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SEVEN PRINCIPLES FOR EQUITABLE ADAPTATION¹

*Prof. Alice Kaswan**

As Professors Robert Bullard and Beverly Wright have stated, “[c]limate change looms as *the* global environmental justice issue of the twenty-first century,” posing critical challenges “for communities that are already overburdened with air pollution, poverty, and environmentally related illnesses.”² Around the world, sea level rise, more extreme storms, heat waves, wildfires, changing weather patterns, and the spread of disease appear inevitable.³ Reducing greenhouse gas (GHG) emissions is necessary but not sufficient to address the potential damage.⁴ Global, national, and subnational adaptation measures to reduce climate harm are essential.⁵ To avoid substantial disparities in the impacts of climate change, equity considerations should play a vital role in emerging United States adaptation initiatives.⁶ Focusing on domestic law, this article briefly describes climate change impacts and the role of socioeconomic factors in determining their magnitude. It then provides seven principles for achieving equitable adaptation.

CLIMATE CHANGE IMPACTS

Among the most dramatic impacts of climate change will be the increasing incidence of disasters.⁷ Climate scientists anticipate that flooding will become more common and severe as sea levels rise and hurricanes become more intense, generating more destructive storm surges – the consequences of which were all too evident after Hurricane Sandy’s inundation of New York and New Jersey in Fall 2012.⁸ Throughout the nation, precipitation events are likely to become more extreme⁹ and, in some parts of the country, overall precipitation levels are already increasing dramatically.¹⁰ Scientists predict increasing wildfires in the western states,¹¹ predictions borne out by recent record-breaking fires.¹² Risks from flooding and fire include not only the direct harm from rising waters or flames, but contamination risks from inundated or incinerated industrial and hazardous waste facilities,¹³ the need to dispose of tons of debris,¹⁴ and the long-term housing and economic impacts that endure for years after major disasters.¹⁵ Adaptation measures must address adequate disaster preparedness, response, recovery, and mitigation measures to reduce long-term risks.

Increasing disaster risks could also render certain parts of the country uninhabitable. Migration away from low-lying coastal areas and floodplains may ultimately be necessary.¹⁶ Certain tribal communities in coastal Alaska, like the Village of Kivalina, already face the need to relocate.¹⁷ Additional climate impacts, like unsustainably high temperatures, droughts or saltwater intrusion that depletes essential water supplies, could likewise require large-scale population shifts.¹⁸ Adaptation measures must address local decision-making processes that govern decisions about when to protect an area from harm (through, for example, coastal armoring, levees, or the enhancement of natural buffers), when to adjust (through, for example, building standards to increase resilience), and when to retreat (through, for example, conservation easements or public purchase of at-risk property).

Scientists have also found that climate change will lead to numerous public health threats. Climate scientists predict that by 2100, average temperatures in the United States will increase by four to eleven degrees and heat waves that historically occurred once every twenty years will occur every other year.¹⁹ Heat waves are among the most lethal of

disasters, causing as many or more deaths than other types of disasters.²⁰ Moreover, higher temperatures trigger higher pollution levels, increasing the negative public health consequences of high heat.²¹ Warmer temperatures in the United States are also predicted to lead to the spread of disease and allergens.²²

Climate change will have pervasive economic impacts as well. For example, 80,000 businesses and almost 400,000

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jobs were reportedly lost from Hurricanes Katrina and Rita.²³ Changes in resource availability, like water supplies, could increase the cost of water and, given the importance of irrigation to agriculture, increase the cost of food.²⁴ Warmer temperatures may increase demand for air conditioning, potentially increasing electricity costs.²⁵ Climate mitigation efforts, however well-meaning, could also increase energy costs, by either placing a price on carbon through a market-based control mechanism or by encouraging the use of more expensive renewable energy sources.²⁶ More broadly, adaptation measures themselves are likely to be extremely costly. Fortifying or moving key infrastructure, like roads, airports, and sewage treatment plants, will cost billions.²⁷ Relocating communities or buying out property owners to protect them from harm would cost billions more.²⁸ Disaster response and reconstruction costs multiple billions of dollars.²⁹ Indirectly, addressing climate impacts and financing adaptation measures could drain government resources from other functions, like education and the social safety net, unless alternative financing sources are developed.³⁰

CLIMATE CHANGE IMPACTS AND EQUITY

The consequences of climate change will be experienced unevenly. In the United States, poor and marginalized communities without sufficient financial and social resources will face significant adaptation challenges.³¹ To quote Professor Robert Verchick: “Catastrophe is bad for everyone. But it is especially bad for the weak and disenfranchised.”³²

While it is critical to determine risk exposure – to assess the likelihood that a community will encounter a given climate impact – a community’s ultimate vulnerability cannot be determined without also assessing its sensitivity and its capacity to cope.³³ Depending upon the type of climate impact at issue, sensitivity is determined by such features as the quality of the housing stock, underlying health conditions, land elevation, and proximity to other hazards. The capacity to cope is a function of such factors as a community’s financial and social resources, access to health care, and geographic mobility.

