes social and physical characteristics of vulnerability from general or combined vulnerability
3.2.2	Inventory and map socially and physically vulnerable populations			Maps depicting areas of certain types of social vulnerability, critical facilities & infrastructure, floodplains, building density, housing/building conditions; layered data for mapped index of social and physical vulnerability
3.2.3	Local knowledge included in social and physical vulnerability			Describes source of information for social and physical vulnerability assessment being local knowledge from members of the community

4. Strategies/Actions

4.1 Awareness/Knowledge		Score	Page #	Comments
4.1.1	Continuously collected data, and assessment tools			Description of information collection, archival and use, of flexibility to shifting demands, and of health and safety information collection, archival and use; tools relied on to increase data/info collection
4.1.2	Public warning systems or communication plan			Detailed description of specific policies and actions to warn and inform low-income, isolated and other socially vulnerable populations of eminent danger, evacuation and in-place protection
4.1.3	Community educational awareness			Description of an outreach effort to improve disaster risk awareness and education; inform preparedness measures, for the low-income
4.1.4	Advertisement and preemptive warning			E.g. insurance advertising and marketing to low-income, hazards and risk signage in vulnerable areas, real estate hazard disclosure
4.2 Coordination				
4.2.1	Horizontal			Coordinates with policies, programs and responsibilities managed and operated under other agencies or departments, and with policies/programs from comprehensive plan or other relevant jurisdictional plans
4.2.2	Internal			Informed by assessments conducted for plan, specifically vulnerability assessment
4.2.3	Vertical			Coordinates with policies, programs and funds from higher level like state and federal or lower level
4.3 Smart Growth & Development				
4.3.1	Increasing development density and population density			E.g. density bonuses, cluster development, changes in land use density, density transfer provisions, transit-oriented development, infill development
4.3.2	Affordable housing			E.g. tax abatements, affordable housing set asides, mixed use/mixed income development, housing rehabilitation/revitalization
4.3.3	Preventative development			E.g. damage thresholds for change in building code standards, building acquisition and relocation, floodplain management regulations, freeboard requirements (requirements beyond standard NFIP)
4.4 Preparedness & Response				
4.4.1	Evacuation and re-entry			Jurisdiction responsible for directing pre-event evacuation of susceptible populations plan and/or procedures without understating the importance of evacuation; protocol for smooth return re-entry; safety provisions for evacuees
4.4.2	Sheltering including public shelters and sheltering in-place			Facilities set-up or centers designated for emergency shelters before, during, and after an event, with excess capacity for the most extreme scenarios
4.4.3	Emergency services and resources distribution			Food, water and other supplies distribution to targeted and most at-risk populations including responsible agency, plans and/or procedures; expanded and tailored medical services under critical scenarios; volunteer management
4.4.4	Mass search and rescue operations			Plan and/or procedures and resources to seek out and rescue those suffering from the impacts of a disaster, may have not heeded warnings, or that warnings may have not reached
4.5 Structural & Infrastructural Controls				
4.5.1	Structural reinforcement			Reinforcement of housing and businesses while taking advantage of modern practices; weatherizing low-income housing

4.5.2	Telecommunications infrastructure			Improve telecommunications infrastructure in low-income communities, particularly where there is a high concentration of non-English-speaking residents
4.5.3	Policies and programs to reduce stress on public infrastructure and electric grid			Investments and incentives for renewable energy and energy efficiency in buildings, especially low-income housing and community organizations and businesses
4.6 Design Tools				
4.6.1	Reusable and adaptable post-disaster buildings			Description of materials used to mention reusable materials to cut down on cost; reusable, flexible buildings or modular components that are modifiable and adaptable in terms of spatiality and scale, and replicable housing (for semi-permanent or permanent low-income housing and critical facilities)
4.6.2	Design for increased social interaction			Describes techniques and tools employed to specifically enhance social opportunities and interactions among low-income and other socially vulnerable groups
4.7 Recovery & Restoration				
4.7.1	Relocation assistance - transitional or interim housing, etc.			Description of housing program for vulnerable and low-income (whom contributed to the details of the program) where housing provides more space and privacy than shelters, and enables families to resume normal activity; reconnects families back to community; community relocation; voluntary buyout programs
4.7.2	Ensuring post-disaster safety			Debris removal - Plan for conducting emergency clean-up and disposal of debris with a list of possible local contractors, actions to protect low-income communities from disaster debris; Building inspections including re-entry criteria
4.7.3	Permanent housing			Place-based and citizen-desired options for permanent housing recovery for a range of resident types (homeowner, renter, and landlord) that ensures a seamless return to stable housing; connects displaced individuals with resources and wealth of options
4.7.4	Restoration of local businesses			Plans and/or procedures for assisting or intervening to bring small and minority businesses back into operation; administration of small business resumption loans
4.7.5	Correct or repair pre-disaster deficiencies			Description of plans and responsibilities for assessing the deficiencies in structures, programs, and policies etc., and procedures for correcting them for future events
4.8 Households & Individuals				
4.8.1	Disaster Unemployment assistance			Plans to increase unemployment insurance and disaster unemployment assistance and extend the benefit periods
4.8.2	Disaster supplemental nutrition assistance			Describes protecting SNAP to ensure the availability of Disaster SNAP or D-SNAP for food assistance among low-income households following disasters
4.8.3	Flood insurance			Demonstrated effort to make flood insurance more affordable or with fewer hurdles for lower income families
4.8.4	Energy and water use efficiency consultation			Pre-disaster planning to consult with and reach out to low-income households to inform them of energy efficiency products and retrofitting at a severely subsidized rate; products and habits for decreasing water use
4.9 Community Assets & Services				
4.9.1	Community preservation			Describes an emphasis on preserving the character, culture and aesthetic of a community to maintain or even enhance its connectedness and cohesion

4.9.2	Backup services			E.g. community backup heating/cooling in low-income and more isolated neighborhoods, especially those with poorly performing existing systems
4.9.3	Shared renewables			Describes plans to transfer low-income communities under the direction of cooperative and shared renewable energy sources to minimize cost and set up an autonomous communal grid
4.9.4	Quality of life & access to services			E.g. increasing access to healthy food and public transportation, enhancing pedestrian infrastructure and open space, social and other public services, childcare, welfare
4.9.5	Blight removal			Compiles list of resources to improve the physical appearance of notoriously underserved low-income neighborhoods; establishes supplementary or new programs for blight removal in these areas

5. Inter-Organizational Coordination

5.1 Plan Integration

5.1.1	Coordination with standard/required and other related plans			E.g. land use, general, comprehensive plan; emergency management/operations; climate change plan; disaster recovery plan; flood mitigation plan; sustainability plan; economic development plan; transportation plan
5.1.2	Coordination with housing, and affordability/poverty reduction plans			Incorporates data and housing/affordability assessments that may have been conducted and compiled for plans, identifies and builds on strategies, and utilizes and/or expands on funding and implementation from plans

5.2 Horizontal Coordination

5.2.1	Coordination with other jurisdictional organizations & agencies			E.g. budget/revenue/finance agency; building dep't/permit office; emergency management office; planning/community development agency; floodplain management office; parks/environmental agency; contractors; public health/works; transportation agency; utilities
5.2.2	Coordination with nonprofit and volunteer organizations			Description of nonprofit and/or volunteer organization that work with/in low-income neighborhoods to coordinate with or that have been connected with

6. Participation

6.1 Planning Process

6.1.1	Description of specific outreach and participation to include socially and physically vulnerable populations			Includes a narrative of participants, the roles they played in the planning process, and the impact they had on the plan itself
6.1.2	Schedule of participation			Includes an outline of the dates for specific points or steps in the participation and outreach process

6.2 Public Engagement Techniques

6.2.1	Citizen advisory committee with community liaison			List of members and description of process to nominate or select members of the public to spearhead community-based efforts and represent voice of marginalized constituents; community liaison to serve as mediator between citizens and organizations
6.2.2	Focus groups			Moderator-led discussions of topics in plan with intimate-sized group of representatives
6.2.3	Public meetings/workshops			Description of outreach strategy and inclusion of various members and groups demographically and geographically; periodic meetings or workshops to reflect different stages in the planning process; exploration of various options and ideas for the plan; informal or formal event
6.2.4	Practice emergency protocol			Cites events specifically tailored to acting out protocol under an extreme weather event, emphasis on vulnerable and low-income

