

2015

Mapping Coastal Risks and Social Vulnerability: Current Tools and Legal Risks

Lisa Schiavinato

Heather Payne

Repository Citation

Schiavinato, Lisa and Payne, Heather, "Mapping Coastal Risks and Social Vulnerability: Current Tools and Legal Risks" (2015).
Virginia Coastal Policy Center. 16.
<https://scholarship.law.wm.edu/vcclinic/16>

Mapping Coastal Risks and Social Vulnerability: Current Tools and Legal Risks

Lisa Schiavinato, Esq.¹

Heather Payne, Esq.²



North Carolina
Coastal Resources Law,
Planning, and Policy Center



SPRING 2015

Contact Us

Please contact Lisa Schiavinato at lschiav@ncsu.edu if you have comments, questions, or suggestions.



About the Authors

Lisa Schiavinato, Esq.: Lisa Schiavinato is co-director of the North Carolina Coastal Resources Law, Planning, and Policy Center and also serves as the law, policy, and community development specialist for North Carolina Sea Grant.



Heather Payne, Esq.: Heather Payne is assistant director of the University of North Carolina School of Law Center for Law, Environment, Adaptation, and Resources.

About the North Carolina Coastal Resources Law, Planning, and Policy Center

The North Carolina Coastal Resources Law, Planning, and Policy Center is an inter-institutional entity that coordinates and applies the legal, planning, and policy expertise of the University of North Carolina System to the state's coastal and marine resources and development issues.

The Center is a research, advisory, and educational entity. It provides informational support to state agencies, state advisory groups, local governments, the legal community and community organizations in their efforts to address ocean, coastal and development issues.

In addition, the Center engages in long-term coastal use and development trends and issues. These results are communicated through white papers, as well as through the semiannual publication of *Legal Tides*, a newsletter that reaches more than 1,400 attorneys, state agency and local government personnel, and community organizations.

The Center also sponsors conferences and other educational programs in its efforts to extend pertinent information to coastal management professionals, community organizations and others with an interest in coastal issues..

Executive Summary

Extreme weather events and nuisance flooding are increasing, with communities already experiencing impacts. Both the identification of local hazards and the assessment of local vulnerabilities can protect people, their property, and their livelihoods.

This goal of this project, along with the accompanying paper *Mapping Coastal Risks and Social Vulnerability: Principles and Considerations*, is to provide an overview for local governments of the social vulnerability data sets that are currently available, how social vulnerability is currently being used and could be used, and what legal risks might be associated with utilizing it. A typical factor used to determine social vulnerability is race or ethnicity. The use of race specifically raises legal concerns, primarily based on the equal protection clause of the U.S. Constitution. In this paper, we discuss the equal protection analysis framework and the potential legal challenges associated with using race as a factor in making decisions based on maps or other decision-support tools that include social vulnerability criteria.

While the use of race as one (of many) factors to determine social vulnerability can yield useful information, due to the potential legal ramifications, this paper recommends that local governments should not make funding or other decisions, such as permitting decisions, based on decision-support tools that use race or even ethnicity as a component or factor in determining social vulnerability. However, support tools that do not use race as a factor can be used to translate extreme weather and nuisance flooding adaptation planning into action that influences policy and local decision-making. Mapping flood risk with social vulnerability and potential sea level rise can be a valuable exercise for local governments and communities to understand their flood risk. Data gleaned from such a map can then influence strategies such as hazard mitigation plans, buyout programs, disaster recovery plans, and long-term public infrastructure placement. By utilizing data around where the most vulnerable communities reside, local governments can ensure critical functions and services are available for *all* communities when a disaster occurs.

I. Increasing Risks, Costs and Threats to Local Communities

The combination of more extreme weather events, long-term erosion and subsidence is a significant concern in the United States, especially for coastal communities. Extreme weather events, such as heat waves, large storms, destructive thunderstorms, and tornadoes,⁴ are expected to become more frequent, while Atlantic hurricane activity has increased substantially across most measures since the early 1980s.⁵ In addition, floods have caused 4,586 deaths in the United States between 1959 and 2005, with property and crop damage averaging \$8 billion annually between 1981 and 2011.⁶ Moreover, according to the National Oceanic and Atmospheric Administration (“NOAA”), nuisance flooding – defined as “flooding which causes public inconvenience, but little or not property damage”⁷ – has increased 900 percent since the 1960s.⁸ Managing the resulting impacts, such as road closures and overwhelmed storm drains, requires additional resources and contributes to public safety concerns. Just since 2001, coastal flooding on the Eastern Seaboard has increased dramatically, with the flood threshold exceeded an average of 20 times annually in Atlantic City, NJ; Annapolis, MD; Washington, D.C.; Wilmington, NC; and Charleston, SC.⁹ Whether these events are considered together or separately, a

conclusion one can draw is that the potential of substantial property loss and public safety risks to affected communities is substantial.

With more people living closer to the coast – the United States added approximately 2.2 million new housing units in coastal areas between 1990 and 2010¹⁰ – millions of homes are vulnerable to storm surge and rising seas, with many of them outside federal flood zones.¹¹ With so many homes lying outside the floodplain at risk, some of them without flood insurance, local governments are concerned about the potential impacts and how to mitigate or adapt to risk. For example, Hampton Roads, VA, has approximately 340,000 residences at risk but outside a zone where flood insurance is required.¹² There has been a “dramatic rise in coastal storm-related losses” due to population increases and a rise in structures built in at-risk areas.¹³

Both local governments and the public are already aware that these trends indicate more than a “nuisance”. Flooding is becoming more frequent and more expensive, deteriorating roads and other public infrastructure.¹⁴ This has spurred action not only at the local government level, but also at the neighborhood level. For example, the Unitarian Church in Norfolk, Virginia, has posted a tide chart on its website so parishioners know whether they’ll be able to get to church, or if the road will be flooded.¹⁵ In addition, the advancement of technology has facilitated the development of new tools to supplement weather alert systems. For example, a new mobile application lets users both provide and receive real-time information about the location of flooded roads, so they can plan travel accordingly and avoid potentially dangerous areas.¹⁶

Other public infrastructure, including bridges, water lines, rail lines, and sewer systems,¹⁷ is also at risk from salt corrosion from repeated smaller floods and from catastrophic flooding during larger events.¹⁸ For instance, salt corrosion is a concern because it has the potential to react with, and alter, the composition of iron, steel, zinc, concrete and wire insulation. Salt can react with transmission lines and telephone wires causing outages, and repeated inundation from minor flooding can weaken roads and sidewalks.¹⁹ An example of how salt corrosion creates a problem is the City of Norfolk’s light rail system, which has been shut down several times due to flooding since it opened in 2011.²⁰ In addition to roads, sewage systems, septic tanks, and landfills are underwater more frequently, which threaten public health and safety.²¹ For example, wastewater flowing into septic systems cannot be treated when the system is flooded, thereby becoming a potential source of pollution.²²

As a result, local governments are focused on making their communities more resilient by identifying their flood risk and developing strategies to mitigate and adapt to their flood risk. However, local governments recognize that completing this endeavor comes at an expense and requires technical expertise. Therefore, local governments are also identifying existing state and federal programs that can provide financial and technical assistance.²³ Such assistance is important for local governments, particularly in rural areas, that lack financial and staff resources to mitigate and adapt to their flood risk. However, competition is increasing for the scarce government resources that currently exist for mitigation and adaptation projects.²⁴ The question has thus become how local governments can increase their chances of receiving state and federal assistance. According to the Environmental Protection Agency’s Overall Strategies for Flood Resilience and Disaster Recovery, “communities that identify potential hazard mitigation projects and complete hazard mitigation grant applications before a disaster occurs, instead of having

to quickly develop such lists of projects in the aftermath of a disaster, are better positioned to apply for federal funding for disaster recovery and can speed up their recovery process.”²⁵ This means that planning has become more imperative for local governments, and a part of planning ahead for local governments is identifying gaps in information and other roadblocks to understanding their flood risk. For instance, new data has shown that the poorest communities can be the least resilient to weather extremes.²⁶ The ability to pinpoint the location of vulnerable populations in relation to areas prone to flooding is crucial component to mitigation and resource planning.

This goal of this paper, along with the companion paper *Mapping Coastal Risks and Social Vulnerability: Principles and Considerations*, is to provide an overview of the social vulnerability data sets that are currently *available*, how social vulnerability mapping could be and is being used, and what legal risks might be associated with utilizing it. Sections II and III of this paper describe the major mapping tools that currently exist which incorporate social vulnerability, and how those tools could work with current programs and planning efforts. However, much of the underlying data used to determine social vulnerability includes race or ethnicity as a factor, which raises legal concerns primarily based on the equal protection clause of the U.S. Constitution. After discussing the equal protection analysis framework and potential legal issues in Sections V and VI, this paper concludes with recommendations for how social vulnerability can be integrated into planning and other activities.

II. One Tool in the Toolkit: How Vulnerability Mapping Can Work with Current Programs and Planning Efforts

One tool governments are using to determine where to take specific actions is vulnerability mapping. Vulnerability maps can be useful because they can provide “the precise location of sites where people, the natural environment or property are at risk due to a potentially catastrophic event that could result in death, injury, pollution or other destruction.”²⁷ Thus, in addition to the standard topographical features that maps can illustrate – specifically elevations above and below sea level – new mapping programs also can show “social vulnerability”.

Dr. Susan Cutter and colleagues at the Hazards and Vulnerability Research Institute (“HVRI”) at the University of South Carolina have defined social vulnerability as “the social, economic, demographic, and housing characteristics that influence a community’s ability to respond to, cope with, recover from, and adapt to environmental hazards.”²⁸ While researchers had investigated other components of vulnerability, the “social aspects of vulnerability” was less understood.²⁹ Therefore, measures of social vulnerability were developed. Social vulnerability is indicated by certain demographics, typically including socioeconomic status, gender, disability and age. These factors all have an impact on a community’s level of resilience; for example, wealthier communities tend to absorb and recover from property losses more quickly.³⁰ “Historically, studies about natural hazards and social vulnerability have been conducted in separate silos.”³¹ By combining these silos and incorporating social variability characteristics into elevation and flood maps, local governments and the public obtain knowledge about areas that may need particularized assistance due to demographic factors. Governments also can determine areas where projects can be prioritized to aid in resilience, leading to reduced disaster impacts.

Vulnerability maps are typically created with Geographic Information System (“GIS”)

technology to show elevations and other physical characteristics of an area, such as hazard zones, overlaid with demographic data at the state, county, or U.S. Census tract level.³² When U.S. Census tract information is incorporated, the data can be especially useful to local governments, as it allows for comparisons within town or city limits. Vulnerability maps allow the examination of “both the potential impact of natural hazards and which populations are most likely to be negatively affected.”³³

The identification of local hazards and assessment of local vulnerabilities can protect people, their property, and their livelihoods. Vulnerability maps can be used to help minimize the impacts of disasters by showing where risks are high and steering development to other, lower risk areas. These maps also can help local governments making siting decisions for new public infrastructure. In addition, vulnerability maps can help local governments plan for evacuations by showing the potential effectiveness (or ineffectiveness) of specific routes and the accessibility of evacuation plans to certain populations, such as the elderly, children, and the disabled. Particularly advantageous from a local government perspective, these maps can be integrated into current programs, as well as serve as a starting point for reinvigorated disaster planning.