Both physical and social factors thus determine climate impacts.³⁴ Social scientists evaluate social factors in terms of social vulnerability, defined as “the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard.”³⁵ Substantial evidence demonstrates that social vulnerability is greater for the poor, the elderly, racial minorities, people with underlying health conditions or disabilities, the socially isolated and politically marginalized, immigrants, and communities that are dependent upon vulnerable natural resources.³⁶

To avoid these disparities, climate change adaptation policies must grapple with underlying socioeconomic inequities. Decreasing social vulnerability requires adaptation measures that both reduce the underlying sensitivity to harm and enhance impacted communities’ resilience to harm after it has occurred. As in the environmental justice context, pursuing climate justice involves improving substantive outcomes for disadvantaged communities, developing inclusive and empowering participatory mechanisms, and addressing the deeper social and institutional forces that create and perpetuate systemic disparities,³⁷ themes addressed by the seven principles articulated below.

Improving equity is valuable not only on its own terms, but because of the adverse societal consequences of failing to address equity. Widespread homelessness, unemployment, and illness disrupt the social fabric of a community and could create far-reaching instability. The already-frayed social safety net may be unable to cope with the scale of disruption that could occur. Considered comprehensively, it is more prudent to develop adaptation plans that avoid harm than it is to attempt to repair the harm after the fact — or suffer the consequences of irreparable devastation.³⁸

SEVEN PRINCIPLES FOR EQUITABLE ADAPTATION

Given the key role of socioeconomic factors in determining the magnitude of climate impacts, an integrated ecological, social, and economic approach to adaptation planning, like that suggested by Rob Verchick and by Manuel Pastor and his co-authors in the disaster planning context, is essential to equitable adaptation efforts.³⁹ Although successful adaptation will require attention to a wide range of important principles,⁴⁰ this article articulates a subset of that array, focusing on those principles with the greatest impact on equity.

The principles are intended to guide adaptation planning in any of the contexts in which it emerges. The principles are applicable to action taken by local, state, or national entities. They could inform new adaptation legislation, or they could be integrated into adaptation efforts by institutions, like disaster management agencies, housing agencies, public health organizations, and local governments as they act under existing authorities.

1. GOVERNMENT HAS AN IMPORTANT ROLE TO PLAY

A threshold question is whether government action is necessary or whether people can (and should) take care of themselves. There is little dispute over the importance of governmental measures to protect key infrastructure, like highways and energy systems. Where individual or private business welfare is at stake, however, some might argue that as long as the government

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provides accurate and accessible information about current and future climate impacts, the private market will generate the optimal response. As citizens perceive growing threats, they will respond, and their responses will reflect their individual (and differing) risk tolerances. For example, they will or will not move away from floodplains, seashores, or disease-prone areas, buy hazard insurance, trim fire-prone vegetation in their yards, and purchase air conditioning. Under this view, if citizens end up in harm's way, then they are responsible for their own choices.⁴¹

Relying on individual initiative is, however, unlikely to lead to sufficient adaptation. Individuals could discount what appear to be inchoate, distant, and remote threats. As a consequence, they could fail to make sufficient investments to prepare for uncertain risks. Moreover, certain adaptation choices, like retreat, require difficult emotional decisions that could lead to collectively irrational results, as community residents prefer denial to leaving their homes and communities and losing all the social capital that resides in existing community structures.

Relying on the market is particularly detrimental to low-income marginalized communities. As Manuel Pastor and his co-authors have observed, relying on "market forces" to adequately prepare for disasters and other climate change impacts will fail to provide an adequate adaptation response because reliance on private action fails to protect those without the knowledge or means to act, systematically disadvantaging poor and isolated communities.⁴² Even assuming adequate knowledge, poor residents do not have the resources to respond to that knowledge by preparing, insuring, or moving.⁴³ When serious disasters occur, the government has historically provided some compensation, but that compensation cannot make up for underlying inequities.⁴⁴

Moreover, relying on market forces to depopulate at-risk areas would exacerbate, not reduce, risks to low-income and of-color citizens who could be powerfully attracted to newly affordable housing – housing that has become affordable and available because it is at risk.⁴⁵ Where citizens do not have adequate resources and face limited housing mobility due to lingering discrimination, individual responses to climate change risk do not reflect free and unconstrained "choices."

Given the likelihood that market forces will fail to adequately protect people from harm, and fail in ways that exacerbate risks for more vulnerable populations, comprehensive government adaptation initiatives are warranted. The remainder of this section addresses key themes to guide the incorporation of equity considerations in adaptation policy.