6.2.5	Volunteer opportunity			Promotion and offering of volunteer opportunities for all public with incentives like time banking and community currency for additional encouragement
6.2.6	Information distribution			Teaching and informative pamphlets/brochures, educational videos/demonstrations; public notice – radio, television, smartphone app, social media, website, in-person, paper; community bulletin
6.2.7	Public survey and targeted outreach			Mailed or distributed paper survey, online survey (email, website, word of mouth); methods for reaching out to low-income – overcoming barriers

6.3 Stakeholders/Persons Involved in Process

6.3.1	Neighborhood groups and civic/community based organizations			Narrative of involvement, role, education and influence of neighborhood groups, and civic-based organizations on plan and process
6.3.2	General public			Narrative of involvement, role, education and influence of low-income/impoverished, minorities groups, elderly, youth, disabled members of the public on plan and process
6.3.3	Housing agency/authority			Narrative of involvement, role, education and influence of the local housing agency/authority on plan and process
6.3.4	Social services/childcare/welfare			Narrative of involvement, role, education and influence of social services, childcare and welfare providers on plan and process
6.3.5	Nonprofit organization			Narrative of involvement, role, education and influence of nonprofit organizations on plan and process

7. Implementation

7.1 Responsibilities of Organizations

7.1.1	Communications			Description of responsible organizations or positions, modes of communication employed, and communication protocol for each type of incident, with emphasis on extending reach out to low-income populations
7.1.2	Immediate responsibilities			E.g. mass care, emergency assistance, housing and human services, public health and medical services, public safety and security, worker safety, warning
7.1.3	Recovery responsibilities			E.g. damage assessments, population protection, setting up programs and prioritizing long term recovery, management of volunteers and donations

7.2 Responsibilities of Individuals

7.2.1	Public officials and employees, and consultants			Detailed description and distribution of expert or trained individuals to lead each task in response and recovery
7.2.2	Volunteers			Description of role, needs and sources of volunteers that have been informed and consulted with ahead of time
7.2.3	Public participants			Description of the influence and role committed members of the public will have during planning, and/or response and recovery

7.3 Timeline

7.3.1	Detailed breakdown of actions/policies by timeline			Some form of list, table, or graphic showing dates, months and/or years when each action or policy by grouping is expected to be implemented and the duration of its implementation; demonstrates prioritization and hierarchy
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7.4 Finances

7.4.1	Develop revenue sources			Detailed description of sources of funding that are and will be available during crises, and sources of funding set aside specifically in budget for response and recovery, and for each pre-event strategy; creates innovative financing mechanisms
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8. Monitoring

8.1 Monitoring Implementation

8.1.1	Monitor performance of actions and policies			Description of plans and responsibilities for monitoring the efficacy of implemented actions and policies; sets up easily understandable measurement system to benchmark actions/policies
8.1.2	Public monitor progress of meeting their needs and able to			Allowing a space for low-income and other vulnerable groups to hold policymakers and other decision-makers accountable to meeting their desires; portion of engagement for empowering residents to act on their democratic duty and informing them of this authority
8.1.3	Identify new and continuous obstacles			Observes and analyzes obstacles to inclusion, vision, and success, and/or concocts a strategy for overcoming these obstacles or if necessary, declare obstacles unresolvable or permanent; identification and acknowledgement of certain cultures and relationships that challenge engagement and visioning
8.1.4	Review stakeholder group membership			Persons responsible for overseeing the involvement of each representative stakeholder and ensuring continuous involvement of various types of stakeholders particularly those that are traditionally excluded from the process like low-income groups
8.1.5	Ensure progress is clearly communicated to public and stakeholders			Accounts methods used for communicating results and the status of implementation and successes associated with the plan, specifically notes methods for communicating to marginalized low-income groups

8.2 Self-Monitoring

8.2.1	Review biases and assumptions			Demonstrates an awareness to revisit the analysis of a problem and identification of solutions that may have been influenced by biases and assumptions among the planner and plan creator, continuing the tradition of marginalization of low-income groups
8.2.2	Manage conflicts and resolve disputes			Mediation for managing conflicts during the planning process, and in the post-disaster phase, and to resolve disputes and clarify lines of responsibility to ensure equal opportunity and voice, specifically with the traditionally marginalized
8.2.3	Assess community engagement and reactions			Description of reactions of those involved and planned alongside with and how reactions influenced plan; analysis of engagement of public and low-income members of the community
8.2.4	Ensure accountability, transparency, and equity in recovery process			Members of planning team hold each other accountable for success of plan and implementation, as do members of the public; each step and action taken in the disaster recovery process is clearly communicated to all those affected and/or involved; maintains equal opportunity for involvement and recovery

8.3 Updating Plan

8.3.1	Review economic and damage loss assessments, and other changed conditions			Analyzes and assesses or plans to, post-disaster damages and losses, and other conditions in affected communities to include in future versions or updates of the plan
8.3.2	Update vulnerability assessments			Acknowledges changing, or the potential for, community conditions economically and environmentally that warrant revisiting of vulnerability assessments, with plans to update them
8.3.3	Update goals and policies			Reveals goals and policies that have been altered or newly removed/included from plan due to changing conditions or unexpected conditions; intends to revisit goals and policies with potential to alter or update them
8.3.4	Update organizational makeup and responsibility			Review post-plan and/or post-disaster situations and conditions to ensure organizational flexibility to reorganize and reallocate responsibilities, as it pertains to low-income communities

Appendix B. Plan Evaluation Scores

Table 20. Detailed Plan Evaluation Scores for Norfolk, VA

			RE.Invest	Haz Mit	PlaNorfolk	Resil. Strat.	Rising Resil.	ThRIVE	total	avg
2. Goals	2.1 General	2.1.1	1	2	2	2	0	2	9	1.5
		2.1.2	2	2	2	2	2	2	12	2.0
		2.1.3	1	0	1	1	2	1	6	1.0
	ST		4	4	5	5	4	5	27	4.5
	2.2 Coordination	2.2.1	0	1	1	2	1	1	6	1.0
		2.2.2	0	1	0	0	1	1	3	0.5
		2.2.3	2	2	1	2	2	2	11	1.8
	ST		2	4	2	4	4	4	20	3.3
	2.3 Equity & Cohesion	2.3.1	0	1	0	1	1	1	4	0.7
		2.3.2	0	0	1	1	1	2	5	0.8
		2.3.3	0	0	1	2	0	1	4	0.7
		2.3.4	0	0	1	2	1	2	6	1.0
	ST		0	1	3	6	3	6	19	3.2
	2.4 Restoration	2.4.1	0	1	0	1	0	1	3	0.5
		2.4.2	0	1	1	0	0	0	2	0.3
		2.4.3	2	0	0	1	2	2	7	1.2
	ST		2	2	1	2	2	3	12	2.0
	2.5 Adaptation/ Anticipation	2.5.1	0	0	0	1	0	0	1	0.2
		2.5.2	0	0	2	2	0	1	5	0.8
		2.5.3	0	1	1	1	2	1	6	1.0
		2.5.4	1	1	2	2	2	2	10	1.7
	ST		1	2	5	6	4	4	22	3.7
	2.6 Minimal Impacts	2.6.1	2	2	0	1	1	1	7	1.2
		2.6.2	1	2	1	2	1	1	8	1.3
		2.6.3	2	2	1	1	1	2	9	1.5
	ST		5	6	2	4	3	4	24	4.0
	2.7 Sustain	2.7.1	0	1	1	2	0	2	6	1.0
		2.7.2	1	0	1	2	2	1	7	1.2
	ST		1	1	2	4	2	3	13	2.2
	Total		15	20	20	31	22	29	137	22.8
	%		34%	45%	45%	70%	50%	66%		
3. Fact Base	3.1 Existing Conditions	3.1.1	1	2	2	2	2	2	11	1.8
		3.1.2	0	2	1	2	2	2	9	1.5
		3.1.3	1	2	2	2	2	2	11	1.8
	ST		2	6	5	6	6	6	31	5.2
	3.2 Vulnerability Assessment							1	1	0.2
		3.2.1	0	1	0	0	0	2	3	0.5