A. Use of Vulnerability Mapping with Current Programs

Vulnerability mapping can be used by all levels of government to decide where to best direct resources to make all communities more resilient, and inform local government decision-making with respect to zoning, rezoning, and upgrades to public infrastructure. Despite the Federal Emergency Management Agency’s (“FEMA”) mission “to lead America to prepare for, prevent, respond to and recover from disasters,”³⁴ there is no indication based on research that FEMA is currently using social vulnerability mapping. However, in June 2013, FEMA and other federal agencies were directed by President Obama to help prepare the country for the impacts of climate change.³⁵ In its 2012 Climate Change Adaptation Policy Statement, which was developed to fulfill the requirements of Executive Order 13514 and the corresponding Council for Environmental Quality guidance,³⁶ FEMA is working to integrate climate change adaptation considerations into programs, policies, and operations, and “will evaluate methods for addressing future climate change conditions through its grant programs . . . and study how to introduce long-term climate change risks into the benefit/cost analysis methods that guide the awarding of grants.”³⁷ While it is an open question at this time whether social vulnerability mapping will be a part of the agency’s implementation of the executive order and CEQ guidance, it appears that FEMA also will look for ways in which it can support local communities’ climate change impacts.

³⁸

While FEMA has not yet publicized what this might mean for specific grant programs, perhaps current programs under Hazard Mitigation Assistance (“HMA”) – Pre-Disaster Mitigation Grants, Hazard Mitigation Grants, and Flood Mitigation Assistance including Severe Repetitive Loss Grants and Repetitive Flood Claims Grants – could be more utilized by local governments and state agencies for vulnerability mapping. While we do not know at this point how FEMA will integrate climate change adaptation into its grant programming, it is nevertheless useful to understand how they might do so, and how this might apply to local governments interested in vulnerability mapping. Moreover, FEMA’s HMA program changed in 2013 in response to the Biggert Waters Flood Insurance Reform Act of 2012 and FEMA has

changed its HMA guidance to stress the need for applicants to consider all program requirements at the outset of program scoping and development.³⁹ Program-specific changes are described briefly below.

1. Pre-Disaster Mitigation Grants

With the Pre-Disaster Mitigation Grant Program, funding is provided to tribal governments, state agencies, tribal agencies and local communities for hazard mitigation planning and projects on an annual basis. The program is designed to reduce overall risk and to reduce reliance on federal funding when a disaster does occur. Individual homeowners and businesses may apply to FEMA through the states or tribal governments.⁴⁰ One change in this program is that, while the Federal maximum request to develop a new hazard mitigation plan remains unchanged at \$800,000, the Federal maximum request to update a hazard mitigation plan has been reduced to \$300,000.⁴¹

2. Hazard Mitigation Grants

The Hazard Mitigation Grant Program (“HMGP”) assists in implementing long-term hazard mitigation measures following a major disaster. The program’s purpose is to reduce risk going forward and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Like the Pre-Disaster Mitigation program, individual homeowners and businesses cannot apply directly, but instead can apply through the state, local governments, Indian tribes, or private non-profit organizations.⁴² One change specific to this program is that FEMA may provide “Advance Assistance”, which means up to 25% (up to a cap of \$10 million) of the estimated costs associated with HMGP in advance of a state incurring eligible costs.⁴³ The purpose is to provide “resources to develop mitigation strategies and obtain data to prioritize, select, and develop complete HMGP applications in a timely manner.”⁴⁴

3. Flood Mitigation Assistance Grants

Tribal governments, state agencies, tribal agencies and local communities can apply for Flood Mitigation Assistance Grants (“FMA”) through states and tribal governments, which are defined as “applicants” under the program. As with the previous programs described, individual homeowners and businesses may apply for funding through those entities. Three types of FMA grants are available: 1) planning grants, to prepare flood mitigation plans; 2) project grants, to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of National Flood Insurance Program (“NFIP”) insured structures; and 3) management cost grants, to help administer the FMA program and activities.⁴⁵ Proposals for any of these can be submitted each year, but the program routinely has more requests for funding than money allocated to the program.⁴⁶ Major changes in this program include:

- The cap of \$10 million to a state and \$3.3 million to a community for any five-year period has been eliminated;
- There is no longer a limit on in-kind contributions for the non-Federal cost share;
- Mitigation reconstruction is an eligible activity;
- More Federal funds are now allowed for properties with repetitive flood claims and severe repetitive loss properties; and
- There is no longer a restriction that a planning grant cannot be awarded to a

community more often than once every five years.⁴⁷

The elimination of the first and last restrictions could enable local governments to seek more assistance, more often.

The Severe Repetitive Loss Program was eliminated as a separate funding mechanism in 2013.⁴⁸ Under this previous program, residential properties must have been covered by an NFIP policy and have been classified as a Severe Repetitive Loss. To be classified as such, the property must have met three conditions. First, the residential property must have at least four NFIP claim payments, including building and contents, over \$5,000 each. Secondly, the residential property must have at least two separate claims payments (building payments only) that have been made with the cumulative amount exceeding the market value of the building. Thirdly, at least two of the referenced claims must have occurred within any 10-year period but must be greater than 10 days apart.⁴⁹ While this program was officially eliminated as a separate funding mechanism in 2013,⁵⁰ communities are continuing to use these criteria when applying for FMA project grants. Under the updated FMA grant program, the first two conditions must be met, but the third has been eliminated.⁵¹

Similarly, the Repetitive Flood Claims Grant Program was designed to reduce or eliminate the long-term risk of flood damage to NFIP-insured structures. As with the Severe Repetitive Loss Program, this program has been merged with the FMA project grants program.⁵² Under the FMA program, a repetitive loss property is defined as one that satisfies two conditions. First, the structure must have incurred flood-related damage on two occasions where the average cost exceeded 25% of the market value at the time of the event. Additionally, the flood insurance policy must have contained increased cost of compliance coverage at the time of the second damage event.⁵³

FEMA routinely provides a listing of properties which, based on historical claims, are eligible to receive limited grant funding. States or local governments, working with property owners, determine which properties to submit for grant funding. Properties are often submitted as a group, with multiple properties combined within a single grant application, and states must rank each application from agencies and local communities based on funding priority.⁵⁴ Using vulnerability mapping to identify specific properties or groupings, applications can provide FEMA with the analysis demonstrating why the action is important based on previous claims and from a vulnerability perspective. Dr. Cutter and colleagues specified that this “baseline hazards information may also be helpful when submitting grants for mitigation funds”⁵⁵ and, given FEMA’s Climate Change Adaptation Policy Statement, could potentially improve a grant application’s chance of funding.

B. Vulnerability Mapping in Disaster Planning

Vulnerability mapping may be a useful tool to aid local governments in disaster planning efforts because such maps can be used to determine populations that may need significant assistance during evacuations, which in turn will enable the community to be more resilient by planning to get all citizens out of harm’s way.⁵⁶ This could be especially helpful if routine transportation routes utilize tunnels, which are closed preemptively in storm situations.⁵⁷

There are strong examples at both the state and local levels that vulnerability mapping and planning also can aid government at both the state and local levels. For instance, it may aid local disaster efforts by informing zoning changes and post-disaster rebuilding plans. For example, in Charlotte, North Carolina, the city uses stormwater fees to purchase properties at high risk of flooding, with the goal of decreasing overall flooding damage in the community.⁵⁸ Such mapping also can aid local governments with longer-term resilience planning. Specifically, local governments may wish to use mapping data to update and integrate their community or comprehensive land use plans with Hazard Mitigation Plans, ensuring that future growth will be in safer areas.⁵⁹ Prioritizing infrastructure spending in safer, less vulnerable areas can also help with long-term resilience.⁶⁰

Actions taken by California and Maine illustrate how vulnerability mapping and planning may be helpful at the state level. California developed an “enhanced” multi-hazard mitigation plan, which made the state eligible for more federal funding following a disaster declaration.⁶¹ According to 44 C.F.R. § 201.5, enhanced state mitigation plans must meet all of the requirements of a standard plan plus “demonstrate a broad, programmatic mitigation approach and demonstrate a systematic and effective administration and implementation of existing mitigation programs.”⁶² Maine limits development and redevelopment of properties adjacent to sandy beaches, requiring that structures be moved inland if they are substantially damaged more than one time in a storm event, and site plans must assess a project’s vulnerability to a two foot sea level rise.⁶³

III. How Can Vulnerability Be Measured?

Various federal and state agencies, as well as other groups, have determined several ways that vulnerability can be measured through the development of data portals, which are described below. Each of portal has its own benefits and drawbacks in terms of ease of obtaining data, using the data, and legal concerns, especially when using race as a factor. While interest from local governments in using these tools is growing, using and interpreting the data contained in the data portals can be complicated, both for decision-makers and the public. Examples of how to use these data portals are in the Appendix.

A. Data Portals Developed Using U.S. Census Data

Through the decennial census, the federal government compiles large amounts of data, some of which can be used to determine social vulnerability. Social vulnerability is defined as “the social, economic, demographic, and housing characteristics that influence a community’s ability to respond to, cope with, recover from, and adapt to environmental hazards,”⁶⁴ and data collected through the decennial census includes this information. This makes the U.S. Census helpful in understanding an area’s vulnerability in the context of people and communities.

When Dr. Cutter and colleagues developed the social vulnerability index, or SoVI®, they incorporated factors that utilize U.S. Census data. The social vulnerability index was designed to “assist in the improvement of emergency preparedness, planning, response and recovery at local, state, national, and international scales.”⁶⁵ Twenty-nine factors are currently used in the index, including race (Percent Asian, Percent Black, Percent Hispanic, Percent Native American), age (Percent of Population under 5 Years or 65 and Over, Median Age), income (percent Poverty, Percent of Households

Earning Greater than \$200,000 Annually, Per Capita Income), gender (Percent Female, Percent Female Headed Households), among others.⁶⁶

At the county level, all 29 factors are used in the index to determine whether the county has low, medium, or high social vulnerability. “High” and “low” indicate the 20% most and least vulnerable in coastal areas of each state. The data can also include detail to the Census tract level, with 27 factors to determine pockets at a lower level that may need additional attention. Hospitals Per Capita and Percent of Population without Health Insurance are only *available* at the county level. In addition to being displayed visually in maps at the HVRI website,⁶⁸ SoVI[®] is used by multiple data portals, including the NOAA Sea Level Rise and Coastal Flooding Impacts Viewer and Surging Seas: Sea Level Rise Analysis by Climate Central.⁶⁹ Additionally, SoVI[®] is used by South Carolina’s Emergency Management Division, Oxfam America, the California Emergency Management Agency, and the Centers for Disease Control and Prevention, among others.⁷⁰

1. NOAA Sea Level Rise and Coastal Flooding Impacts Viewer

The purpose of NOAA’s viewer is “to provide coastal managers and scientists with a preliminary look at SLR [sea level rise] and coastal flooding impacts” using nationally consistent data sets and analyses.⁷¹ Users can look at potential future sea levels, simulations of sea level rise at local landmarks, the uncertainty of sea level rise predictions, potential marsh migration due to sea level rise, vulnerability, and how tidal flooding will become more frequent. Existing mitigation structures also can be viewed. Currently, only coastal areas are covered by NOAA’s viewer. Moreover, it is unclear what decisions can be made using the social vulnerability components of the viewer due to legal concerns, given it uses race as a factor. These legal concerns are explained beginning on page 17. Data from NOAA’s viewer has been used by Rutgers University’s NJ Flood Mapper, the California Coastal Conservancy, the South Florida Climate Compact, The Nature Conservancy’s Coastal Resilience Tool, the National Hurricane Center’s Potential Surge Mapping, U.S. Army Corps of Engineers Projects Evaluation, among others.⁷²

2. Surging Seas: Sea Level Rise Analysis by Climate Central

Climate Central’s Surging Seas tool provides similar information as the NOAA viewer, but in a different format. With Climate Central’s mapping tool, users can view a searchable interactive map of sea level rise and flood risk areas, including social vulnerability, population, ethnicity, income, and property heat maps based on different sea level rise scenarios.⁷³ Users also can see a flood likelihood for a particular location based on the user’s choice of sea level, comprehensive analysis of sea level rise and flood exposure – on roads, homes, and socially vulnerable populations – for a particular place, and compare one location to others based on a particular topic, such as population, homes, roads, schools, socially vulnerable populations, EPA sites (including landfills, brownfields, listed animal waste sources, hazardous waste sites, facilities with hazardous materials, wastewater sources)⁷⁴ and public safety. As with the NOAA tool, while the information may be useful, it is unclear what decisions can be made using the social vulnerability measure given the use of race as one of the inputs. Specific examples of the Surging Seas tool can be found in the Appendix.