2. DESIGN SUBSTANTIVE ADAPTATION MEASURES THAT ADDRESS VULNERABILITY

Adaptation policies that attempt to treat everyone the same, regardless of underlying demographic characteristics, will result in substantial inequality given underlying differences. To achieve equitable adaptation, adaptation policies must explicitly address the demographics of affected populations and target interventions to address the needs of the most vulnerable.⁴⁶ Although such measures cannot eliminate all inequity – they cannot

prevent the inexorable loss of Native American Alaskan coastal communities, for example – they could in many instances reduce harm and lessen disparities. Relevant characteristics include income, race, age, status as renters versus owners, and type of employment. Immigrant status is also relevant to adaptation policy, and is addressed explicitly below in connection with communication measures.

Disparities in income create many of the most significant disparities in vulnerability to climate change impacts. Income disparities also have a racial dimension: Although many whites live in poverty, communities of color are disproportionately poor.⁴⁷ Climate impacts that disproportionately impact the poor will therefore affect a larger percentage of people of color. Adaptation policies that target resources toward low-income communities could thus ameliorate both income and racial disparities.

For example, given poor families' lack of resources to prepare for disasters,⁴⁸ funding hazard preparation measures for low-income households or assisting with housing retrofits to provide cooling could improve outcomes for disadvantaged communities.⁴⁹ Moreover, poor residents are less likely to have adequate transportation to flee disasters,⁵⁰ face greater challenges in finding affordable and safe shelter if evacuation is necessary,⁵¹ and are less likely to have air conditioning or other means for keeping cool in heat waves.⁵² As Hurricane Katrina made abundantly clear, adaptation plans must provide timely transportation options,⁵³ provide for adequate and safe public shelters, and provide cooling centers in heat waves so that poor residents do not remain in place – and at risk – because of inadequate transportation or fear of public facilities.

In the disaster recovery context, to avoid homelessness and widespread suffering, low-income residents will require various forms of assistance, including adequate housing vouchers and relocation assistance where rebuilding is infeasible. If rebuilding requirements, like flood-proofing codes, add significant costs to re-building, then government support for such measure may be needed to ensure that low-income households are not priced out of rebuilding.⁵⁴ Given the challenges in siting and building low-income and public housing, a strong governmental role, and financial support, is likely to be necessary to ensure that adequate low-income options are available.

Long-range land use planning to address shifts in habitability will have important equity implications and should avoid criteria that adversely impact low-income communities. For example, if planners in an area subject to flooding risks were to choose what areas to protect based solely upon land value, that criterion would systematically undermine poor communities, communities that often have less power in local land use debates.⁵⁵ Land use decisions about protection, retreat, and new development should be guided by substantive criteria that recognize a range of community values, including but not limited to land value. In addition, decisions about how to facilitate retreat, and how to compensate for the loss of property, should recognize that low-income residents do not have the resources to start fresh

elsewhere and face significant risks of homelessness or deepening poverty if relocation assistance is not provided.

Such long-range land use planning must also address potential impacts on areas that are likely to experience in-migration, as the population shifts from areas at risk to areas that face fewer risks and remain more habitable.⁵⁶ Adequate affordable housing in the nation's more habitable regions will be essential to avoid serious housing shortages and potential increases in homelessness.

Income is not the only demographic feature requiring sustained attention in the development of adaptation measures. Elderly and disabled residents face substantially greater risks in disasters because they are less likely to have adequate independent transportation, fare worse in shelters without adequate medical services, and are likely to suffer greater psychological distress from a disaster's profound disruptions.⁵⁷ They are also more vulnerable to public health threats, like heat and disease.⁵⁸ As a consequence, special accommodations for transportation, shelter, and medical needs are necessary for elderly and disabled residents to avoid serious consequences from disasters and the range of public health threats that climate change could cause.⁵⁹

Renters also require particularized attention. Renters are less able to prepare for disasters or heat waves because landlords control investments in home strengthening, air conditioning, or other mechanisms to reduce vulnerability to disasters or heat waves.⁶⁰ Local governments could adopt building codes that require or incentivize landlords to strengthen structures and install air conditioning. Moreover, in hot climates, building codes could require building designs that minimize summer heat and incorporate energy-efficient cooling mechanisms. Given evidence that past disaster recovery programs have provided more resources for homeowners than for displaced renters,⁶¹ adaptation planners should ensure that recovery programs provide adequate options for renters, including vouchers and housing alternatives.⁶² In developing post-disaster rebuilding plans, relevant officials should include sufficient replacement rental and public housing, housing that has historically been replaced at a lower rate than other forms of housing.⁶³

Lastly, given variations in risk exposure by occupation, adaptation planning should address the unique needs of certain workers. Outdoor workers, like agricultural, construction, and sanitation workers, face greater risks from high heat and pollution levels.⁶⁴ Those risks could be reduced by adjustments to the workday and by occupational safety guidelines that address adequate hydration, cessation of work when ambient temperatures exceed a certain level, and other measures to protect vulnerable workers.