		3.2.2	0	1	0	0	0	0	1	0.2
		3.2.3	0	1	0	1	0	1	3	0.5
	ST		0	3	0	1	0	4	8	1.3
	Total		2	9	5	7	6	10		
	%		17%	75%	42%	58%	50%	83%		
4. Strategies/Actions	4.1 Awareness/ Knowledge		-1				1	1	1	0.2
		4.1.1	2	2	1	2	2	2	11	1.8
		4.1.2	0	1	1	2	0	1	5	0.8
		4.1.3	1	2	1	2	0	2	8	1.3
		4.1.4	0	2	1	1	0	1	5	0.8
	ST		2	7	4	7	3	7	30	5.0
	4.2 Coordination	4.2.1	1	2	2	2	2	2	11	1.8
		4.2.2	1	1	0	2	2	2	8	1.3
		4.2.3	1	2	2	2	2	2	11	1.8
	ST		3	5	4	6	6	6	30	5.0
	4.3 Smart Growth/ Development				1	1	1	1	4	0.7
		4.3.1	0	0	2	2	0	2	6	1.0
		4.3.2	0	0	2	2	0	2	6	1.0
		4.3.3	0	2	2	2	1	2	9	1.5
	ST		0	2	7	7	2	7	25	4.2
	4.4 Preparedness/ Response		-1	-1					-2	-0.3
		4.4.1	0	1	1	0	0	1	3	0.5
		4.4.2	0	0	1	1	0	1	3	0.5
		4.4.3	1	1	0	2	0	1	5	0.8
		4.4.4	0	0	0	1	0	1	2	0.3
	ST		0	1	2	4	0	4	11	1.8
	4.5 Structural	4.5.1	1	2	2	2	2	2	11	1.8
		4.5.2	0	0	1	2	0	1	4	0.7
		4.5.3	1	1	2	1	1	1	7	1.2
	ST		2	3	5	5	3	4	22	3.7
	4.6 Design	4.6.1	1	0	0	0	1	0	2	0.3
		4.6.2	0	0	1	2	0	2	5	0.8
	ST		1	0	1	2	1	2	7	1.2
	4.7 Recovery & Restoration				1		1		2	0.3
		4.7.1	0	0	1	1	0	0	2	0.3
		4.7.2	0	0	1	1	1	1	4	0.7
		4.7.3	0	0	1	1	0	1	3	0.5
		4.7.4	0	0	0	1	0	1	2	0.3
		4.7.5	0	1	1	2	0	1	5	0.8
	ST		0	1	5	6	2	4	18	3.0
			-1				1		0	0.0

5. Inter-Organizational Coordination		4.8.1	0	0	0	0	0	0	0	0.0
		4.8.2	0	0	0	0	0	0	0	0.0
		4.8.3	2	2	1	1	1	1	8	1.3
		4.8.4	1	0	2	0	0	1	4	0.7
	ST		2	2	3	1	2	2	12	2.0
			-1		1	-1	1	1	1	0.2
	4.9 Community Assets/ Services	4.9.1	1	0	2	1	2	2	8	1.3
		4.9.2	0	1	0	0	0	0	1	0.2
		4.9.3	0	0	1	0	0	0	1	0.2
		4.9.4	0	0	2	2	1	2	7	1.2
		4.9.5	1	0	2	1	0	2	6	1.0
	ST		1	1	8	3	4	7	24	4.0
	Total		11	22	39	41	23	43		
	%		17%	33%	59%	62%	35%	65%		
6. Participation	5.1 Plan Integration	5.1.1	0	2	2	2	1	2	9	1.5
		5.1.2	0	0	2	2	0	2	6	1.0
	ST		0	2	4	4	1	4	15	2.5
	5.2 Horizontal Coordination	5.2.1	2	2	2	2	2	2	12	2.0
		5.2.2	1	0	2	2	1	1	7	1.2
	ST		3	2	4	4	3	3	19	3.2
	Total		3	4	8	8	4	7		
	%		38%	50%	100%	100%	50%	88%		
	6.1 Planning Process		-1						-1	-0.2
		6.1.1	0	0	1	2	0	2	5	0.8
6. Participation		6.1.2	1	1	0	1	0	1	4	0.7
	ST		0	1	1	3	0	3	8	1.3
			-1	1			1		1	0.2
	6.2 Public Engagement Techniques	6.2.1	0	0	1	1	1	1	4	0.7
		6.2.2	0	1	1	2	2	2	8	1.3
		6.2.3	1	1	1	2	2	2	9	1.5
		6.2.4	0	0	1	0	0	0	1	0.2
		6.2.5	2	0	1	1	0	0	4	0.7
		6.2.6	0	1	1	2	0	2	6	1.0
		6.2.7	0	1	1	1	1	1	5	0.8
	ST		2	5	7	9	7	8	38	6.3
			-1		1	1	1		2	0.3
	6.3 Stakeholders/ Persons Involved	6.3.1	0	1	2	2	2	2	9	1.5
		6.3.2	1	1	1	1	1	1	6	1.0
		6.3.3	0	0	2	1	2	2	7	1.2
		6.3.4	0	0	1	1	0	0	2	0.3
		6.3.5	1	1	1	1	0	1	5	0.8

	ST		1	3	8	7	6	6	31	5.2
	Total		3	9	16	19	13	17		
	%		11%	32%	57%	68%	46%	61%		
7. Implementation	7.1	7.1.1	0	0	1	1	0	1	3	0.5
	Organizational Responsibility	7.1.2	0	0	1	0	0	1	2	0.3
		7.1.3	0	0	0	0	0	0	0	0.0
	ST		0	0	2	1	0	2	5	0.8
	7.2 Individual Responsibility		-1				1		0	0.0
		7.2.1	0	1	2	1	0	2	6	1.0
		7.2.2	0	0	0	1	0	0	1	0.2
		7.2.3	1	1	1	1	1	1	6	1.0
	ST		0	2	3	3	2	3	13	2.2
	7.3 Timeline	7.3.1	0	2	2	2	1	1	8	1.3
	ST		0	2	2	2	1	1	8	1.3
	7.4 Finances	7.4.1	2	2	0	2	1	2	9	1.5
	ST		2	2	0	2	1	2	9	1.5
	Total		2	6	7	8	4	8	35	
	%		13%	38%	44%	50%	25%	50%		
8. Monitoring	8.1 Monitoring Implementation		-1			1	1	1	2	0.3
		8.1.1	1	2	2	2	0	2	9	1.5
		8.1.2	1	1	1	2	1	1	7	1.2
		8.1.3	0	2	1	1	1	0	5	0.8
		8.1.4	0	0	1	0	0	0	1	0.2
		8.1.5	0	1	1	1	1	1	5	0.8
	ST		1	6	6	7	4	5	29	4.8
	8.2 Self-Monitoring						1		1	0.2
		8.2.1	0	0	0	1	0	0	1	0.2
		8.2.2	0	0	0	0	0	0	0	0.0
		8.2.3	0	1	1	0	2	1	5	0.8
		8.2.4	0	0	0	0	0	1	1	0.2
	ST		0	1	1	1	3	2	8	1.3
	8.3 Updating Plan	8.3.1	0	2	1	1	0	1	5	0.8
		8.3.2	0	1	0	0	0	0	1	0.2
		8.3.3	0	2	2	1	0	0	5	0.8
		8.3.4	0	1	0	0	0	0	1	0.2
	ST		0	6	3	2	0	1	12	2.0
	Total		1	13	10	10	7	8		
	%		4%	50%	38%	38%	27%	31%		
General	GT		28	48	50	65	44	60	49.167	
Specific	GT		9	35	55	59	35	62	42.5	
Combined	Total Score		13.8587	37.349	51.781401	58.6352657	36.26207729	59.3599	42.874	

Table 21. Detailed Plan Evaluation Scores for New York City

		NDRC P&C	Edgewater	Haz Mit	One NYC	PlaNYC	BIG U RbD	total	avg	
2. Goals	2.1 General	2.1.1	2	2	2	2	2	2	12	2.0
		2.1.2	1	2	2	2	2	1	10	1.7
		2.1.3	2	2	0	0	0	1	5	0.8
	ST	5	6	4	4	4	4	27	4.5	
	2.2 Coordination	2.2.1	1	2	2	1	1	0	7	1.2
		2.2.2	0	0	2	1	1	1	5	0.8
		2.2.3	2	0	2	0	0	1	5	0.8
	ST	3	2	6	2	2	2	17	2.8	
	2.3 Equity & Cohesion	2.3.1	1	0	0	1	0	0	2	0.3
		2.3.2	2	0	1	0	0	1	4	0.7
		2.3.3	1	0	0	2	0	0	3	0.5
		2.3.4	2	1	0	2	0	1	6	1.0
	ST	6	1	1	5	0	2	15	2.5	
	2.4 Restoration	2.4.1	1	0	1	0	2	2	6	1.0
		2.4.2	1	0	1	0	2	2	6	1.0
		2.4.3	2	0	1	1	1	1	6	1.0
	ST	4	0	3	1	5	5	18	3.0	
	2.5 Adaptation/ Anticipation	2.5.1	0	0	0	1	1	0	2	0.3
		2.5.2	0	1	0	1	1	1	4	0.7
		2.5.3	2	1	1	0	0	1	5	0.8
		2.5.4	2	1	2	0	0	2	7	1.2
	ST	4	3	3	2	2	4	18	3.0	
	2.6 Minimal Impacts	2.6.1	1	2	2	2	1	0	8	1.3
		2.6.2	2	0	2	2	1	0	7	1.2
		2.6.3	2	2	2	1	2	1	10	1.7
	ST	5	4	6	5	4	1	25	4.2	
	2.7 Sustain	2.7.1	2	2	2	2	1	0	9	1.5
		2.7.2	1	0	2	1	2	2	8	1.3
	ST	3	2	4	3	3	2	17	2.8	
	Total	30	18	27	22	20	20	137	22.8	
	%	68%	41%	61%	50%	45%	45%			
3. Fact Base	3.1 Existing Conditions	3.1.1	2	2	2	1	2	2	11	1.8
		3.1.2	2	1	2	2	2	2	11	1.8
		3.1.3	2	2	2	2	2	2	12	2.0
	ST	6	5	6	5	6	6	34	5.7	
	3.2 Vulnerability Assessment	1		-1	1	1	1	3	0.5	
		3.2.1	1	1	2	1	1	2	8	1.3
		3.2.2	0	0	2	0	1	1	4	0.7
		3.2.3	1	1	0	0	0	0	2	0.3