B. Data Portals Developed Using Sub-Sets of U.S. Census Data

Also reviewing U.S. Census data, researchers and government agencies have attempted to make statistically accurate rankings using a subset of the twenty-nine factors. This section will discuss why a sub-set of U.S. Census was developed and include two

examples of how data sub-sets are currently being used.

1. *Why Use a Sub-Set of U.S. Census Data?*

In the article “Social Vulnerability to Environmental Hazards,” Dr. Cutter and colleagues suggest that using all of the U.S. Census data factors may not be necessary to identify the areas with high vulnerability, but that 11 independent factors can account for approximately 76 percent of the observed differences. These 11 factors are:

- Personal wealth;
- Age;
- Density of the built environment;
- Single-sector economic dependence;
- Housing stock and tenancy;
- Race – African American;
- Ethnicity – Hispanic;
- Ethnicity – Native American;
- Race – Asian;
- Occupation; and
- Infrastructure dependence.

These factors were empirically defined as “a robust set of variables that capture” the characteristics which demonstrate social vulnerability, such that they can be compared geographically and over time.⁷⁶ However, there are legal concerns associated with using race. None of the data portals currently *available* and discussed in this paper use this data sub-set of 11 factors.

2. *U.S. Department of Housing and Urban Development (“HUD”) Location Affordability Portal*

HUD, unlike the previous data portals described, does not include race in its Location Affordability Portal, but rather looks at multiple levels within five factors, also from U.S. Census data: income; family size; number of commuters; ownership status of home; and work status. The Location Affordability Portal was developed to determine how affordable different neighborhoods are as an algorithm of transportation and housing costs. While this shows “burdensome housing” – where 30% of income is going toward housing costs – in a community, it does not include elevation or other data that could be helpful to local governments. In order to plan for weather events or to slow inundation, this tool would need to be combined with another in order to identify the areas at greatest risk. If, however, governments were to explore the option of relocating households due to adaptive rezoning, flooding, the inability to rebuild, or FEMA grant acquisitions, HUD’s tool could be useful to ensure relocations occur to areas which will not make the problem of burdensome housing worse. Specific examples of the HUD tool can be found in the Appendix.

C. U.S. Census Data Plus Other Metrics

The California Communities Environmental Health Screening Tool (“CalEnviroScreen”) was developed primarily to assist the California Environmental Protection Agency (“CalEPA”) in carrying out its environmental justice mission.⁷⁷ To ensure all have access to environmental justice, CalEPA identified the parts of the state where pollution burdens were greatest and, therefore, where funding should be targeted.⁷⁸ The tool is currently being used in “administering environmental justice grants, promoting greater compliance with environmental laws, prioritizing site-cleanup activities and identifying opportunities for sustainable economic development in heavily impacted neighborhoods.”⁷⁹

CalEnviroScreen uses existing environmental, health and socioeconomic data to consider the extent to which communities across the state are burdened by and vulnerable to pollution, creating a screening score for each community. The data sets considered are broken into four categories: exposures; environmental effects; sensitive populations; and socioeconomic factors. The sensitive populations indicators include: prevalence of children and the elderly; rate of low birth-weight births; and rate of asthma emergency department visits. The socioeconomic indicators include: education attainment; linguistic isolation; poverty; and unemployment.

When California first rolled out CalEnviroScreen, it did include racial and ethnic identity as risk factors to calculate social vulnerability. This was, in part, because “[s]cientific research indicates that the relationship between pollutant exposure, stress, and health outcomes can vary based on the race and ethnicity of a population.”⁸⁰ However, with the release of an updated version, these were removed from the social vulnerability calculations, specifically “to facilitate the use of the tool by government entities that may be restricted from considering race/ethnicity when making certain decisions.”⁸¹ Specifically, the report noted: “While race and ethnicity will not be used in compiling a score using CalEnviroScreen, a new section has been added that provides information on the racial and ethnic composition of communities throughout the state. This information will help us to better understand the correlation between race/ethnicity and the pollution burdens facing communities in California.”⁸² Unfortunately, a published analysis was not completed to determine how the removal of race/ethnicity from the calculation impacted the results of the tool. Anecdotally, however, the agency has reported no significant difference when linguistic isolation, unemployment and socioeconomic data were utilized and when race/ethnicity was added to those other data sets.⁸³

IV. Legal, “Strict Scrutiny” Concerns

There are legal issues associated with using vulnerability mapping to make decisions when race or ethnicity is considered, and, specifically, what level of judicial review would apply to a local government action if it were challenged in court. While there could be various types of challenges associated with local governments using vulnerability mapping to make decisions, the most likely challenge – and the challenge that is the focus of this paper – is based on the equal protection clause of the 14th Amendment to the U.S. Constitution. After presenting an overview of current state of equal protection law, this section will include an analysis of which government actions, including race or ethnicity, have survived judicial review, which ones have not, and how the use of vulnerability mapping could be

analyzed by a court.

A. Equal Protection Overview

The equal protection clause of the 14th Amendment states that “no state shall . . . deny to any person within its jurisdiction the equal protection of the laws.”⁸⁴ The clause was designed to ensure that laws treat those in a similar situation the same way. It was necessary because of historic and routine discrimination against minorities and women. It applies to all government actions “which classify individuals for different benefits or burdens under the law.”⁸⁶

Since 1954, the Supreme Court of the United States “has relied on the equal protection clause as a key provision for combating . . . discrimination[.]”⁸⁹ The main question for courts when reviewing equal protection clause cases, therefore, is whether the government’s classification is justified. To answer this question, courts analyze the classification, determine the appropriate level of judicial scrutiny based on that classification, and then determine if the purpose being advocated by the government justifies the difference in treatment between similarly situated individuals.

The equal protection clause applies only to government actions, not those of private individuals.⁹⁰ Therefore, when courts evaluate challenged actions, their first question is whether there is a government action at issue. “Government action” is defined broadly. For example, proposing houses for either acquisition or elevation under a FEMA Flood Mitigation Assistance program likely would count as a government action. Zoning changes have also been found to constitute government actions in equal protection cases.⁹¹ Significantly, legal scholarship in this area has suggested that disaster planning should “specifically address disaster response and preparedness” for vulnerable populations, and that a lack of doing so may contravene the U.S. Constitution and federal statutes because some of these laws contain protections for vulnerable populations.⁹² It is, therefore, likely that many, if not all, actions taken based on vulnerability mapping tools could be considered “government action”.

The equal protection clause requires people who are alike in all relevant ways with respect to a particular interest to be treated the same. Therefore, once government action exists and is challenged by an individual that claims he or she has been treated in a discriminatory manner, the next step for the court is to determine what classification, if any, is being made by the government. The government makes a classification when it draws a distinction among people. Classifications can be made on any number of factors, such as race, national origin, age and gender.

The equal protection clause does not imply the government cannot draw lines and classify individuals. What it guarantees is that “those classifications will not be based upon impermissible criteria or arbitrarily used to burden a group of individuals.”⁹³ Likewise, a classification does not go against equal protection when it distinguishes a person as “dissimilar” using a permissible basis for the purposes of the classification and treats them differently.

B. Strict Scrutiny Overview – Judicial Review for Government Actions Using Race

Key Point

An example of racial classification would be a law that prohibits blacks from serving on juries.⁸⁷ An example of age classification would be a law that permits only those aged 16 and older to apply for a driver’s license.⁸⁸

There are three levels of judicial review: strict scrutiny, intermediate scrutiny and rational basis.

Level of Scrutiny	What Triggers the Level of Scrutiny?
Strict	Race, Ethnicity (National Origin), Alienage
Intermediate	Gender, Non-marital children
Rational Basis	All other classifications

When not dealing with suspect classifications (i.e., classifications that could trigger strict or intermediate review), the government has more latitude, as rational basis review simply requires that a law be “rationally related to a legitimate government interest”. In matters of public safety, governments are allowed to protect the public interest incrementally,⁹⁴ and, in zoning, ordinances are presumed valid and will not be held unconstitutional if the challenged ordinance bears a rational relationship to a permissible state objective.⁹⁵

Classifications based on race are considered “suspect”, as “classifying persons according to their race is more likely to reflect racial prejudice than legitimate public concerns.”⁹⁶ When discussing the use of race, the U.S. Supreme Court has concluded: “The Constitution cannot control such prejudices, but neither can it tolerate them. Private biases may be outside the reach of the law, but the law cannot, directly or indirectly, give them effect.”⁹⁷ Chief Justice Warren Burger noted that a “core purpose” of the equal protection clause “was to do away with all governmentally imposed discrimination based on race.”⁹⁸ Therefore, when race is used as a classification, the highest level of judicial scrutiny applies.

Key Point

In *Loving v. Virginia*, a biracial married couple were convicted of cohabiting as husband and wife, where a Virginia statute made interracial marriages a crime. The U.S. Supreme Court reversed the convictions. In his concurrence, Justice Potter Stewart stated that, “it is simply not possible for a state law to be valid under our Constitution which makes the criminality of an act depend upon the race of the actor.”⁹⁹

To determine if the challenged government action does make a classification based on race, how the law allegedly discriminates must be analyzed. There are three ways that strict scrutiny can apply based on the use of a discriminatory race-based classification: 1) if there are race-based criteria in the statute being challenged, such as requiring all of Japanese descent to be removed from the West Coast and interned, including United States citizens;¹⁰⁰ 2) if a neutral (non-race-based) statute is being administered in a discriminatory way, such as when waivers are *available* for an activity, but none are given to a racial minority;¹⁰¹ or 3) if there is a discriminatory purpose. Factors to be considered by a court in determining whether a racially discriminatory purpose is motivating the government action include:

- The impact is so stark and dramatic as to be unexplainable on other grounds;
- The historic background suggests an offensive purpose;

- The legislative or administrative records show intent;
- There were departures from normal procedure;
- There were substantive departures where the normal considerations would favor a contrary outcome; and
- The sequence of events leading up to the challenged decision.¹⁰²

Simply having a disparate impact – an adverse effect of a law or practice that appears fair and not to specify a racial classification, but nonetheless discriminates¹⁰³ – on a racial group is not significant enough to demonstrate a discriminatory purpose.