3. PROVIDE CULTURALLY-SENSITIVE COMMUNICATIONS AND SERVICES

Communication is key to effective adaptation. Given the diversity of populations, community and demographic-specific strategies are necessary.⁶⁵ Public education can help communities prepare for disasters and inform them about how to address public health risks from heat waves, allergens, or new diseases.

Early warning systems are also essential to prepare for weather-related disasters, including potential flooding and heat waves.⁶⁶ Effective disaster response requires providing those affected with information about evacuation and shelter options. After a disaster occurs, effective recovery depends upon widespread access to information about available recovery resources.

Experience in the disaster context demonstrates that linguistic and cultural isolation will exacerbate climate impacts for immigrant communities unless proactive steps are taken to develop community-specific communication mechanisms.⁶⁷ In addition to identifying language needs, adaptation planners need to identify culturally appropriate modes of communication including, potentially, newspapers, radio, television, e-mail, social media, or door-to-door outreach.⁶⁸ Given undocumented immigrants' justifiable fear of deportation or historically rooted distrust of government,⁶⁹ government agencies should provide assurances that they will not deport.⁷⁰ In addition, agencies could partner with nongovernmental community organizations that could facilitate community outreach, provide information, and help organize vulnerable or impacted communities.⁷¹ The same issues arise in the context of providing services, like shelters or cooling centers, and in the context of distributing resources, like disaster relief.

Effective communications strategies are likely to vary for non-immigrant as well as immigrant communities, and require location-specific assessments.⁷² Some neighborhoods may have strained relationships with local police departments or other officials.⁷³ Certain populations could also require different communication methods. For example, personal, door-to-door warning and assistance may be necessary to adequately prepare elderly and disabled residents.⁷⁴

4. DEVELOP PARTICIPATORY PROCESSES

Decisionmakers cannot develop substantively appropriate adaptation and communication strategies without the right participatory processes. Given the importance of community-specific information, adaptation planning processes require bottom-up participatory mechanisms.⁷⁵ Such participatory processes are important not only to obtain critical information, but to provide marginalized communities with a voice in difficult political decisions.⁷⁶ Consistent with principles of environmental justice, adaptation planning could provide a vehicle for community empowerment and self-determination.⁷⁷

Adaptation planners should engage with community leaders to obtain site-specific information about relative disaster or heat preparedness and to identify appropriate modes of – and institutions for – communicating information about preparedness, warnings, and recovery.⁷⁸ Community-based information about available resources is also essential, including transportation and shelter options in the event of natural disasters or heat waves.⁷⁹

The political dimension to participatory processes is as important as the informational dimension. Many adaptation-related decisions will be politically controversial. For example, planners must determine who benefits from disaster recovery resources. What resources for homeowners? What resources for

renters? If new housing will be built, what income levels will it serve? With what neighborhood structures? In the long-term, communities facing flood and fire risks will have to make fateful decisions about what areas to protect and what areas to abandon.

To be effective, participatory opportunities need to occur early in the process and address local power dynamics. Timing is critical to the ability to shape decision making; an obligatory public hearing on an already-complete planning document does not constitute real public participation. An extended process of place-based community hearings and forums is more likely to generate meaningful participation.⁸⁰ Moreover, given power disparities and the political marginalization of some communities, carefully crafted and targeted outreach will be necessary to draw in all communities. While good participatory mechanisms cannot erase endemic power imbalances, they at least provide transparent forums that give historically less powerful constituencies a seat at the table.

5. REDUCE UNDERLYING NON-CLIMATE ENVIRONMENTAL STRESSES

In some instances, climate change does not create new risks; it exacerbates existing risks. For example, it could increase risks from flooded sewage treatment plants, industry, or waste sites.⁸¹ As Prof. Robin Craig has observed, a key adaptation principle is to “Eliminate or Reduce Non-climate Stresses and Otherwise Promote Resilience.”⁸² By improving the baseline, climate impacts will be less extreme. Because environmental justice research has demonstrated that many existing environmental problems, like hazardous waste storage and disposal sites, air pollution, and other environmental risks are disproportionately located in of-color and low-income communities,⁸³ reducing non-climate environmental stressors will have indirect equity benefits.

For example, improving inadequate storm water management, an existing non-climate problem, could mitigate the contamination that could arise from climate-caused increases in extreme precipitation.⁸⁴ In their compliance and enforcement initiatives, EPA or applicable state agencies could include vulnerability to disasters as a key factor in prioritizing their review of industrial and municipal storm water management plans and assessing compliance with industrial waste storage requirements. Similarly, the federal superfund program and its state equivalents could consider flood or fire risks in prioritizing cleanup efforts and in selecting remedies that take potential future disasters into account.⁸⁵ Moreover, aggressive efforts to reduce air pollution now will reduce the adverse consequences of future heat-induced air pollution increases.⁸⁶

Following this principle would not only mitigate climate impacts; it would provide significant co-benefits by reducing existing non-climate stresses. Given extensive co-benefits, such initiatives are often considered “no” or “low” regrets policies that are justified whether or not climate change occurs.⁸⁷

6. MITIGATE MITIGATION: ADDRESSING ADAPTATION/ MITIGATION TRADEOFFS

Although climate adaptation (addressing the impacts of climate change) and climate mitigation (reducing GHG emissions to lessen climate change) often involve different regulatory strategies, there are significant interactions between adaptation and mitigation measures. Policymakers need to consider the interplay between mitigation and adaptation.