	ST		3	2	3	2	3	4	17	2.8
	Total		9	7	9	7	9	10		
	%		75%	58%	75%	58%	75%	83%		
4. Strategies/Actions	4.1 Awareness/ Knowledge					1	1	1	3	0.5
		4.1.1	2	1	2	2	2	2	11	1.8
		4.1.2	2	0	2	2	2	0	8	1.3
		4.1.3	2	2	2	2	1	1	10	1.7
		4.1.4	0	1	1	1	2	2	7	1.2
	ST		6	4	7	8	8	6	39	6.5
	4.2 Coordination	4.2.1	2	2	2	2	2	2	12	2.0
		4.2.2	2	2	2	2	1	2	11	1.8
		4.2.3	2	2	2	2	2	2	12	2.0
	ST		6	6	6	6	5	6	35	5.8
	4.3 Smart Growth/ Development		1		1	1	1	1	5	0.8
		4.3.1	1	2	1	2	1	0	7	1.2
		4.3.2	2	1	1	2	1	2	9	1.5
		4.3.3	2	2	2	2	2	0	10	1.7
	ST		6	5	5	7	5	3	31	5.2
	4.4 Preparedness/ Response		1		-1	1	1		2	0.3
		4.4.1	1	1	2	1	0	1	6	1.0
		4.4.2	2	0	2	2	1	0	7	1.2
		4.4.3	2	0	2	2	2	0	8	1.3
		4.4.4	0	0	1	0	0	0	1	0.2
	ST		6	1	6	6	4	1	24	4.0
	4.5 Structural	4.5.1	2	2	2	2	2	2	12	2.0
		4.5.2	2	0	2	2	2	0	8	1.3
		4.5.3	2	0	2	2	2	1	9	1.5
	ST		6	2	6	6	6	3	29	4.8
	4.6 Design	4.6.1	1	1	2	1	1	0	6	1.0
		4.6.2	2	0	2	2	1	2	9	1.5
	ST		3	1	4	3	2	2	15	2.5
	4.7 Recovery & Restoration		1		1	1	1	1	5	0.8
		4.7.1	1	0	2	1	1	1	6	1.0
		4.7.2	1	1	1	2	1	0	6	1.0
		4.7.3	0	0	2	1	1	0	4	0.7
		4.7.4	1	0	2	1	2	0	6	1.0
		4.7.5	2	1	2	1	2	1	9	1.5
	ST		6	2	10	7	8	3	36	6.0
	4.8 Households/ Individuals		1					1	2	0.3
		4.8.1	0	0	0	0	0	0	0	0.0
		4.8.2	0	0	0	0	0	0	0	0.0

		4.8.3	2	2	2	2	2	1	11	1.8
		4.8.4	2	0	1	2	1	0	6	1.0
		ST	5	2	3	4	3	2	19	3.2
			1			1	1	1	4	0.7
		4.9.1	2	2	1	2	1	2	10	1.7
		4.9.2	2	0	2	1	2	1	8	1.3
		4.9.3	1	0	2	2	2	1	8	1.3
		4.9.4	2	1	2	2	2	2	11	1.8
		4.9.5	0	0	1	2	2	2	7	1.2
		ST	8	3	8	10	10	9	48	8.0
		Total	52	26	55	57	51	35		
		%	79%	39%	83%	86%	77%	53%		
5. Inter-Organizational Coordination	5.1 Plan Integration	5.1.1	2	2	2	2	1	2	11	1.8
		5.1.2	2	0	1	2	0	1	6	1.0
	ST		4	2	3	4	1	3	17	2.8
	5.2 Horizontal Coordination	5.2.1	2	2	2	2	2	2	12	2.0
		5.2.2	0	1	2	2	2	2	9	1.5
	ST		2	3	4	4	4	4	21	3.5
	Total		6	5	7	8	5	7		
		%	75%	63%	88%	100%	63%	88%		
6. Participation	6.1 Planning Process		1			1	1	1	4	0.7
		6.1.1	2	1	2	2	2	2	11	1.8
		6.1.2	1	2	2	0	2	2	9	1.5
	ST		4	3	4	3	5	5	24	4.0
			1		1		1	1	4	0.7
	6.2 Public Engagement Techniques	6.2.1	1	1	2	1	1	1	7	1.2
		6.2.2	2	2	2	1	2	2	11	1.8
		6.2.3	2	2	2	1	1	2	10	1.7
		6.2.4	0	0	1	1	2	1	5	0.8
		6.2.5	0	0	1	1	2	0	4	0.7
		6.2.6	2	1	2	2	2	1	10	1.7
		6.2.7	2	0	2	2	0	2	8	1.3
	ST		10	6	13	9	11	10	59	9.8
			1			1	1	1	4	0.7
	6.3 Stakeholders/Persons Involved	6.3.1	2	2	2	2	2	2	12	2.0
		6.3.2	2	1	1	2	1	2	9	1.5
		6.3.3	2	0	2	2	2	2	10	1.7
		6.3.4	0	0	2	2	0	0	4	0.7
		6.3.5	1	1	2	1	2	2	9	1.5
	ST		8	4	9	10	8	9	48	8.0
	Total		22	13	26	22	24	24		

	%		79%	46%	93%	79%	86%	86%		
7. Implementation	7.1	7.1.1	0	0	2	2	1	0	5	0.8
	Organizational Responsibility	7.1.2	0	1	2	2	2	0	7	1.2
		7.1.3	2	0	2	0	2	0	6	1.0
	ST		2	1	6	4	5	0	18	3.0
	7.2 Individual Responsibility					1	1	1	3	0.5
		7.2.1	1	1	2	2	2	2	10	1.7
		7.2.2	0	0	2	1	2	1	6	1.0
		7.2.3	1	1	1	2	1	1	7	1.2
	ST		2	2	5	6	6	5	26	4.3
	7.3 Timeline	7.3.1	1	0	2	0	1	2	6	1.0
	ST		1	0	2	0	1	2	6	1.0
	7.4 Finances	7.4.1	2	1	2	2	2	2	11	1.8
	ST		2	1	2	2	2	2	11	1.8
	Total		7	4	15	12	14	9	61	
	%		44%	25%	94%	75%	88%	56%		
8. Monitoring	8.1 Monitoring Implementation		1		-1		1	1	2	0.3
		8.1.1	2	0	2	2	2	2	10	1.7
		8.1.2	1	1	1	1	0	1	5	0.8
		8.1.3	0	0	1	1	1	1	4	0.7
		8.1.4	0	0	0	0	0	1	1	0.2
		8.1.5	2	2	2	1	1	1	9	1.5
	ST		6	3	5	5	5	7	31	5.2
	8.2 Self-Monitoring							1	1	0.2
		8.2.1	0	0	0	0	0	0	0	0.0
		8.2.2	0	0	0	0	0	0	0	0.0
		8.2.3	1	1	2	2	2	2	10	1.7
		8.2.4	0	0	1	1	0	0	2	0.3
	ST		1	1	3	3	2	3	13	2.2
	8.3 Updating Plan	8.3.1	1	0	2	0	1	2	6	1.0
		8.3.2	0	0	1	0	0	0	1	0.2
		8.3.3	0	0	2	0	0	1	3	0.5
		8.3.4	0	0	0	0	0	1	1	0.2
	ST		1	0	5	0	1	4	11	1.8
	Total		8	4	13	8	8	14		
	%		31%	15%	50%	31%	31%	54%		
General	GT		63	39	71	56	53	52	55.67	
Specific	GT		71	38	81	80	78	67	69.17	
Combined	Total Score		66.425121	36.986715	75.5435	70.77295	68.5688	60.658213	63.16	