If one of the three race-based tests is met, then strict scrutiny applies to the challenged government action. From a legal process standpoint, this means the burden is then placed on the government to prove that the same decision would have been reached absent a race-based motive.¹⁰⁴ The government can demonstrate this by proving the government action: 1) is narrowly tailored; and 2) serves a compelling government interest. This analysis looks at both to whom the law applies, and what interest the government has in the harm the law seeks to redress or prevent. It is critical to note that both factors must be satisfied in order for the government action to pass the strict scrutiny “test” and, therefore, be constitutional. The following sections will explain each factor of this test.

1. Is the Government Action Narrowly Tailored?

In this analysis, the court determines whether the government is using the least restrictive means to meet the government’s goal for implementing the action under question. For a classification to be narrowly tailored, it must treat all similar persons in a similar manner, or that they be “similarly situated.” People are “similarly situated,” for example, when they are in the same circumstance, been subject to the same standards or have the same problem in the same context.¹⁰⁵ The classification also cannot be either “overinclusive” or “underinclusive”. Overinclusive means that, the classification includes persons who are similarly situated plus an additional group and, therefore, burdens more people than necessary. Underinclusive means the classification excludes some people who are similarly situated in terms of the purposes of the law. See the box below for specific examples of what overinclusive and underinclusive mean in a real world context.

Examples Overinclusive vs. Underinclusive Classifications

“In *Vance v. Bradley*, the U.S. Supreme Court upheld a mandatory retirement age of 60 for those in the Foreign Service. The Court recognized that the law was overinclusive in that it applied to many who were capable of continuing to work effectively [after age 60], and it was underinclusive in that it did not apply to many who were under that age and were no longer capable of performing adequately.”

“In *New York Transit Authority v. Beazer*, the U.S. Supreme Court upheld a city’s regulation that prevented those in methadone maintenance programs from holding positions with the Transit Authority. . . . The law was overinclusive in excluding from employment the vast majority of methadone users who posed no safety risk, and it was underinclusive in that it allowed employment of others who would be a safety threat.”¹⁰⁶

When dealing with racial classification, there are five factors considered in a court’s narrow tailoring analysis. First, whether it is possible that the motivation for the classification was illegitimate racial prejudice, such as with *Loving v. Virginia*.¹⁰⁷ Second, a court will determine whether the government action places an undue burden on one racial group, such as where university admission is denied to non-minority students because race, while not given a numerical value, is a “meaningful factor.”¹⁰⁸ Third, a classification will fail narrow tailoring if the government action gives an arbitrary or disproportionate benefit to minorities. This would occur, for example, where minorities were given an additional weighting during admission to a university which was determinative, when non-minorities did not get in but would have had they also been granted the additional weighting.¹⁰⁹ Fourth, a court will look at whether the government action ignored race-neutral policies, such as those based on seniority or some other classification.¹¹⁰ The fifth factor is whether the government action uses race in a rigid or mechanical way, as with quotas. An example of this would be setting aside a specific percentage of subcontracts to go to minority businesses to compensate for general past societal discrimination.¹¹¹ If any of these are found, the government action fails strict scrutiny analysis. According to precedent, legally-acceptable affirmative action programs have none of these factors.¹¹²

2. Does the Government Action Serve a Compelling Government Interest?

In order to pass the compelling government interest part of the strict scrutiny test, at least one compelling government interest must exist. A court’s determination that a compelling government interest exists “requires a judicial finding that the use of the classification is so important as to outweigh the central purpose” of the equal protection clause.¹¹³ Compelling government interests which have been recognized by the courts include national security or emergency needs, remedying prior governmental discrimination, diversity in higher education in some cases, or dealing with fundamental rights. If none of these exist, then the government action also fails strict scrutiny.

Exam Compelling Government Interest in *Adarand Constructors vs. Pena* (1995)

In 1995, the U.S. Supreme Court held the compelling interest test applies to any racial classification, whether the classification benefited or burdened a minority.¹¹⁴ When the City of Richmond attempted to ensure 30% of city-funded construction contracts were awarded to minority-owned businesses to correct “societal discrimination,” the Supreme Court determined remedying “societal discrimination” was not a compelling interest which would justify the use of a racial classification. Remedying past discrimination is only permissible when the previous discrimination was by the governmental entity itself or by private sector entities within its jurisdiction.¹¹⁵

3. Government Actions Which Have Not Passed Strict Scrutiny

Government actions which have not survived a strict scrutiny analysis include those involving some instances of affirmative action in higher education, employment promotions, and government contracts. One relevant case is *Adarand Constructors v. Pena*,¹¹⁶ which concerned a division of the U.S. Department of Transportation’s bidding procedures, which provided additional compensation for general constructors if they subcontracted with Disadvantaged Business Enterprises (“DBE”). DBEs were defined as businesses owned by “socially and economically disadvantaged individuals.”¹¹⁷ In practice, the process to be certified as a DBE allowed for a presumption of social and economic disadvantage for minority-owned businesses, while white-owned businesses were rarely certified. The U.S. Supreme Court held that strict scrutiny analysis applied when the government action was challenged on equal protection grounds, as it implicated a classification based on race.¹¹⁸

The *Adarand* decision has had an influence on federal agency actions. Shortly after the ruling, the Department of Justice noted that, while the case involved contracting, the holding was not confined to that context, and “it is clear that strict scrutiny will now be applied by the courts in reviewing the federal government’s use of race-based criteria in health, education, hiring, and other programs as well.”¹¹⁹ Based on the Department of Justice’s analysis of *Adarand*’s impact, the decision ultimately may lead to deemphasizing race in most government decision-making, and it’s possible *Adarand* may be behind the changes to CalEnviroScreen to specifically exclude race – perhaps because government agencies will not believe they can use race-based criteria in any sort of decision-making without potentially violating the equal protection clause.

4. Can Government Actions That Utilize Race Ever Survive Strict Scrutiny?

While it is a challenge for a government action that utilizes race to survive strict scrutiny analysis, such actions are not necessarily doomed to fail the standard. In the context of legislative redistricting, for example, the U.S. Supreme Court has noted that because racially homogenous groups tend to congregate in the same neighborhoods, a district that appears to be racially gerrymandered may in fact be consistent with “traditional districting principles such as compactness, contiguity, and respect for political subdivisions.”¹²⁰ However, it is worth noting that the legislative redistricting in that case, *Shaw v. Reno*,¹²¹ was held unconstitutional because the “bizarrely drawn” congressional district suggested an effort to separate voters into different districts based on race.¹²²

In addition, according to *Regents of the University of California v. Bakke*,¹²³ plans to encourage diversity in higher education, in situations where race was one factor among many in a highly individualized review of each applicant rather than the use of

a quota system, may pass strict scrutiny.¹²⁴ The U.S. Supreme Court has determined that student body diversity in higher education is a compelling government interest, but the Court has distinguished admissions policies used by institutions that either required a specific number of diverse applicants to be admitted¹²⁵ or that awarded a specific numerical benefit to minorities during the application process.¹²⁶

This area of the law is highly complex and has the potential to present challenges to local governments interested in including social vulnerability in mapping flood risk or in disaster planning. This area of the law continues to develop¹²⁷, hence the unsettled nature of any analysis. The table below lists noteworthy cases in the realm of equal protection that have potential application to local governments in the context of social vulnerability. The next section analyzes how vulnerability mapping might be analyzed by the courts.

Name of Case and Citation	Area of Law	Level of Scrutiny	Outcome
<i>Adarand Constructors v. Peña</i> , 515 U.S. 200 (1995)	Contracting / Affirmative Action	Strict	Court struck down affirmative action program
<i>Bakke v. Regents of the University of California</i> , 438 U.S. 265 (1978)	Higher Education / Affirmative Action	Strict	Court struck down affirmative action program
<i>Cone Corp. v. Hillsborough County</i> , 908 F.2d 908 (11th Cir. 1990)	Contracting / Affirmative Action	Strict	Court allowed affirmative action program to continue; it considered race-neutral alternatives, was narrowly tailored, did not use quotas, and furthered a compelling government interest
<i>City of Richmond v. J.A. Croson Co.</i> , 488 U.S. 469 (1989)	Contracting / Affirmative Action	Strict	Court struck down affirmative action program
<i>Fisher v. University of Texas</i> , 133 S.Ct. 2411 (2013)	Higher Education / Affirmative Action	Strict	Court struck down affirmative action program
<i>Gratz v. Bollinger</i> , 539 U.S. 244 (2003)	Higher Education / Affirmative Action	Strict	Court struck down affirmative action program
<i>Grutter v Bollinger</i> , 539 U.S. 306 (2003)	Higher Education / Affirmative Action	Strict	Court allowed program to continue; narrowly tailored, did not use quotas
<i>Johnson v. Board of Regents</i> , 263 F.3d 1234 (11th Cir. 2001)	Higher Education / Affirmative Action	Strict	Court struck down affirmative action program
<i>Korematsu v. United States</i> , 323 U.S. 214 (1944)	Wartime Imprisonment	Strict	Court allowed internment based on ancestry
<i>Shaw v. Reno</i> , 509 U.S. 630 (1993)	Redistricting	Strict	Court required new maps
<i>U.S. v. Paradise</i> , 480 U.S. 149 (1987)	Promotions	Strict	Court allowed affirmative action program to continue
<i>Village of Arlington Heights v. Metropolitan Housing Development Corp.</i> , 429 U.S. 252 (1977)	Discriminatory Purpose	Rational Basis	Court allowed rezoning even with disproportionate impact
<i>Wygant v. Jackson Board of Education</i> , 476 U.S. 267 (1986)	Employment	Strict	Court struck down program
<i>Yick Wo v. Hopkins</i> , 118 U.S. 356 (1886)	Discriminatory Impact	Strict	Court struck down law

C. How Might Vulnerability Mapping Be Analyzed by the Courts?

While there is currently no court decision specific to the use of race in vulnerability mapping that can provide local governments with concrete guidance, one can surmise based on *Adarand* that using race in vulnerability mapping may be determined by the courts to be government action subject to strict scrutiny analysis. As noted by an appellate court discussing a case where race was one factor among twelve in an equal protection context, “[r]ace-conscious decision-making is fundamentally in conflict with the idea of Equal Protection, and when a state attempts to allocate valuable benefits . . . on the basis of race, it is the obligation of the courts to require a powerful showing.”¹²⁸

However, at least one scholar has argued that vulnerability mapping or other environmental justice initiatives that include race characteristics should be viewed more like legislative redistricting cases.¹²⁹ The main argument for treating environmental justice cases differently is that environmental justice initiatives may be taken pursuant to public safety concerns, rather than implicating financial considerations like employment or who is awarded a contract.¹³⁰ However, many of the potential actions which could be taken based on social vulnerability mapping – grant project funding, infrastructure investments – do have financial implications. In the case of grant funding, certain property owners could be provided with funding to improve their buildings, while others are not, leading to a difference both in property value and the amount paid in flood insurance. Infrastructure investments similarly could increase the property values of some neighborhoods, while not in others.

The potential analysis for a reviewing court is further complicated legally when looking at the kind of power being utilized by government. Governments act pursuant to different powers. A common power used by government to ensure public safety, commonly referred is the police power. When taking an action that could reduce flood risk and increase community resiliency, a government might make decisions using vulnerability mapping pursuant to public safety. This is because moving residents out of harm’s way, ensuring infrastructure is accessible in times of flooding, relocating emergency services to higher ground, and other similar actions all increase public safety. However, the way this police power interacts with vulnerability mapping and equal protection has not been litigated, which creates the uncertainty. This uncertainty should signal local governments to be cautious of taking actions implicating race in the decision-making process, such as passing an ordinance, making a decision on permitting, or implementing zoning changes.