In some instances, mitigation measures could be “maladaptive” by creating adaptation challenges, some of which raise equity concerns.⁸⁸ For example, a key strategy for reducing GHG emissions is encouraging smart growth to reduce transportation emissions from sprawl.⁸⁹ That smart growth could, however, increase urban heat. Scientists have documented that dense urban environments increase urban temperatures by several degrees over less-dense surrounding areas, a phenomena known as the “urban heat island effect.”⁹⁰ Moreover, although having denser cities might reduce overall air pollution emissions by reducing the driving associated with sprawl, increased urban density could increase localized air pollution levels.⁹¹ Finally, because many existing urban areas are in coastal areas and along rivers that face high disaster risks,⁹² intensifying growth would often, as Prof. Lisa Grow Sun has suggested, constitute “smart growth in dumb places.”⁹³ Where smart growth is justified, land use measures should prevent development in the riskiest areas and provide green spaces to minimize urban heat.⁹⁴ Transportation infrastructure should facilitate evacuation and be resilient to damage from potential disasters.⁹⁵

Certain mitigation measures could also generate equity concerns if they increase energy costs, which could occur through greater reliance on more expensive renewable energy or from imposing a price on carbon through a market-based mechanism like cap-and-trade or a carbon tax.⁹⁶ Measures to alleviate such impacts, like financing energy efficiency or public transportation, would ameliorate the potential adverse economic consequences of climate mitigation policies.

In other instances, adaptation measures could compromise mitigation. For example, while policymakers should develop cooling strategies to protect people from heat waves, policies that simply require or finance the installation of air conditioning would undermine mitigation by increasing energy demand.⁹⁷ In addition to, or instead of air conditioning, policymakers should consider building standards that lead to cooler buildings,⁹⁸ urban designs that reduce the heat island effect, cooling centers, and demand-response systems that allow residents or utilities to reduce air conditioning use in unoccupied buildings.

7. A COMPREHENSIVE AGENDA

While these suggestions for incorporating equity considerations into adaptation planning are important, it is also clear that they address symptoms, not causes. Underlying socioeconomic vulnerabilities create the disparities in the capacity to recover and reconstruct from disasters, inequities in the capacity to relocate to avoid harm, and differences in the public health consequences

of increasing heat, pollution, and disease. We are confronting more than a “disaster planning” or “adaptation planning” issue.

A larger socioeconomic agenda is critical to achieving equitable adaptation. The IPCC has stated that “[a] prerequisite for sustainability in the context of climate change is addressing the underlying causes of vulnerability, including the structural inequalities that create and sustain poverty and constrain access to resources.”⁹⁹ The IPCC states further that “[a]ddressing social welfare, quality of life, infrastructure, and livelihoods ... in the short term ... facilitates adaptation to climate extremes in the longer term.”¹⁰⁰

Successful adaptation will require addressing such pervasive issues as poverty, affordable housing, the provision of healthcare, and the political voice of currently marginalized communities.¹⁰¹ Building social infrastructure has always been

a laudable goal. Impending climate impacts provide yet another reason to mend social ills, or risk systemic disruptions that could make disasters like Hurricane Katrina and its aftermath the norm rather than the exception.

CONCLUSION

While global climate change is an “environmental” problem, the scope and scale of its impacts is strongly determined by underlying socioeconomic variables. As climate impacts emerge, they have the potential to exacerbate existing inequalities and cause severe hardships for the nation’s most vulnerable populations – hardships that are not only intrinsically of concern, but also destabilizing to the larger community. These seven principles provide policymakers with guideposts for achieving equitable adaptation.



Endnotes: Seven Principles for Equitable Adaptation

¹ This essay is adapted from a longer article entitled “Domestic Climate Change Adaptation and Equity,” 42 ENVTL. L. REP. 11125 (2012).

² ROBERT D. BULLARD & BEVERLY WRIGHT, THE WRONG COMPLEXION FOR PROTECTION: HOW THE GOVERNMENT RESPONSE TO DISASTER ENDANGERS AFRICAN AMERICAN COMMUNITIES 51 (2012).

³ See generally CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (M.L. Parry et al., eds., 2007), available at: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf>.

⁴ Public attention is understandably focused on climate mitigation – on policies to reduce greenhouse gas emissions – but mitigation measures cannot undo the consequences of already-accumulated atmospheric greenhouse gases (GHGs). See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Summary for Policymakers*, in CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, *supra* note 3, at 19, 20 [hereinafter IPCC, *Summary for Policymakers*], available at: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf>; UNITED STATES GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 11 (2009) [hereinafter USGCRP REPORT], available at: <http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf>.