Appendix C. Spatial Coding Scores

Norfolk:

Table 22. RE.invest Report Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
The Hague													
Downtown Arts District		1		1		1	1	1	1	1	1	1	
Low Vuln.		1		1		1	1	1	1	1	1	1	
Total		-1		-1		-1	-1	-1	-1	-1	-1	-1	

Table 23. Southside Hazard Mitigation Plan Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
Ballentine Place				1									
Ingleside				1									
Crown Point				1									
Industrial Park				1									
Fort Norfolk				3									
Cottage Road Park									1				
High Vuln.				2					1				
Low Vuln.				5									
Total				-3					1				

Table 24. PlaNorfolk 2030 Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
Broad Creek (area)			1										
Moton (Robert's)			1										
Grandy Village			1										
South Brambleton			1										
Broad Creek							2						
Douglas (Bruce's) Park			1										
Spartan Village			1										
Central Hampton Blvd			1				5			2			
Colonial Place-Riverview			1				1						
Cottage Line			1				1						
Downtown			1				3						
East Little Creek Rd			3				3						
East Ocean View			4				2						
Fairmount Park			3				2						
Fort Norfolk							2						

Ghent							1						
Norview			1				1						
Wards Corner			3				1						
Huntersville							2						
Mid-Town Industrial			1										
Military Highway			2				1						
Monticello- Granby			1										
Park Place			2				2						
St. Paul's			4		1		5						
Southside			2				2						
West Ocean View							1						
High Vuln.			23		1		22			2			
Low Vuln.			8				10						
Total			15		1		12			2			

Table 25. Norfolk Resilience Strategy Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self- monit.
Chesterfield Heights										1			
Lafayette River											1		
Downtown									1				
Park Place			1						2			1	
Wards Corner									1				
Sentara Norfolk							1						
Sentara Leigh							1						
High Vuln.			1						2			1	
Low Vuln.							2		2				
Total			1				-2		0	1	0	1	

Table 26. Tidewater Rising Resiliency Challenge Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
Chesterfield Heights		1	1		1	1	1		2	2	1	1	1
High Vuln.		1	1		1	1	1		2	2	1	1	1
Total		1	1		1	1	1		1	1	1	1	1

Table 27. ThRive NDRC Phase 2 Application Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
Haven Creek							1						
Knitting Mill Creek							1						
Colley Bay							1						
Willoughby Spit							1						
St. Paul's	1		1				2					1	
Tidewater Gardens	1		1				2					1	
South Brambleton	1		1				2					1	
Harbor Park	1						2					1	
Chesterfield Heights	1						2					1	
ODU		1					1						
Norfolk State		1											
Tidewater CC		1					1						
Grandy Village			1										
High Vuln.	5	2	4				13					5	
Low Vuln.		1					2						
Total	5	1	4				11					5	

New York City:

Table 28. BIG “U” Rebuild by Design Report Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
Stuyvesant Town							2			1		1	
East Village							1		2	2	1	1	2
Lower East Side	3	2	2			1	9	1	4	2	1	1	2
Two Bridges					1		3	1	4	2		1	3
Financial District							2			2		1	
Battery Park		1					3			2		1	
Hell's Kitchen										1			
Chelsea										1			
West Village													
Tribeca										1			
Battery Park City										1			
Chinatown										1			
Low Vuln.		1					5			6		2	
High Vuln.	3	2	2		1	1	15	2	10	8	2	4	7
Total	3	1	2		1	1	10	2	10	2	2	2	7

Table 29. New York City Hazard Mitigation Plan Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
Belmont												1	
Brooklyn Heights				1								1	
Civic Center												1	
Kew Gardens												1	
St. George												1	
Coney Island	1		1		1								
Rockaway Beach	1				1								
South Shore	1												
Howard Beach	1												
Breezy Point	1												
Midland Beach	1												
Rikers Island				1	1								
Governor's Island							1						
Arverne East					1								
Kips Bay			1				1						
Greenpoint			1										
Williamsburg			1										
Hunters Point		1	1										
East Harlem							1						
Randall Manor									1				
Low Vuln.	3			1			1					3	
High Vuln.	2		3		2		1					2	
Total	-1	0	3	-1	2		0		1			-1	

Table 30. PlaNYC: A Stronger, More Resilient New York Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
Borough Park					1								
Bay Ridge					1								
Rockaway Park	1		2		7		3	1	1	1	1	2	
Oakwood Beach	1		1		3			1	1	1			
Seaside	1		2		2		3	1	1	1	1	1	
Rockaway Beach	1		1	1	4		4	1	1	1	1	1	
Arverne	1		2		2		5	1	1	1	1	1	
Edgemere	1		1		2		3	1	1	1	1	1	
Two Bridges	1		2		5			1	1	1			
Kips Bay	1		1	2	2		1	1	1	1			
Red Hook	1	1	2	1	6		3	2	2	2		2	
Greenpoint	1		2		4		3	1	1	1			
Long Island City	1		3		4		1	1	1	1			
Woodhaven Blvd							1						
Marine Park							1						
Canarsie							1						
Navy Yard	1		2		2			1	1	1			
Dumbo	1		1		2		1	1	1	1		1	
Gowanus	1		1		2			1	1	1			
Williamsburg	1		2		2		1	1	1	1			
Newtown Creek	1		1		2			1	1	1			
Sunset Park	1		1		2		1	1	1	1			
South Beach	1		2		5		1	1	1	1		1	
Midland Beach	1		3		4			1	1	1		1	
New Dorp	1		2		2			1	1	1		1	
Great Kills	1		2		2		1	1	1	1		2	
Eltingville	1		1		1		1	1	1	1		1	
Annadale	1		1		1		1	1	1	1		1	
Prince's Bay	1		1		2		1	1	1	1		1	

Tottenville	1		1		5		1	1	1	1		1	
Charleston							1						
Stapleton			1										
St. George			2										
Howard Beach	1		2		3		1	1	1	1	1		
Hamilton Beach	1		3		2			1	1	1	1	1	
Broad Channel	1		3		4		1	1	1	1	1	1	
Far Rockaway	1		1		4		2	1	1	1	1	2	
Belle Harbor	1		1		5		1	1	1	1	1	1	
Breezy Point	1		1		2		1	1	1	1	1	1	
Sea Gate	1		1		2			1	1	2			
Gravesend	1		1		2		2	1	1	1		1	
Coney Island	1		4	1	4		6	2	1	1		2	
Brighton Beach	1		1		4		1	1	1	1			
Manhattan Beach	1		1		2			1	1	1			
Sheepshead Bay	1		2		7		2	1	1	2		1	
Gerritsen Beach	1	1	3		3		1	1	1	1			
Stuyvesant Town	1		2		2			1	1	1			
Lower East Side	1		2		5		3	1	1	1			
Lower Manhattan	1		5		5		8	1	1	1		2	
Battery Park City	1		1		2			1	1	1			
Tribeca	1		1		5		1	1	1	1			
West Village	1		1		4			1	1	1			
Chelsea	1		1		3		1	1	1	1			
Hudson Yards	1		2		2			1	1	1			
Low Vuln.	11		18		35		15	11	11	11	3	8	
High Vuln.	22	2	42	3	76		43	24	23	25	5	14	
Total	11	2	24	3	41		28	13	12	14	2	6	

Table 31. OneNYC Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
West Farms	1		1				2						
Crotona Park East	1		1				3						
Longwood	1		1				4			1			
Soundview	1		1				4						
Hunts Point	1		1				4			1			
Long Island City							2						
Flatlands							1						
East Midtown			1				1						
Jerome Ave			1				1	1					
Fort Greene							1		1	1			
Canarsie		1			1		1						
East New York							3						
Jamaica			1				2						
Crown Heights							1						
North Shore			1				1						
South Shore					1		1						
Williamsburg							2						
Greenpoint							1						
Bedford Stuyvesant							1						
Washington Heights							3			1			
Tremont							1						
Coney Island		1		2	1		3						
Kips Bay				2			1						
East Harlem			1	2			3						
Roosevelt Island				2			1						
Harlem Gateway							1						
Cromwell/ Jerome							1						