Key Point

There are a few states that prohibit the use of race in decision-making. For example, according to a Washington statute, the State “shall not discriminate against, or grant preferential treatment to, any individual or group on the basis of race, sex, color, ethnicity, or national origin in the operation of public employment, public education, or public contracting.”¹³¹ Another example is Michigan, which prohibits “all sex- and race-based preferences in public education, public employment, and public contracting.”¹³²

V. How Agencies Have Utilized Vulnerability Mapping In A Way That May Avoid Legal Strict Scrutiny Review

Given the current state of the law, local governments and others, in their use of vulnerability mapping, must ensure that programs are developed and implemented in a way that is least likely to invite an equal protection challenge. Legal challenges can be expensive, divert attention from other goals, and can halt implementation of plans on a practical level. Below are examples of programs that have been developed and are being used in a way that minimizes legal risk under the equal protection clause.

A. California EnviroScreen

When California first rolled out CalEnviroScreen, it included racial and ethnic identity as risk factors to calculate social vulnerability. However, with the release of later versions, race and ethnic identity were removed from the social vulnerability calculations, specifically “to facilitate the use of the tool by government entities that may be restricted from considering race/ethnicity when making certain decisions.”¹³³ Local governments in California can now take action based on CalEnviroScreen without implicating factors which would trigger strict scrutiny review.

B. EPA’s Use of Data For Pre-Decisional Information Gathering

The EPA created EJView “for the public to identify potential environmental justice areas - or disadvantaged communities that are being unduly exposed to environmental harms.”¹³⁴ EJView “allow[s] users to create maps and generate detailed reports based on the geographic areas and data sets they choose.” This includes demographic data, health data, environmental data, and facility-level data, as these are the data sets that EPA has determined may affect public and environmental health within a community or region.¹³⁵

The demographic data used in EJView is derived from the U.S. Census, and includes population density, percent minority (includes all races/ethnicities except non-Hispanic whites), percent children, percent female, and percent renter. Data *available* from previous U.S. Census include per capita income, percent below poverty, percent with education of less than high school diploma, percent with high school diploma only, percent with college degree, percent of homes constructed before 1950, and percent speaking English less than well.¹³⁶ From the U.S. Geological Survey, EJView incorporates the locations of schools and universities, hospitals, and places of worship.¹³³

Additionally, EJView encompasses a large set of variables not *available* in other national mapping tools. For example, hazardous waste sites, sites requiring air permits, sites requiring water permits, inventories of toxic chemicals, Superfund sites, and brownfield sites all can be mapped. Nonattainment areas - those not meeting the standards for ozone, lead, and particulates - are available for mapping, as are other health indicators, such as cancer risk, respiratory risk, neurological risk, infant mortality rate, and low birth weight rate.¹³⁷

While EJView does incorporate percent minority as one of its potential data sets, the EPA appears to use maps with that data only in the “pre-decisional” phase of decision-making. For example, a map including race as a factor could be for screening

purposes; EPA's Office of Air and Radiation, when issuing air permits, is evaluating exposure and health risk modeling that breaks out data based on demographic characteristics, including race and income. That map could also be used to show the benefits that accrue to certain demographic groups due to specific air regulations.¹³⁸ However, EPA did change its minority and women-owned business enterprise programs in response to *Adarand*.¹³⁹ Despite extensive research done for this paper, it is unclear what changes, if any, might have been made to other programs or how EPA may be incorporating the holding in *Adarand* into other guidance documents.

The EPA is in the process of developing "a variety of internal screening tools and other GIS applications to enhance environmental justice analysis and decision-making to better protect public health."¹⁴⁰ The tool will be national in scope and will serve as a consistent screening tool to be used across the EPA and by others. It is not clear at this point how or if race will be utilized in the new tool.

VI. Recommendation For How To Avoid Strict Scrutiny Concerns In Vulnerability Mapping

The risks and costs associated with extreme weather events are rising. To mitigate, local governments have shown a strong interest in increasing resiliency. Vulnerability mapping can be a valuable tool to help reach this goal. However, local governments should be cognizant of the potential legal risks associated with vulnerability mapping. While there is some uncertainty in the area of "strict scrutiny law", what is known is that there are concerns associated with using race as a factor in mapping, especially if such a map were to be used to codify policy or make decisions that have financial implications such as approving a buyout program. However, this should not cause a local government to shy away from developing a vulnerability map, should it decide to do so. Such a tool still could be used to great effect without race being included as a factor. Perhaps most critical is that local governments be able to use the tools they develop to inform decision-making. "Adaptation planning must connect to action."¹⁴¹

Mapping flood risk is a good place to start. The American Society of Civil Engineers determined that the country has failed to learn from Hurricane Katrina, especially at the local level of land use decision-making, "where issues are considerably more complex and the resources more limited" than at the federal level.¹⁴² To get started, local governments may find useful the sea level rise, population, and income maps from Climate Central, which have data for the coasts of California, Connecticut, Delaware, Florida, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Oregon, Rhode Island, South Carolina, Virginia, Washington, and Washington, D.C.¹⁴⁰ Another strategy would be for a state to take over floodplain mapping, which North Carolina has done, to maximize the accuracy and functionality of the maps.¹⁴³ As other states and FEMA reassess flood maps, local governments can incorporate the potential for climate change impacts into those maps as well.

Another idea is to combine sea level rise, income, and population data with the HUD Affordability Portal to give governments information about their risk, factoring in sea level rise with where their most vulnerable populations are located. Once those areas are identified, local governments can implement the programs of their choice, such as a buyout program to reduce flood damage and increase public safety by purchasing high-risk properties. Money for buyout programs is also often *available* following intense storm

events.¹⁴⁵

To gain even further local insight, state governments could prioritize the development of state-specific vulnerability mapping tools. One option is to develop a tool similar to CalEnviroScreen, which likely does not present strict scrutiny concerns. This tool could then be used by local governments for grant and planning purposes and by entities for other purposes, such as assessing transportation or housing needs. Another option is to develop a handbook specifically designed for local governments. For example, North Carolina published “Adapting to Climate Change: A Handbook for Local Governments in North Carolina.”¹⁴⁶ While vulnerability mapping may not be a simple exercise for most of the country currently, this data can be a valuable asset in helping communities plan for the future. In aiding vulnerable populations to become more resilient, our communities become safer for everyone.

Climate change – warming, sea level rise, droughts, more intense hurricanes and floods – “will affect many of the critical services and functions that local government provide.”¹⁴⁷ The elderly, the poor, the obese, those with diabetes, those with heart disease, and those with asthma are all more prone to heat stress, and where those individuals are located should determine the location of cooling centers. With flooding, the loss of electricity, water and sewer can impact citizens’ health, and storm surge can wash pollutants into water supplies.¹⁴⁸ Locating water and sewer treatment plants on higher ground, requiring the same for hazardous material storage, and burying electrical supplies can minimize these impacts.¹⁴⁹ By planning for climate change’s impact on the most socially vulnerable and developing post-disaster recovery plans in advance, local governments can better protect all of its citizens and reduce future risk to life and property.

Notes

- 1 Lisa Schiavinato is co-director of the North Carolina Coastal Resources Law, Planning, and Policy Center and also serves as the law, policy, and community development specialist for North Carolina Sea Grant. Ms. Schiavinato wishes to thank Center law fellows Samantha Walker and Rory Fleming for their research assistance in the preparation of this document. Ms. Schiavinato also thanks Ms. Shana Jones, Vinson Institute of Government, and Professor Maria Savasta-Kennedy, University of North Carolina School of Law, for providing peer review.
- 2 Heather Payne is assistant director of the University of North Carolina School of Law Center for Law, Environment, Adaptation, and Resources.
- 3 *Climate Change Indicators in the United States*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/climate/climatechange/science/indicators/weather-climate/index.html> (last updated Dec. 23, 2014).
- 4 Doyle Rice, *Study: Climate Change Pumps Up Risk Of Severe Storms*, USATODAY (Sept. 24, 2013, 9:44 AM), <http://www.usatoday.com/story/weather/2013/09/23/climate-change-global-warming-thunderstorms-tornadoes/2854979/>.
- 5 *Extreme Weather*, GLOBALCHANGE.GOV, <http://nca2014.globalchange.gov/highlights/report-findings/extreme-weather>.
- 6 *Id.*
- 7 *Nuisance Flooding*, ECOLOGYDICTIONARY.ORG, http://www.ecologydictionary.org/Environmental-Engineering-Dictionary/nuisance_flooding.
- 8 Emily Yehle, NOAA: ‘Nuisance Flooding’ in some cities up 900% since 1960s, E&ENEWS (July 28, 2014), <http://www.eenews.net/eenewspm/2014/07/28/stories/1060003632>.
- 9 *Sea-Level Rise: Flooding in coastal U.S. cities has soared since 2001*, E&ENEWS CLIMATEWIRE (July 14, 2014), <http://www.eenews.net/climatewire/stories/1060002758/feed>. Norfolk, VA, was in the top ten U.S. areas with an increase in nuisance flooding, with a 325 percent increase between the period 1957-1963 to 2007-2013; see also Yehle, *supra* note 8.
- 10 Deborah J. Nelson, Ryan McNeill & Duff Wilson, *Why Americans Are Flocking to Their Sinking Shores Even as the Risks Mount*, in WATER’S EDGE: THE CRISIS OF RISING SEA LEVELS, REUTERS (Sept. 17, 2014, 1:00 PM), available at <http://www.reuters.com/investigates/special-report/waters-edge-the-crisis-of-rising-sea-levels/> (with interactive map at website).