⁵ The Intergovernmental Panel on Climate Change defines adaptation as: “the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.” See CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, *supra* note 3, at 6. On balance, scientists predict that the negative consequences will outweigh the beneficial impacts. See IPCC, *Summary for Policymakers*, *supra* note 4, at 17.

⁶ Cf. ROBERT R. M. VERCHICK, FACING CATASTROPHE: ENVIRONMENTAL ACTION FOR A POST-KATRINA WORLD 105-70 (2010) (proposing “Be Fair” as a central principal of disaster law); Jim Chen, *Law among the Ruins*, in LAW AND RECOVERY FROM DISASTER: HURRICANE KATRINA 1, 3 (Robin Malloy, ed., 2009) (arguing that the quest for equality should be a central component of disaster law); Victor B. Flatt, *Adapting Laws for a Changing World: A Systemic Approach to Climate Change Adaptation*, 64 FLORIDA L. REV. 269, 289-91 (2012) (discussing the important role of distributional justice in adaptation); J.B. Ruhl & James Salzman, *Climate Change Meets the Law of the Horse*, 62 DUKE L.J. 975 (2013) (suggesting equity as one of three overarching policy goals for adaptation efforts); Robert R.M. Verchick, *Disaster Justice: The Geography of Human Capability*, 23 DUKE ENVTL. L. & POL’Y FORUM 23 (2012).

⁷ See NAT’L RESEARCH COUNCIL, ADAPTING TO THE IMPACTS OF CLIMATE CHANGE 1 (2010), available at: http://www.nap.edu/catalog.php?record_id=12783.

⁸ Sea levels have already increased over the last century and, notwithstanding uncertainty about the magnitude, climatologists predict further increases of three to four feet by 2100. See USGCRP REPORT, *supra* note 4, at 149 (describing past increase of up to two feet) and 150 (predicting future increase) and 149 (predicting more destructive storm surges). While no single weather event can

be attributed to climate change, Hurricane Sandy provided a wake-up call to many about climate change and the risks of rising sea levels and more intense storm surges. Thomas Kaplan, *Most New Yorkers Think Climate Change Caused Hurricane*, *Poll Finds*, THE NEW YORK TIMES (Dec. 3, 2012).

⁹ See IPCC, MANAGING THE RISKS OF EXTREME EVENTS AND DISASTERS TO ADVANCE CLIMATE CHANGE ADAPTATION 13 (2012) [hereinafter IPCC, MANAGING THE RISKS], available at <http://www.ipcc-wg2.gov/SREX/>.

¹⁰ Between 1958 and 2007, heavy storms increased by 67 percent in the Northeast and by 31 percent in the Midwest. USGCRP REPORT, *supra* note 4, at 32.

¹¹ *Id.* at 82 (describing fourfold increase in western wildfires over the last several decades).

¹² See, e.g., Pete Spotts, *Monster Wildfire in Arizona: A Glimpse of What Climate Change Could Bring*, CHRISTIAN SCIENCE MONITOR, June 9, 2011, <http://www.csmonitor.com/Environment/2011/0609/Monster-wildfire-in-Arizona-A-glimpse-of-what-climate-change-could-bring>; Darryl Fears, *Colorado’s Table Was Set for Monster Fires*, THE WASHINGTON POST, Jul. 1, 2012, http://www.washingtonpost.com/national/health-science/colorados-table-was-set-for-monster-fire/2012/07/01/gJQAVa6cGW_story.html.

¹³ VERCHICK, *supra* note 5, at 133; Robin Kundis Craig, *A Public Health Perspective on Sea-Level Rise: Starting Points for Climate Change Adaptation*, XV WIDENER L. REV. 521, 536-37 (2010); MANUEL PASTOR ET AL., IN THE WAKE OF THE STORM: ENVIRONMENT, DISASTER, AND RACE AFTER KATRINA 30 (2006).

¹⁴ See LINDA LUTHER, CONG. RESEARCH SERV., RL33477, DISASTER DEBRIS REMOVAL AFTER HURRICANE KATRINA: STATUS AND ASSOCIATED ISSUES (updated 2008) (describing post-Katrina debris removal challenges).

¹⁵ See, e.g., PASTOR, *supra* note 13, at 25-27 (describing the long-term challenges in recovering from disasters, particularly for poor and minority communities).

¹⁶ See, e.g., NAT’L RESEARCH COUNCIL, *supra* note 7, at 75.

¹⁷ See Randall S. Abate, *Public Nuisance Suits for the Climate Justice Movement: The Right Thing and the Right Time*, 85 WASH. L. REV. 197, 207 (2010).