Zarega							1						
Ridgewood							1						
Red Hook				1			1		1		1	1	
Stapleton							2						
Edgemere							1						
Harding Park										1			
Hudson Yards			1										
Seward Park			1										
Hunters Point			1										
Averne			1				1						
Willeys Point			1										
Melrose			1				1						
Highland Park							1						
Dongan Hills							1						
Chelsea							1						
Gravesend							1						
Brooklyn Heights							1						
Rockaway Beach		1			2								
Brighton Beach		1			1								
Low Vuln.			3		1		5		1		1		
High Vuln.		4	11	7	5		43	1	1		5	1	
Total	5	4	8	7	4		38	1	0		4	1	8

Table 32. Edgewater Park Resilient Neighborhoods Report Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
Edgewater Park	1	1	1		1	1	1	1	1	1		1	
Total	0	0	0		0	0	0	0	0	0		0	

Table 33. Lower Manhattan Protect & Connect NDRC Phase 2 Application Spatial Coding Scores

	Vuln. Assess.	Aware./ Knowl.	Smart growth & dev.	Prep. & resp.	Recov. & rest.	HH & indiv.	Comm. assets & services	Planning process	Public eng.	SH/ Persons involved	Respon.	Monit. implem.	Self-monit.
East Village	1		2	1	1	2	5	2	2	2		1	
Lower East Side	1		2	1	1	2	7	2	2	2		1	
Campos Plaza	1		1			1	2	1	1	1		1	
Riis 1 & 2	1		1			1	3	1	1	1		1	
Wald Houses	1		1			1	3	1	1	1		1	
Lavanburg Houses	1		1			1	3	1	1	1		1	
Baruch Addition	1		1			1	3	1	1	1		1	
Cooperative Village	2		2	1		1	3	2	2	2		1	
LaGuardia	1		1			1	2	1	1	1		1	
Two Bridges	2		1	1		1	4	2	3	2		1	
Smith Houses	1		1			1	2	1	1	1		1	
Civic Center	2		1				1	2	2	2			
Financial District	2						1	1	2	2			
Battery Park	1						1						
Battery Park City	2						1	1	2	2			
Tribeca	2						1	1	2	2			
Low Vuln.	9		2	1		1	7	5	8	8		1	
High Vuln.	13		13	3	2	12	35	15	16	15		10	
Total	4		11	2	2	11	28	10	8	7		9	9.2