- 11 *Millions of Homes Vulnerable to Storm Surge, Rising Seas*, EENEWS.NET (July 11, 2014, 4:40 AM), <http://m.accuweather.com/en/outdoor-articles/beach-marine/millions-of-homes-vulnerable-t/30296516>. The research found that 86 percent of flood-prone properties in Virginia Beach, VA, lie outside the federal flood zones, the highest percentage in the United States. See *id.*
- 12 Sarah Kleiner Varble, *Dark Days Ahead Financially if There's Major Flooding*, VIRGINIAN-PILOT (Aug. 4, 2014), <http://hamptonroads.com/2014/08/dark-days-ahead-financially-if-theres-major-flooding>.
- 13 Brian Clark Howard, *Report: Gulf and Atlantic Coasts Not Prepared for Sea-Level Rise*, NAT'L GEOGRAPHIC (July 23, 2014), <http://news.nationalgeographic.com/news/2014/07/140723-gulf-atlantic-coasts-risk-report-flooding-sea-level-rise/>.
- 14 *Flooding is More Than a Nuisance*, VIRGINIAN-PILOT (Aug. 20, 2014), <http://hamptonroads.com/2014/08/flooding-more-nuisance#>.
- 15 Lori Montgomery, *In Norfolk, Evidence of Climate Change is in the Streets at High Tide*, WASH. POST (May 31, 2014), http://www.washingtonpost.com/business/economy/in-norfolk-evidence-of-climate-change-is-in-the-streets-at-high-tide/2014/05/31/fe3ae860-e71f-11e3-8f90-73e071f3d637_story.html.
- 16 Tamara Dietrich, *Can Flood Monitoring Be Crowdsourced?*, TRIBUNE NEWS SERV. (Sept. 24, 2014), available at <http://www.emergencymgmt.com/disaster/Can-Flood-Monitoring-be-Crowdsourced.html>.
- 17 *Putting The Lid on Corrosion: Using Composite Manhole Covers to Help Control Corrosion Costs*, WATER-WORLD, <http://www.waterworld.com/articles/print/volume-29/issue-11/editorial-features/putting-the-lid-on-corrosion-using-composite-manhole-covers-to-help-control-corrosion-costs.html>.
- 18 The Energy Information Administration has listed new local flooding maps showing infrastructure which may be in danger. See FLOOD VULNERABILITY ASSESSMENT MAPS ("Energy Infrastructure with FEMA National Flood Hazard"), U.S. ENERGY INFO. ADMIN., <http://www.eia.gov/special/floodhazard/>.
- 19 Colin Lecher, *FYI: Why Does Salt Water Make Hurricane Damage So Much Worse?*, POPULAR SCI. (Nov. 1, 2012), <http://www.popsoci.com/science/article/2012-10/fyi-does-salt-water-make-hurricane-damage-worse>.
- 20 Deborah J. Nelson, Ryan McNeill & Duff Wilson, *As the Seas Rise, A Slow-Motion Disaster Gnaws at America's Shores*, in WATER'S EDGE: THE CRISIS OF RISING SEA LEVELS, REUTERS (Sept. 4, 2014, 1:00 PM), <http://www.reuters.com/investigates/special-report/waters-edge-the-crisis-of-rising-sea-levels/#article-1-insidious-invasion>.
- 21 Stephanie Soucheray, *Sea Level Rise Threatens Public Health Infrastructure*, N.C. HEALTH NEWS (Apr. 14, 2014), <http://www.northcarolinahealthnews.org/2014/04/14/sea-level-rise-threatens-public-health-infrastructure/>.
- 22 *Septic Systems – What to Do After the Flood*, U.S. ENVTL. PROT. AGENCY, <http://water.epa.gov/drink/emergprep/flood/septicssystems.cfm> (last updated Sept. 10, 2013).
- 23 Aaron Applegate, *Old Maps Show Why Norfolk's Often Waterlogged*, VIRGINIAN-PILOT (July 27, 2014), <http://hamptonroads.com/2014/07/old-maps-show-why-norfolks-often-waterlogged>. Norfolk has identified \$1 billion in flood protection projects, including \$615 million for floodgates, berms and drainage improvements. See *id.*
- 24 See Nelson et al., *supra* note 20.
- 25 PLANNING FOR FLOOD RECOVERY AND LONG-TERM RESILIENCE IN VERMONT: SMART GROWTH APPROACHES FOR DISASTER-RESILIENT COMMUNITIES 10, U.S. ENVTL. PROT. AGENCY (2014), available at <http://www.epa.gov/smartgrowth/pdf/vermont-sgia-final-report.pdf>.
- 26 Benjamin Hulac, *Poorest Communities Are Least Resilient to Weather Extremes*, CLIMATEWIRE (July 28, 2014), <http://www.eenews.net/stories/1060003545>.
- 27 HANDBOOK FOR VULNERABILITY MAPPING, SWEDISH RESCUE SERVS. AGENCY (2007), available at <http://www.unep.fr/shared/publications/pdf/ANNEXES/3.2.4%20Risk%20assessment%20and%20vulnerability%20maps/Handbook%20for%20Vulnerability%20Mapping.pdf>.
- 28 *Social Vulnerability Index: Frequently Asked Questions*, HAZARDS & VULNERABILITY RESEARCH INST., <http://webra.cas.sc.edu/hvri/products/sovifaq.aspx> (last updated Oct. 30, 2013).
- 29 Susan L. Cutter, Bryan J. Boruff & W. Lynn Shirley, *Social Vulnerability to Environmental Hazards*, 84 SOC. SCI. Q. 242, 243 (2003), available at <http://www.scarp.ubc.ca/sites/default/files/3%20Vulnerability%20-%20cutter%20social%20vulnerability%20hazards.pdf>.
- 30 See Social Vulnerability Index, *supra* note 28.
- 31 EXPOSED: SOCIAL VULNERABILITY AND CLIMATE CHANGE IN THE US SOUTHEAST 4, OXFAM AM. (2009), available at <http://www.oxfamamerica.org/static/oa3/files/Exposed-Social-Vulnerability-and-Climate-Change-in-the-US-Southeast.pdf>.
- 32 Susan L. Cutter, Jerry T. Mitchell & Michael S. Scott, *Handbook for Conducting a GIS-Based Hazards Assessment at the County Level*, S.C. EMERGENCY PREPAREDNESS DIV. (1997), available at <http://training.fema.gov/EMIWeb/edu/docs/hrm/Session%206%20-%20Handbook%20GIS-Based%20Hazards%20Assessment.pdf>.
- 33 See OXFAM AM., *supra* note 31.
- 34 *About the Agency*, FED. EMERGENCY MGMT. AGENCY, <http://www.fema.gov/about-agency> (last updated Jan. 31, 2015).
- 35 THE PRESIDENT'S CLIMATE ACTION PLAN 13, EXEC. OFFICE OF THE PRESIDENT (2013), available at <http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf>.
- 36 FEDERAL AGENCY CLIMATE CHANGE ADAPTATION PLANNING: IMPLEMENTING INSTRUCTIONS, WHITE HOUSE (Mar. 4, 2011), available at <http://www.whitehouse.gov/sites/default/files/microsites/ceq/>

- adaptation_final_implementing_instructions_3_3.pdf.
- 37 FEMA Climate Change Adaptation Policy Statement, FED. EMERGENCY MGMT. AGENCY, <https://www.fema.gov/media-library/assets/documents/33082?id=7679> (last updated Mar. 4, 2015).
- 38 *Id.*
- 39 HAZARD MITIGATION ASSISTANCE UNIFIED GUIDANCE 9, FED. EMERGENCY MGMT. AGENCY (2013), available at http://www.fema.gov/media-library-data/15463cb34a2267a900bde4774c3f42e4/FINAL_Guidance_081213_508.pdf.
- 40 *Pre-Disaster Mitigation Grant Program*, FED. EMERGENCY MGMT. AGENCY, <http://www.fema.gov/pre-disaster-mitigation-grant-program> (last updated Feb. 15, 2015).
- 41 See HAZARD MITIGATION ASSISTANCE UNIFIED GUIDANCE, *supra* note 39.
- 42 *Hazard Mitigation Grant Program*, FED. EMERGENCY MGMT. AGENCY, <http://www.fema.gov/hazard-mitigation-grant-program> (last updated Feb. 15, 2015).
- 43 See HAZARD MITIGATION ASSISTANCE UNIFIED GUIDANCE, *supra* note 39, at 80.
- 44 *Id.*
- 45 See Hazard Mitigation Grant Program, *supra* note 42.
- 46 For 2014, FEMA received applications for \$232 million in funding, of which it awarded \$90.1 million. See *FMA FY 2014 Subapplication Status*, FED. EMERGENCY MGMT. AGENCY, <http://www.fema.gov/flood-mitigation-assistance-program/fma-fy-2014-subapplication-status> (last updated Sept. 16, 2014).
- 47 See HAZARD MITIGATION ASSISTANCE UNIFIED GUIDANCE, *supra* note 39, at 4.
- 48 *Severe Repetitive Loss Program*, FEMA.GOV, <http://www.fema.gov/severe-repetitive-loss-program>.
- 49 *Id.*
- 50 *Id.*
- 51 See HAZARD MITIGATION ASSISTANCE UNIFIED GUIDANCE, *supra* note 39, at 89.
- 52 See *Severe Repetitive Loss Program*, *supra* note 48.
- 53 See HAZARD MITIGATION ASSISTANCE UNIFIED GUIDANCE, *supra* note 39, at 89.
- 54 *Id.* at 90-91; see also *Application Development & Process*, FED. EMERGENCY MGMT. AGENCY, <https://www.fema.gov/application-development-process> (last updated Feb. 15, 2015); Planning Process, N.C. HAZARD MITIGATION PLAN (2013), available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0CC8QFjAC&url=https%3A%2F%2Fwww.ncdps.gov%2Fdiv%2FEM%2FHazardMitigation%2FStateHMPlan%2F2013updatedSectionIIPlanningProcessFINAL.doc&ei=cF9qVJO_C5ajyASH84CgBQ&usq=AFQjCNEeKejoahe0silNGbhPPTTOQqVuQ&bvm=bv.79908130,d.aWw.
- 55 See Cutter et al., *supra* note 29.
- 56 Graham Owen, *The Effect of Elevation Uncertainty on Carless Evacuation Planning*, YOUTUBE (Dec. 2, 2013), <https://www.youtube.com/watch?v=z93Q3UQE8g&feature=youtu.be>.
- 57 See *id.*
- 58 20 GOOD IDEAS FOR PROMOTING CLIMATE RESILIENCE, GEORGETOWN CLIMATE CTR. (2014), available at <http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC-20%20Good%20Ideas-July%202014.pdf>.
- 59 See U.S. ENVTL. PROT. AGENCY, *supra* note 25.
- 60 *Id.* at 10.
- 61 See GEORGETOWN CLIMATE CTR., *supra* note 58.
- 62 See MULTI-HAZARD MITIGATION PLANNING GUIDANCE, FED. EMERGENCY MGMT. AGENCY (2008), http://www.fema.gov/media-library-data/1424878409827-c19165ee0d13e65f864b85f8c00546e5/State_Mitigation_Planning_Guidance_2008.pdf.
- 63 See GEORGETOWN CLIMATE CENTER, *supra* note 58.
- 64 See *Social Vulnerability Index*, *supra* note 28.
- 65 See generally HAZARDS & VULNERABILITY RESEARCH INST., <http://webra.cas.sc.edu/hvri/> (last updated Mar. 30, 2015).
- 66 See *Social Vulnerability Index for the United States – 2006-10*, HAZARDS & VULNERABILITY RESEARCH INST., <http://webra.cas.sc.edu/hvri/products/sovi.aspx> (last updated Oct. 30, 2013).
- 67 *Id.*
- 68 See *SoVI 2006-10 – 30 Variable: State and Regional Maps*, HAZARDS & VULNERABILITY RESEARCH INST., http://webra.cas.sc.edu/hvri/products/sovi2010_maps.aspx (last updated Oct. 30, 2013).
- 69 See generally *Surging Seas*, CLIMATE CENTRAL, <http://sealevel.climatecentral.org/>.
- 70 *Social Vulnerability Index: Selected Applications of the Usage of SoVI*, HAZARDS & VULNERABILITY RESEARCH INST., <http://webra.cas.sc.edu/hvri/products/SoVIapplications.aspx> (last updated Oct. 30, 2013). The Centers for Disease Control, however, seems to have also taken the data and developed its own social vulnerability measure comprising only 14 factors and develops a map based on each of four areas: 1) socioeconomic status (below poverty, unemployed, income, no high school diploma); 2) household composition and disability (aged 65 or older, aged 17 or younger, older than age 5 with a disability, single-parent households); 3) minority status and language (minority, speaks English “less than well”); and 4) housing and transportation (multi-unit structures, mobile homes, crowding, no vehicle, group quarters). See Elaine Hallisey, Barry Flanagan, Jessica Kolling & Brian Lewis, *A Social Vulnerability Index (SVI) from the CDC*, CTRS. FOR DISEASE CONTROL, http://svi.cdc.gov/Documents/Publications/CDC_ATSDR_SVI_Materials/SVI_Poster_07032014_FINAL.pdf.
- 71 NEW MAPPING TOOL AND TECHNIQUES FOR VISUALIZING SEA LEVEL RISE AND COASTAL FLOODING IMPACTS, NAT’L OCEANIC & ATMOSPHERIC ADMIN. (2011), available at <http://coast.noaa.gov/>