¹⁸ See, e.g., Robin Kundis Craig, “Stationarity is Dead” – Long Live Transformation: Five Principles for Climate Change Adaptation Law, 34 HARV. ENVTL. L. REV. 9, 55 (2010) (noting the possibility of significant migration from arid western areas to wetter regions, and from coastal areas inland).

¹⁹ USGCRP REPORT, *supra* note 4, at 29, 34 (describing predicted increase in average temperatures; describing predicted increase in heat waves).

²⁰ USGCRP REPORT, *supra* note 4, at 90 (reporting that: “[h]eat is already the leading cause of weather-related deaths in the United States”). A severe 2003 European heat wave reportedly caused 70,000 excess deaths. See NAT’L RESEARCH COUNCIL, *supra* note 7.

²¹ U.S. ENVIRONMENTAL PROTECTION AGENCY (“EPA”), OUR NATION’S AIR: STATUS AND TRENDS THROUGH 2010 11 (2012). Higher temperatures increase the rate at which ozone, a significant air pollutant, is formed from its precursor compounds, nitrogen oxides and volatile organic compounds. See also USGCRP REPORT, *supra* note 4, at 92-94.

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¹⁰ United Nations Declaration on the Rights of Indigenous Peoples voting record <http://unbisnet.un.org:8080/ipac20/ipac.jsp?profile=voting&index=VM&term=ares61295>.

¹¹ United Nations Declaration on the Rights of Indigenous Peoples Adopted by the General Assembly 13 September 2007. <http://www.un.org/esa/socdev/unpfi/en/declaration.html>.

¹² LEHR & SMITH, *supra* note 9, at 14.

¹³ United Nations Declaration on the Rights of Indigenous Peoples, article 32 sec. 2 http://www.un.org/esa/socdev/unpfi/documents/DRIPS_en.pdf.

¹⁴ *Id.*

¹⁵ LEHR & SMITH, *supra* note 9, at 16.

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ *Id.* at 15.

¹⁹ Goodland, *supra* note 3, at 67.

²⁰ *Id.*

²¹ *Id.*

²² Lehr & Smith, *supra* note 9, at 7.

²³ *Id.*

²⁴ Goodland, *supra* note 3, at 67.

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.* at 68.

²⁸ *Id.*

²⁹ *Id.* at 72.

³⁰ DIR. FOR FIN., FISCAL, & ENTER. AFFAIRS, OECD, *Multinational Enterprise in Situations of Violent Conflict and Widespread Human Rights Abuses 4* (May 2002), <http://www.oecd.org/dataoecd/46/31/2757771.pdf>.

³¹ See Preamble, *Norms on the Responsibilities of Transnational Corporations and Other Business Enterprises with Regard to Human Rights*, U.N. Doc. E/CN.4/Sub.2/2003/12/Rev.2 (2003), <http://www1.umn.edu/humanrts/links/norms-Aug2003.html>.

³² Carolin Hillemanns, *UN Norms on the Responsibilities of Transnational Corporations and Other Business Enterprises with Regard to Human Rights*, GER. L.J. Vol. 4, 10 1065(2003), http://www.germanlawjournal.com/pdfs/Vol04No10/PDF_Vol_04_No_10_1065-1080_European_Hillemanns.pdf.

³³ *Id.*

³⁴ *Id.*

³⁵ See Preamble, *supra* note 31.

³⁶ Hillemanns, *supra* note 32, at 1075.

³⁷ LEHR & SMITH, *supra* note 9, at 21.

³⁸ Elias Courson, NORDISKA AFRIKAINSTUTET, *Movement for the Emancipation of the Niger Delta (MEND) 7* (2009), nai.diva-portal.org/smash/get/diva2:280470/FULLTEXT01.

³⁹ Stephanie Hanson, COUNCIL ON FOREIGN RELATIONS *MEND: The Niger Delta's Umbrella Group*, (March 22, 2007), <http://www.cfr.org/nigeria/mend-niger-deltas-umbrella-militant-group/p12920>.

⁴⁰ Courson, *supra* note 38, at 7.

⁴¹ *Id.* at 8.

⁴² *Id.*

⁴³ Hanson, *supra* note 39.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ Ed Pilkington, *Shell Pays Out \$15.5 Million over Saro-Wiwa Killing*, THE UK GUARDIAN (June 8, 2009), <http://www.guardian.co.uk/world/2009/jun/08/nigeria-usa>.

⁴⁹ Hanson, *supra* note 39.

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² Ed Pilkington, *supra* note 48.

⁵³ Antoanella-Iulia Motoc & Tebtebba Found, *Legal Commentary on the Concept of Free, Prior Informed Consent*, SUB-COMM. ON THE PROMOTION AND PROT. OF HUMAN RIGHTS 6 (July 2005), www2.ohchr.org/english/issues/indigenous/docs/wgip23/WP1.doc.

⁵⁴ *Id.* at 6.

⁵⁵ *Id.*

⁵⁶ LEHR & SMITH, *supra* note 9.

⁵⁷ *Id.* at 6-7.