Appendix D. Vulnerability Maps

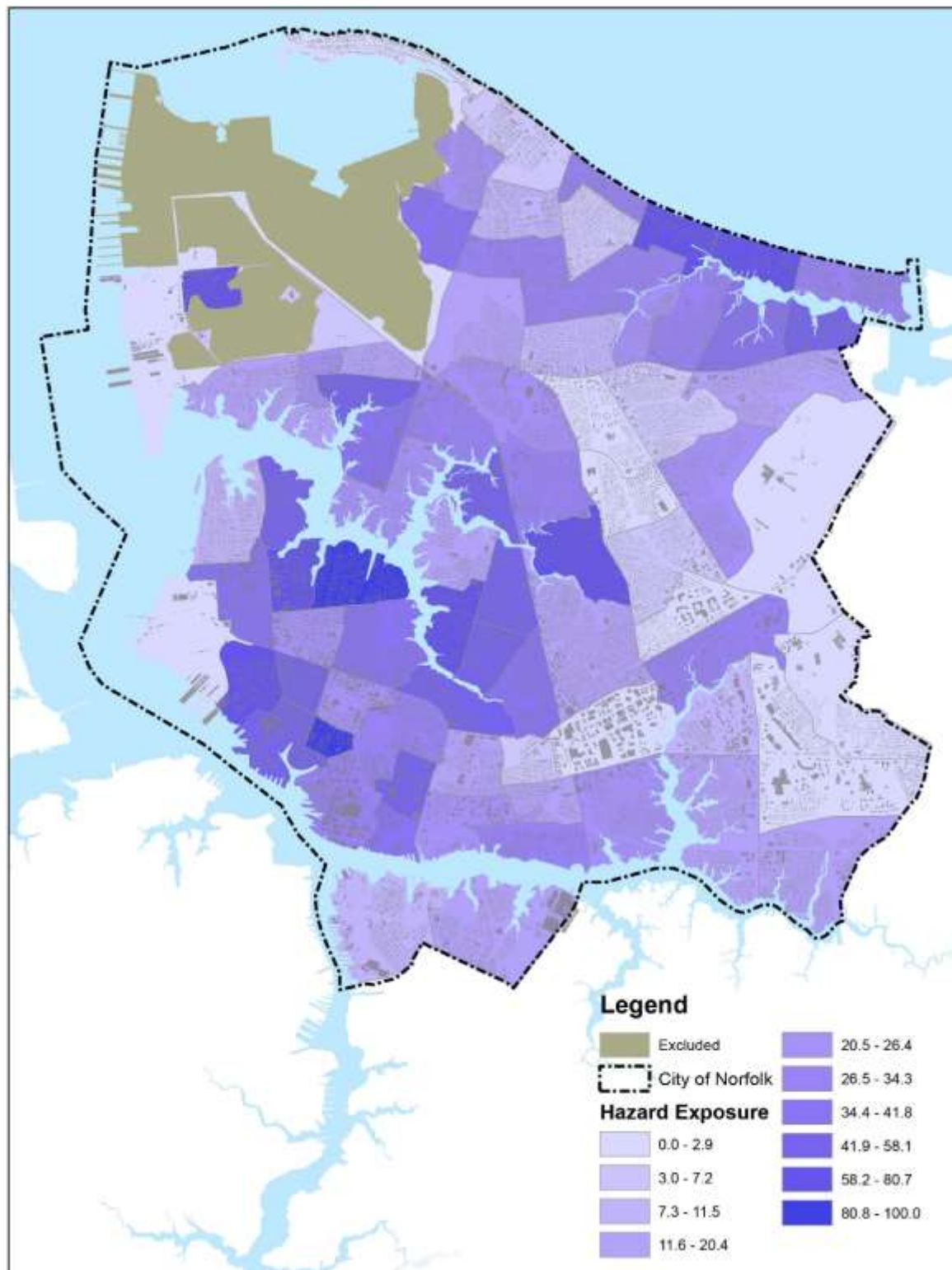


Figure 11. Hazard Exposure in Norfolk, VA

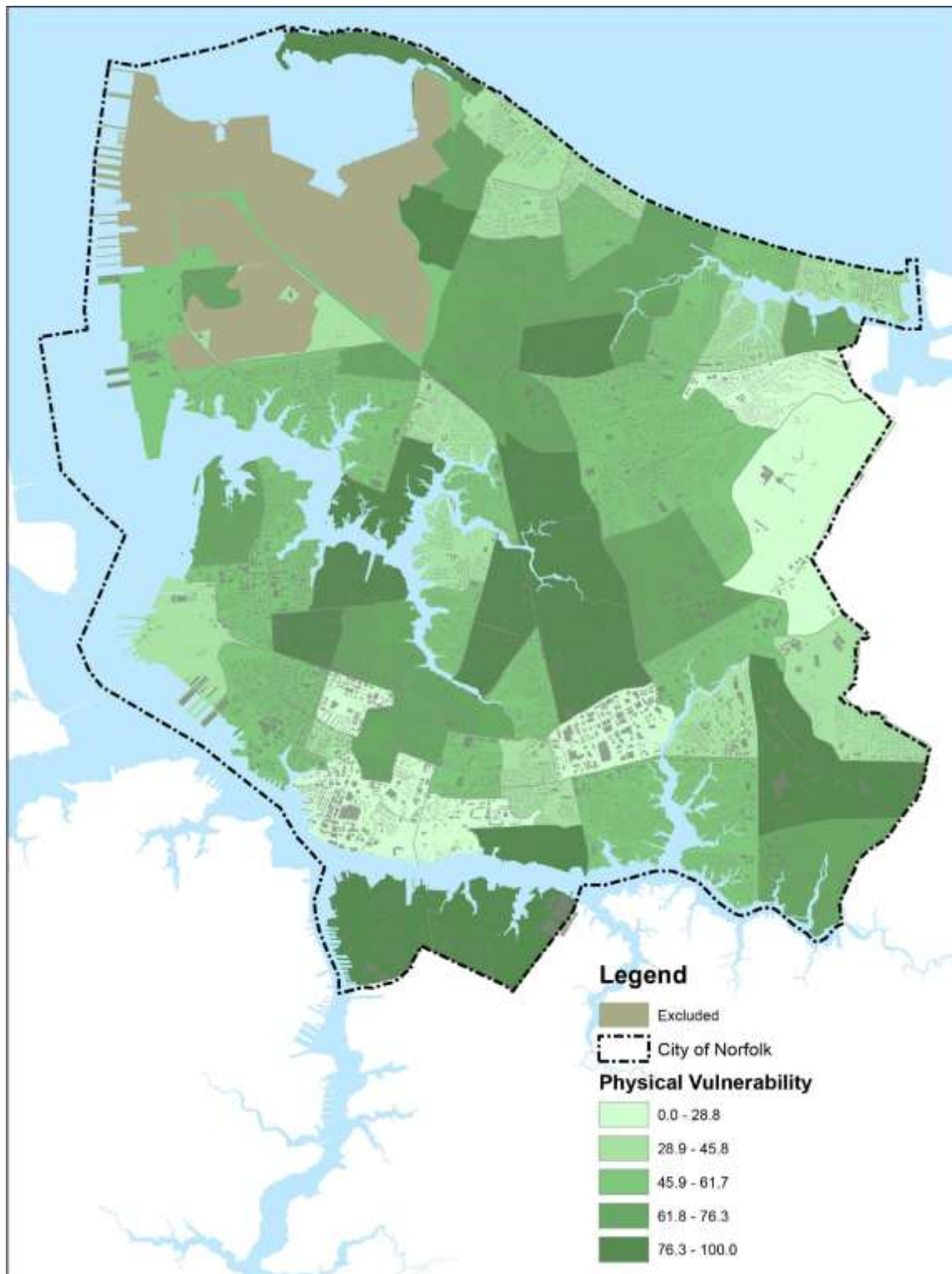


Figure 12. Physical Vulnerability in Norfolk, VA

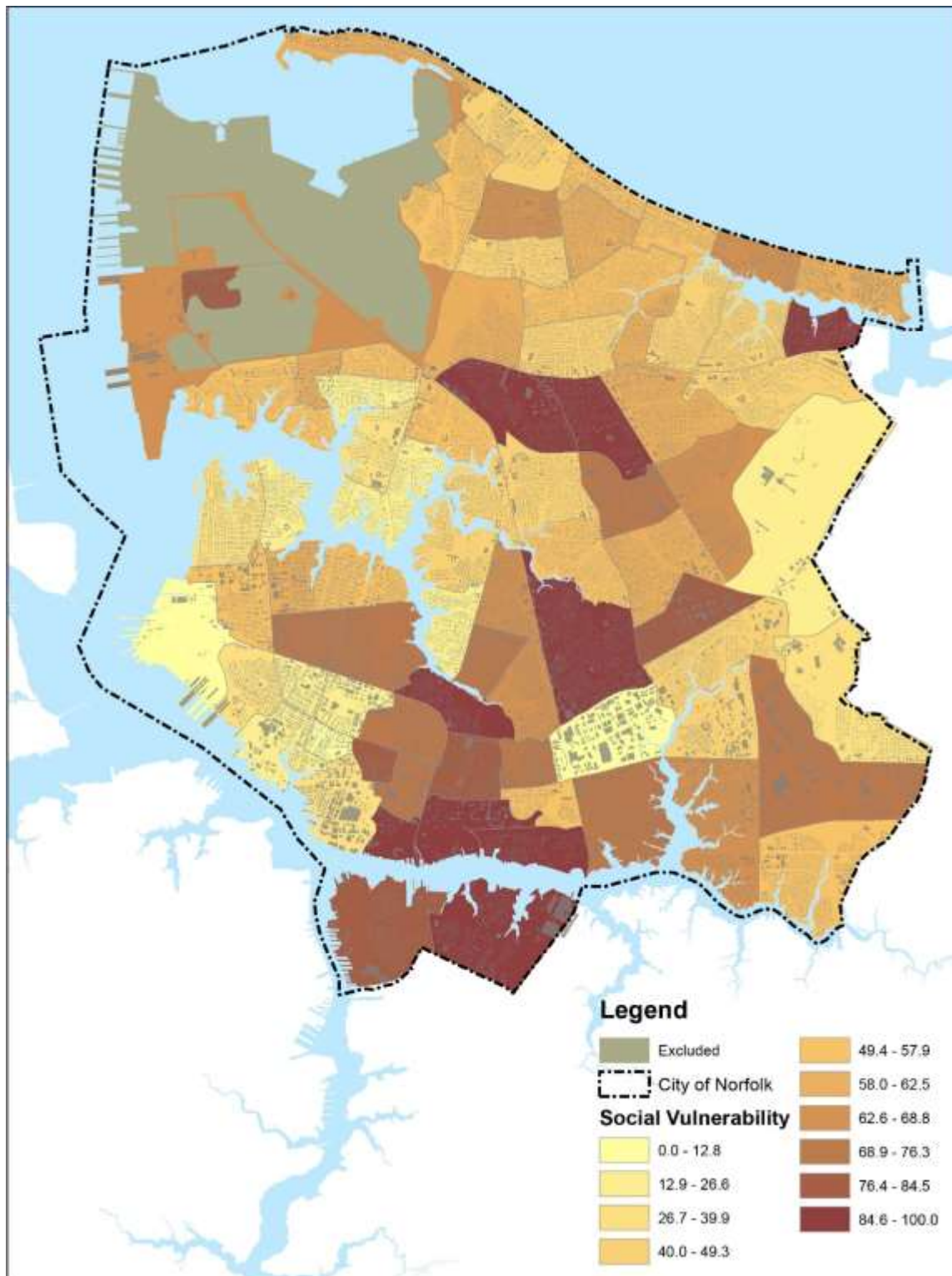


Figure 13. Social Vulnerability in Norfolk, VA