- digitalcoast/_/pdf/New-Mapping-Tool-and-Techniques-for-Visualizing-SLR-Impacts.pdf?redirect=301ocm.
- 72 E-mail from Doug Marcy, Coastal Hazards Specialist, NOAA Office of Coastal Management, to Lisa Schiavinato (Oct. 27, 2014) (on file with authors). The remaining list includes: San Francisco Bay – Adapting to Rising Tides, National Park Service Coastal Parks Assessment, DOE Facilities Assessment, EPA Climate Ready Estuaries and CREAT 3.0, HI Sea Grant and University of Hawaii School of Ocean and Earth Sciences, PACIOOS, DOD BRAC, and MIT Rebuild by Design.
- 73 *Risk Finder: North Carolina*, CLIMATE CENTRAL, <http://sealevel.climatecentral.org/ssrf/north-carolina#sthash.aCOPbWG4.dpuf>.
- 74 See *Sea Level Rise and Coastal Flood Risk: Counties in North Carolina*, CLIMATE CENTRAL, http://ssrf.climatecentral.org/#location=NC_CD_3703&state=North+Carolina&level=4&category=EPA&folder=Contamination+Risks&geo=County&pt=t&target=&p=S&protection=tidelthresh (for North Carolina).
- 75 See Cutter et al., *supra* note 29, at 252.
- 76 *Id.* at 249.
- 77 CALIFORNIA COMMUNITIES ENVIRONMENTAL HEALTH SCREENING TOOL, VERSION 2.0 (CALENVIROSCREEN 2.0), GUIDANCE AND SCREENING TOOL, OFFICE OF ENVTL. HEALTH HAZARD ASSESSMENT (2014), available at <http://oehha.ca.gov/ej/pdf/CES20Finalreport2014.pdf>.
- 78 *Id.*
- 79 *Id.* at ii.
- 80 ANALYSIS OF CALENVIROSCREEN 2.0 SCORES AND RACE/ETHNICITY, OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT (2014), available at <http://oehha.ca.gov/ej/pdf/CES20FinalRaceEthnicity.pdf>.
- 81 CALIFORNIA COMMUNITIES ENVIRONMENTAL HEALTH SCREENING TOOL, VERSION 1.1 (CALENVIROSCREEN 1.1), GUIDANCE AND SCREENING TOOL, OFFICE OF ENVTL. HEALTH HAZARD ASSESSMENT (2014), available at <http://oehha.ca.gov/ej/pdf/CalEnviroscreenVer11report.pdf>.
- 82 *Id.*
- 83 Conversation notes from phone call between Mr. Arsenio Mataka, Assistant Secretary for Environmental Justice and Tribal Affairs, CalEPA, and Research Law Fellow Samantha Walker (Aug. 15, 2014) (on file with authors).
- 84 U.S. CONST. amend. XIV, §1.
- 85 See ERWIN CHEMERINSKY, *CONSTITUTIONAL LAW: PRINCIPLES AND POLICIES* 684 (4th ed. Aspen Publishers 2011).
- 86 RONALD D. ROTUNDA & JOHN E. NOWAK, *TREATISE ON CONSTITUTIONAL LAW: SUBSTANCE AND PROCEDURE*, § 18.1 (5th ed., Thomson West 2012).
- 87 See CHEMERINSKY, *supra* note 85, at 686.
- 88 *Id.*
- 89 *Id.* at 684.
- 90 See ROTUNDA, *supra* note 86, at 307.
- 91 *Church of Lukumi Babalu Aye, Inc. v. City of Hialeah*, 508 U.S. 520 (1993).
- 92 Sharona Hoffman, *Preparing the Disaster: Protecting the Most Vulnerable in Emergencies*, 42 U.C. DAVIS L. REV. 1491, 1516 (2009), available at http://lawreview.law.ucdavis.edu/issues/42/5/articles/42-5_hoffman.pdf.
- 93 See ROTUNDA, *supra* note 86.
- 94 *Railway Express Agency, Inc. v. New York*, 336 U.S. 106, 110 (1949).
- 95 *City of Cleburne v. Cleburne Living Ctr.*, 473 U.S. 432, 440 (1985); see also *Village of Belle Terre v. Boraas*, 416 U.S. 1, 4, 8 (1974); *Village of Euclid v. Ambler Realty Co.*, 272 U.S. 365, 388-90, 395 (1926).
- 96 See CHEMERINSKY, *supra* note 85, at 712.
- 97 *Palmore v. Sidoti*, 466 U.S. 429, 433 (1984).
- 98 See CHEMERINSKY, *supra* note 85, at 712.
- 99 *Loving v. Virginia*, 388 U.S. 1, 13 (1967) (Stewart, J., concurring).
- 100 See generally *Korematsu v. United States*, 323 U.S. 214 (1944).
- 101 *Yick Wo v. Hopkins*, 118 U.S. 356 (1886).
- 102 *Arlington Heights v. Metro Hous. Corp.*, 429 U.S. 252, 260 (1977).
- 103 BLACK'S LAW DICTIONARY 538 (9th ed. 2009).
- 104 See CHEMERINSKY, *supra* note 85, at 687.
- 105 However, the Supreme Court has never defined "similarly situated." See Thomas P. McCarty, *United States v. Khan*, 461 F.3d 477 (4th Cir. 2006): *Discovering Whether "Similarly Situated" Individuals and the Selective Prosecution Defense Still Exist*, 87 NEB. L. REV. 539, 547 (2008).
- 106 See CHEMERINSKY, *supra* note 85, at 704-05.
- 107 388 U.S. 1 (1967).
- 108 *Fisher v. Univ. of Texas*, 133 S. Ct. 2411, 2416 (2013).
- 109 *Johnson v. Bd. of Regents*, 263 F.3d 1234, 1253-54 (11th Cir. 2001).
- 110 *Wygant v. Jackson Bd. of Education*, 476 U.S. 267, 311 (1986).
- 111 *City of Richmond v. J.A. Croson Co.*, 488 U.S. 469 (1989).
- 112 *Grutter v. Bollinger*, 539 U.S. 306 (2003).
- 113 See RONALD D. ROTUNDA & JOHN E. NOWAK, *TREATISE ON CONSTITUTIONAL LAW: SUBSTANCE AND PROCEDURE* 462, § 18.8 (5th ed., Thomson West 2012).
- 114 *Adarand Constructors v. Pena*, 515 U.S. 200 (1995).

- 115 See RONALD D. ROTUNDA & JOHN E. NOWAK, TREATISE ON CONSTITUTIONAL LAW: SUBSTANCE AND PROCEDURE 545, § 18.10(a)(i) (5th ed., Thomson West 2012).
- 116 See *Adarand*, 515 U.S. 200.
- 117 *Id.* at 260.
- 118 When reviewed under strict scrutiny by a lower court on remand, the program was struck down. See *Adarand Constructors v. Pena*, 965 F. Supp. 1556, 1584 (D.C. Colo. 1997).
- 119 LEGAL GUIDANCE ON THE IMPLICATIONS OF THE SUPREME COURT'S DECISION IN ADARAND CONSTRUCTORS, INC. V. PENA, U.S. DEPARTMENT OF JUSTICE (1995), available at <http://www.justice.gov/sites/default/files/olc/opinions/1995/06/31/op-olc-v019-p0171.pdf>.
- 120 *Shaw v. Reno*, 509 U.S. 630, 647 (1993).
- 121 509 U.S. 630 (1993).
- 122 *Id.* at 644.
- 123 438 U.S. 265 (1978).
- 124 *Id.*; see also *Grutter*, *supra* note 112.
- 125 *Regents of the Univ. of Cal. v. Bakke*, 438 U.S. 265 (1978).
- 126 *Gratz v. Bollinger*, 539 U.S. 244 (2003).
- 127 Lyle Denniston, *Direct New Challenges To Bakke Ruling (FURTHER UPDATE)*, SCOTUSBLOG, (Nov. 17, 2014, 10:17 AM), available at <http://www.scotusblog.com/2014/11/direct-new-challenges-to-bakke-ruling/>.
- 128 *Johnson v. Bd. of Regents*, 263 F.3d 1234, 1263 (11th Cir. 2001).
- 129 See generally Christine M. Foot, *Scrutinizing Strict Scrutiny: Environmental Justice After Adarand Constructors, Inc. v. Pena*, 11 BERKELEY J. AFR.-AM. L. & POL'Y 123 (2009).
- 130 *Id.* at 125.
- 131 WASH. REV. CODE § 49.60.400(1) (2012).
- 132 *Schuette v. Coal. to Defend Affirmative Action*, 134 S. Ct. 1623, 1629 (2014); see also MICH. CONST., Art. I, § 26 (2014).
- 133 See CALENVIROSCREEN, *supra* note 81, at 1.1 ("Preface").
- 134 *How to Use This Page*, U.S. ENVTL. PROT. AGENCY (Apr. 2010), <http://epamap14.epa.gov/ejmap/help/ejHowToUsePage.html>.
- 135 *EJView*, U.S. ENVTL. PROT. AGENCY, <http://epamap14.epa.gov/ejmap/entry.html> (last updated Jan. 11, 2013).
- 136 *EJ Layers Description*, U.S. ENVTL. PROT. AGENCY, <http://epamap14.epa.gov/ejmap/help/EJlayersDescription.html>.
- 137 *Id.*
- 138 *Id.*
- 139 PLAN EJ 2014 115, U.S. ENVTL. PROT. AGENCY, available at <http://www.epa.gov/environmentaljustice/resources/policy/plan-ej-2014/plan-ej-2011-09.pdf>.
- 140 MEMORANDUM: APPLICATION OF MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISE REQUIREMENTS IN THE CLEAN WATER AND DRINKING WATER STATE REVOLVING FUND PROGRAMS, U.S. ENVTL. PROT. AGENCY (Nov. 5, 1998), available at http://www.epa.gov/ogwdw/dwsrf/pdfs/memos/memo_dwsrf_policy_1998-11-05.pdf.
- 141 *Information Tools Development*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/environmentaljustice/plan-ej/information.html> (last updated July 23, 2012).
- 142 PREPARING FOR CLIMATE IMPACTS: LESSONS FROM THE FRONT LINES 5, GEORGETOWN CLIMATE CTR. (2014), available at <http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC-%20Preparing%20for%20Climate%20Impacts%20-%20July%202014.pdf>.
- 143 FLOOD RISK MANAGEMENT: CALL FOR A NATIONAL STRATEGY 8, AM. SOC'Y OF CIVIL ENG'RS (2014), available at <http://ascelibrary.org/doi/pdf/10.1061/9780784478585>.
- 144 See CLIMATE CENTRAL, *supra* note 69.
- 145 See GEORGETOWN CLIMATE CTR., *supra* note 58, at 3.
- 146 ADAPTING TO CLIMATE CHANGE: A HANDBOOK FOR LOCAL GOVERNMENTS IN NORTH CAROLINA, COASTAL HAZARDS CTR. 43 (2013), available at <http://coastalhazardscenter.org/dev/wp-content/uploads/2013/06/adapt.pdf>.
- 147 *Id.*
- 148 *Id.* at 12.
- 149 *Id.* at 41.
- 150 *Id.* at 42.

APPENDIX

Exhibit A: Climate Central Surging Seas: Sea Level Rise Analysis by Climate Central

Step 1: Go to <http://sealevel.climatecentral.org/>. You will see the map below.



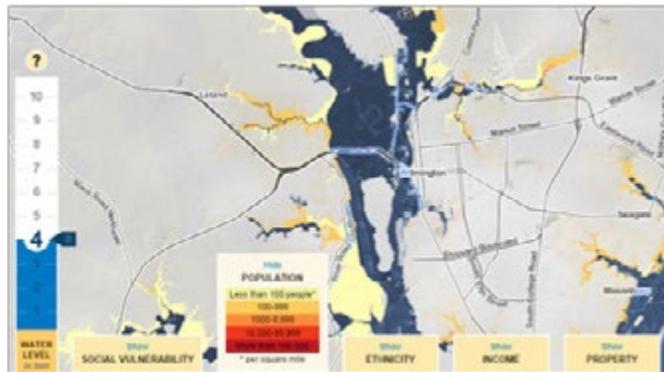
Step 2: Click on the state that you are interested in taking a closer look at. In this case, we are going to click on North Carolina (NC), which will take you to this screen.



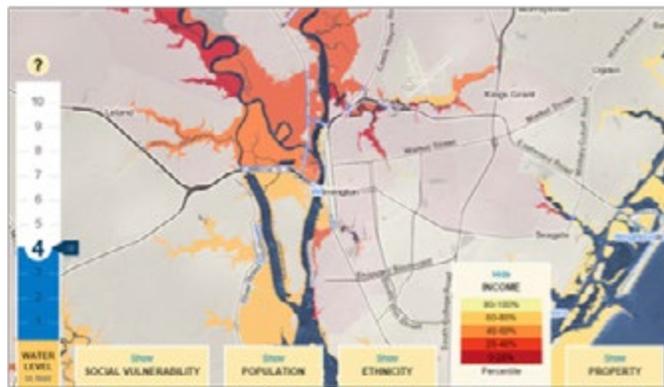
Step 3: Then, you can go to the specific county, city, or municipality that you are interested in investigating more closely. Let us look at Wilmington, NC as an example.



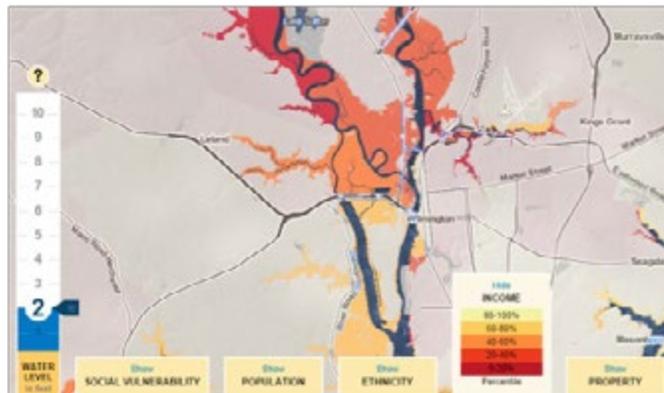
Step 4: On the bottom of the screen, you have a number of inputs that you can manipulate to get a better picture of what's going on at the coast. Let's look at "Population" first.



Step 5: Now let's switch to "Income".



Step 6: Finally, let's examine how the increase and decrease in water level affects the landscape in the City of Wilmington, starting with a decrease to an increase of two feet.



Step 7: For our last step, we check the increase to a sea level rise up to eight feet above the present day.

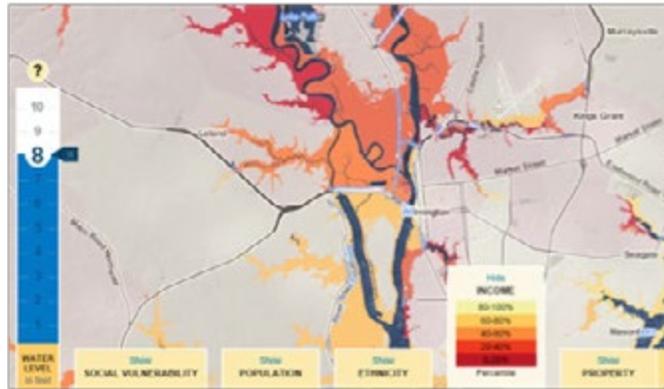
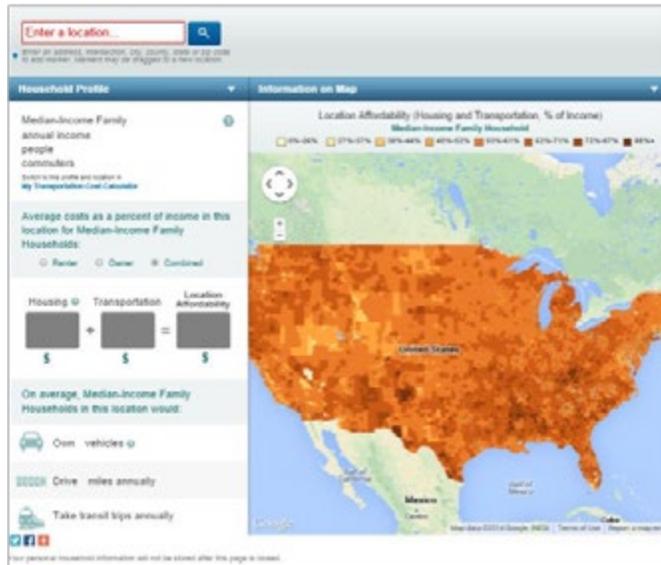


Exhibit B: Location Affordability Portal by U.S. Department of Housing and Urban Development

Step 1: Go to <http://www.locationaffordability.info/lai.aspx>. You will see the map below.



Step 2: At the top left of the screen, you will see a search bar with the text “Enter a Location.” Let’s type in “Wilmington, NC.” Below is the result.



Step 3: The HUD viewer allows the user to manipulate the location, household income profile, whether one is renting or owning a property, how many vehicles are owned (if any), and public transit costs. Currently, the map is showing affordability for a median-income family in Wilmington, NC of four people with two commuters who own two vehicles. Let's click the arrow next to "Household Profile" and choose "Single-Parent Family." The results below will appear.



Step 4: These inputs assume a "Combined" home ownership situation, but let's change the housing input to "Renter" to view the result.





Exhibit C: Emergency Planning and the Americans with Disabilities Act

Another legal issue for local governments engaging in any level of evacuation and emergency planning is their responsibilities Under the Americans with Disabilities Act (“ADA”).¹ While a thorough analysis of this issue is beyond the scope of this paper, the table below provides a snapshot of the current state of the law with respect to how the ADA applies or may apply to local governments in their evacuation and emergency planning or efforts. While this issue is beyond the scope of this paper, the ADA is relevant because vulnerability mapping can provide local governments with information about where individuals that qualify under the ADA reside. This information can then be used to effectively implement local emergency and evacuation plans. Current case law with respect to this issue is not as robust as equal protection case law, but two major cases are highlighted in the table below which shed some light on how the ADA may need to be incorporated at the local level:

¹ Americans with Disabilities Act, 42 U.S.C. 12101 et seq., <http://www.gpo.gov/fdsys/pkg/USCODE-2010-title42/pdf/USCODE-2010-title42-chap126.pdf>.

Duties under the ADA as Stated by Statutes, Regulations and Case Law

Americans with Disabilities Act of 1990 (and Federal Regulations)	Brooklyn Ctr. of Independence for the Disabled v. Bloomberg	Cmtys. Actively Living Indep. & Free v. City of Los Angeles
<p>“No qualified individual with a disability shall, by reason of such disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of a public entity, or be subjected to discrimination by any such entity.” 42 U.S.C. § 12132.</p>	<p>City evacuation plan must have a plan “for evacuating people with disabilities from multi-story buildings.” 980 F. Supp. 2d. 588, 643 (S.D.N.Y. 2013).</p>	<p>Emergency plan must anticipate emergency needs and minimize the need for “last-minute, individualized requests for assistance.” 2011 U.S. Dist. LEXIS 118364, at *45-46.</p>
<p>Public entity may not “[d]eny a qualified individual... the opportunity to participate in or benefit from the aid, benefit, or service.” 28 C.F.R. § 35.130(b)(1).</p>	<p>City must account for public transportation that is accessible in fact, even during a time of emergency. <i>Id.</i> at 644.</p>	<p>Even if temporary housing duties during disasters are provided by a non-governmental organization like the American Red Cross, the city still retains ultimate responsibility on ADA compliance. <i>See Id.</i> at *12.</p>
<p>Public entity may not “[a]fford a qualified individual... an opportunity to participate in or benefit from the aid, benefit, or service that is not equal to that afforded others.” 28 C.F.R. § 35.130(b)(1).</p>	<p>City must survey shelters and know which and how many shelters are accessible to the disabled. City cannot otherwise inform its disabled residents on where to go. <i>Id.</i> at 646.</p>	<p>When a policy is facially neutral, a court examines whether disabled residents are denied meaningful access to a benefit; the city must provide reasonable modifications to ensure the benefit is received (as long as this would not “fundamentally alter” the service). <i>See Id.</i> at *48.</p>
<p>Public entity may not “[p]rovide a qualified individual... with an aid, benefit, or service that is not as effective in affording equal opportunity to obtain the same result, to gain the same benefit, or to reach the same level of achievement as that provided to others.” 28 C.F.R. § 35.130(b)(1).</p>	<p>City plan must assure effective communication with its disabled residents. A spectrum of media should be implemented in order to account for the spectrum of disabilities (i.e., Internet is not expected to be as helpful for the blind). <i>Id.</i> at 650.</p>	<p>The city must develop a plan which applies equally to all residents regardless of disability and must coordinate with other local agencies to ensure this goal is met before a disaster happens. <i>See Id.</i> at *39-40</p>
<p>Does not “[n]ecessarily require a public entity to make each of its existing facilities accessible.” 28 C.F.R. § 35.150(a)(1).</p>	<p>City emergency plan must communicate which resource provision distribution facilities will be accessible to citizens with disabilities. <i>Id.</i> at 653.</p>	<p>The city must take affirmative action with regards to disabilities in disaster planning to ensure compliance with the ADA. <i>See Id.</i> at *43-44.</p>
<p>Must not fail “to take such steps as may be necessary to ensure that no individual with a disability is excluded, denied services, segregated or otherwise treated differently than other individuals,” unless to otherwise “would result in an undue burden.” See 42 U.S.C. § 12182(b)(2)(A).</p>	<p>Communications are to be effective and must ensure “meaningful access to the services being provided.” <i>Id.</i> at 655 (internal citations omitted).</p>	<p>The city must survey all shelters to determine which are accessible to those with disabilities, for communication purposes. <i>See Id.</i> at *48.</p>
<p>Must not fail to “remove architectural barriers, and communication barriers that are structural in nature... and transportation barriers in existing vehicles and rail passenger cars used by an establishment for transporting individuals... where such removal is readily achievable.” See 42 U.S.C. § 12182(b)(2)(A).</p>		<p>The city cannot absolve itself from its duty by citing the importance of personal planning and preparedness. <i>See Id.</i> at *45.</p>