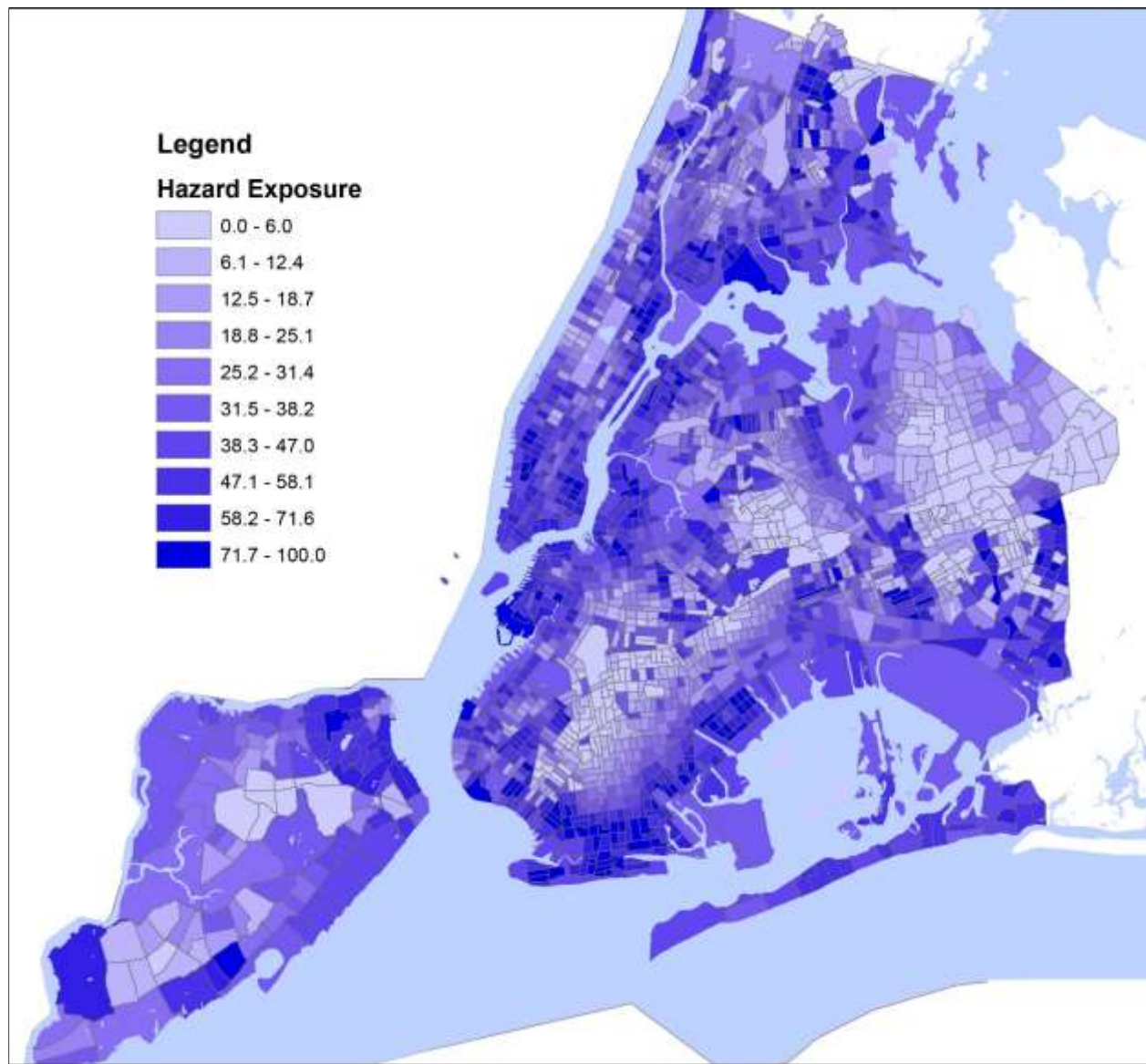


Figure 14. Hazard Exposure in New York City

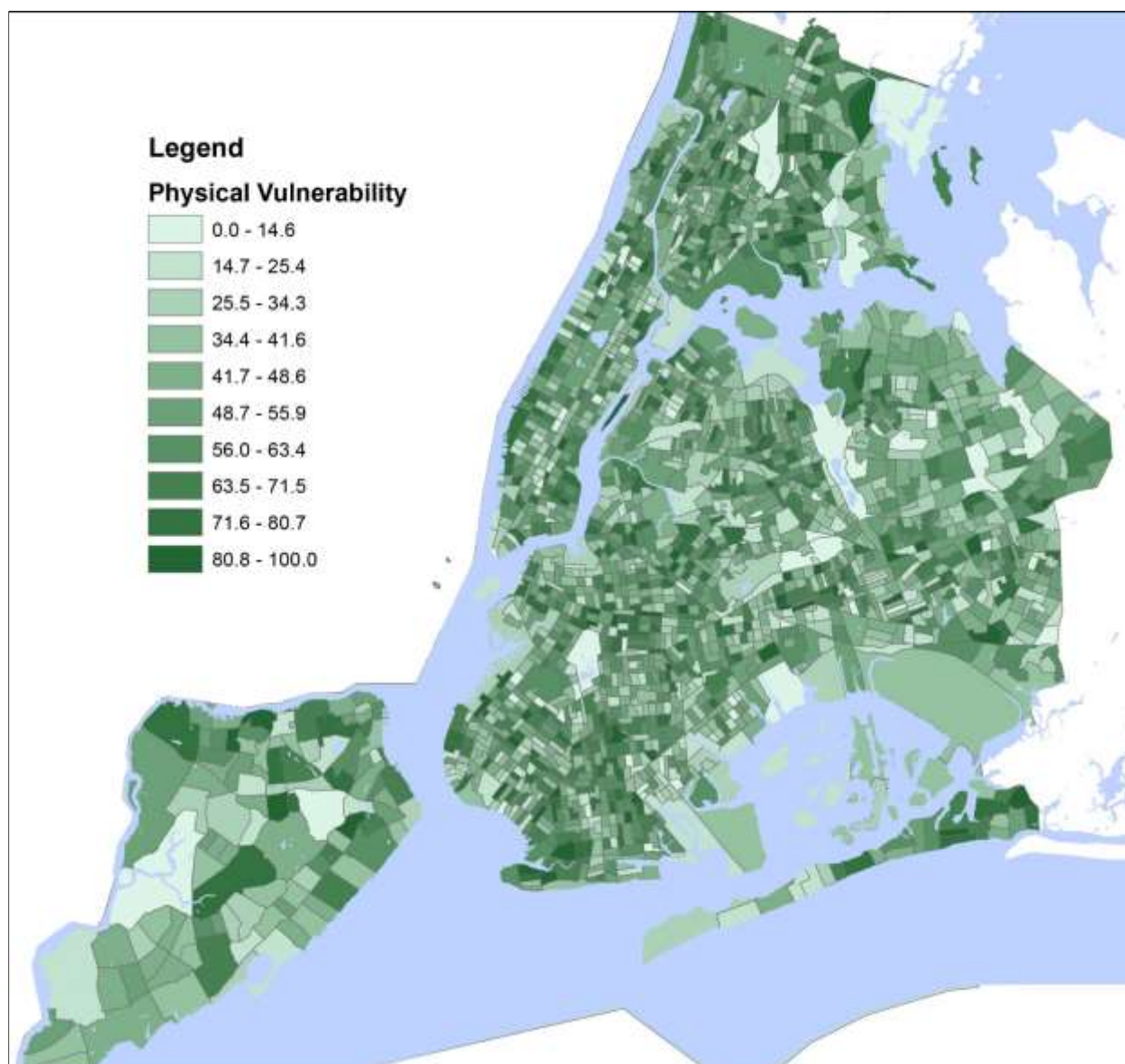


Figure 15. Physical Vulnerability in New York City

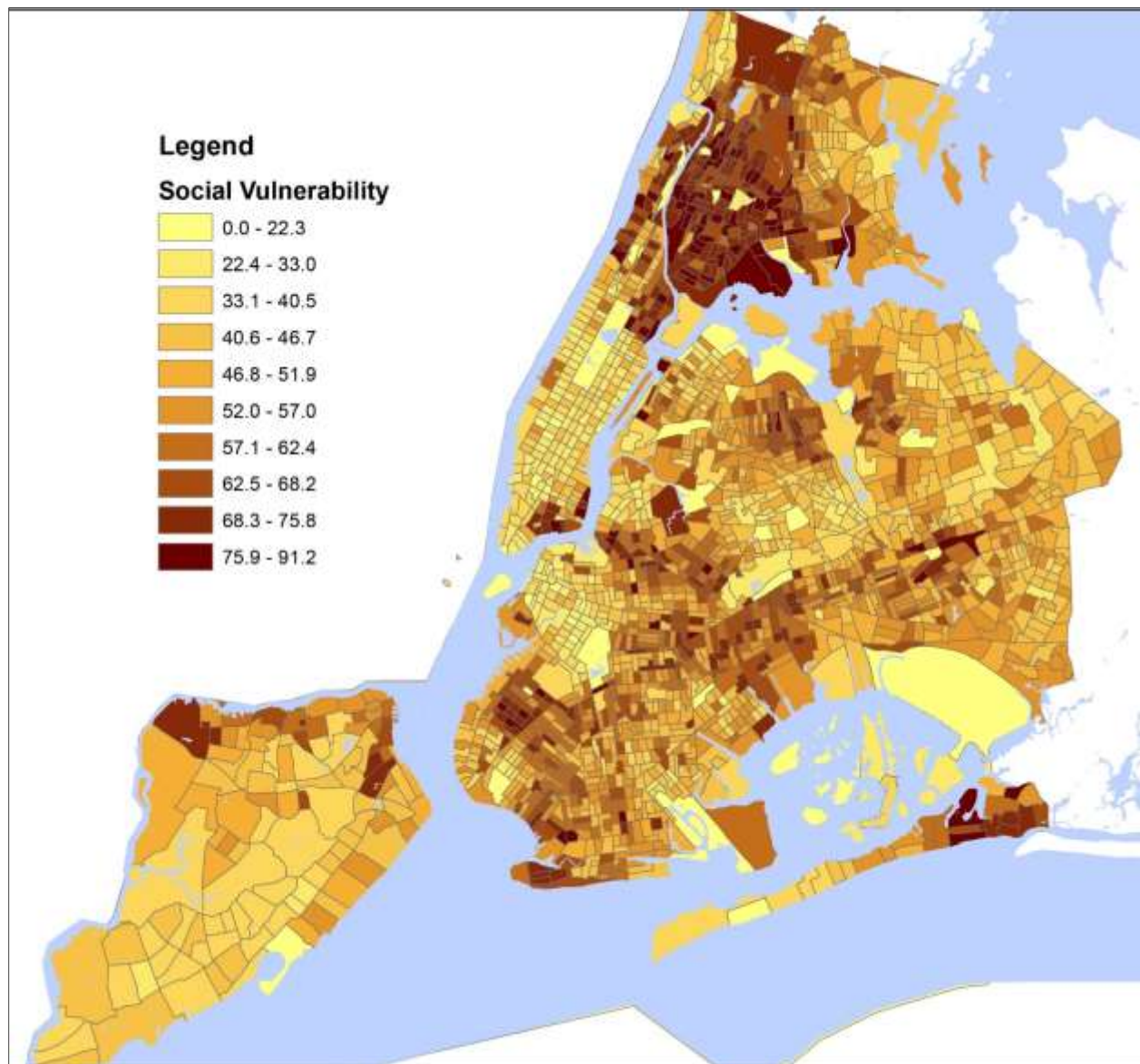


Figure 16. Social Vulnerability in New York City