⁵⁸ *Id.* at 7.

⁵⁹ International Labour Organization, *Indigenous and Tribal Peoples Convention No. 169*, art. 1(b), June 27, 1989, 28 I.L.M. 1382, available at http://www.ilo.org/dyn/normlex/en/f?p=1000:12100:0::NO::P12100_INSTRUMENT_ID:312314.

⁶⁰ *Indigenous Peoples and Sustainable Development*, Int'l Fund for Agric. Dev. 5 (Feb. 2003), <http://www.ifad.org/gbdocs/gc/26/e/ip.pdf>.

⁶¹ *Id.* at 5.

⁶² *Id.* at 5.

⁶³ *Id.* at 5.

⁶⁴ Jennifer Tobin, *Political Investments and Property Rights in Developing Countries*, YALE UNIVERSITY AND BROOKINGS INSTITUTION 2 (Oct. 3, 2005), http://www.people.fas.harvard.edu/~ces/conferences/cpeworkshop/tobin_CPE.pdf.

⁶⁵ *Indigenous Peoples and Sustainable Development*, *supra* note 61.

⁶⁶ *Id.* at 15.

⁶⁷ *Id.*

⁶⁸ *Id.* at 8.

⁶⁹ *Ctr. for Minority Rights Dev. ex rel. Endorois Welfare Council v. Kenya*, A.C.H.P.R. 276/2003 (2009), available at http://www.hrw.org/sites/default/files/related_material/2010_africa_comm_ission_ruling_0.pdf.

⁷⁰ Fergus MacKay, *Suriname: Chinese Logging Companies and Tribal Rights*, FOREST PEOPLES PROGRAMME (Sept. 2002), <http://www.wtm.org.uy/bulletin/62/Suriname.html>.

⁷¹ *Id.* at 76.

⁷² Tobin, *supra* note 64, at 3.

⁷³ *Id.*

⁷⁴ LEHR & SMITH, *supra* note 9, at 22.

⁷⁵ *Id.*

⁷⁶ *Id.*

⁷⁷ *Id.* at 21.

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.* at 71.

⁸¹ SEN, *supra* note 7, at 3.

⁸² John M. Kline & Ludger Odenthal, *The Social Responsibility of Transnational Corporations*, U.N. CONFERENCE ON TRADE AND DEV. 44 (1999), available at <http://www.unctad.org/en/docs/poiteitm21.en.pdf>.

²² JONATHAN SAMET, PUBLIC HEALTH: ADAPTING TO CLIMATE CHANGE 4-5 (Resources for the Future, 2010), available at <http://www.rff.org/RFF/Documents/RFF-IB-10-06.pdf>.

²³ Robert K. Whelan & Denise Strong, *Rebuilding Lives Post-Katrina: Choices and Challenges in New Orleans' Economic Development*, in RACE, PLACE, AND ENVIRONMENTAL JUSTICE AFTER HURRICANE KATRINA: STRUGGLES TO RECLAIM, REBUILD, AND REVITALIZE NEW ORLEANS AND THE GULF COAST 183, 183 (Robert D. Bullard & Beverly Wright, eds., 2009) [hereinafter RACE, PLACE, AND ENVIRONMENTAL JUSTICE]. In the month following Hurricane Sandy, the New York area lost approximately 30,000 jobs due to the storm. See Patrick McGeehan, *Nearly 30,000 Jobs Lost Because of Hurricane Sandy*, THE NEW YORK TIMES (Dec. 20, 2012).

²⁴ See Seth B. Shonkoff et al., *The Climate Gap: Environmental Health and Equity Implications of Climate Change and Mitigation Policies in California – a Review of the Literature*, 109 CLIMATIC CHANGE S485, S491 (2011).

²⁵ See USGCRP REPORT, *supra* note 4, at 54-55 (explaining that warmer temperatures are projected to lead to a slight net increase in energy use because increases in air conditioning are likely to outpace decreases in energy use for heating).

²⁶ See, e.g., NAT'L RESEARCH COUNCIL, *supra* note 7, at 49 (describing increasing energy costs resulting from increasing focus on expensive renewable energy sources).

²⁷ See *id.* (assessing the cost of providing protection from three feet of sea level rise at roughly \$100 billion).

²⁸ For example, relocating a single 400-person Alaskan tribal village, the Village of Kivalina, is projected to cost from 95 to 400 million dollars. See Abate, *supra* note 17, at 207.

²⁹ See M. L. PARRY, ET AL., ASSESSING THE COSTS OF ADAPTATION TO CLIMATE CHANGE: A REVIEW OF THE UNFCCC AND OTHER RECENT ESTIMATES 31 (2009). Hurricane Katrina reportedly caused 146 billion dollars in damage. See *Hurricane Sandy's Rising Costs*, NEW YORK TIMES A32 (Nov. 28, 2012). After Hurricane Sandy, New York estimates \$42 billion in damage, while New Jersey estimates almost \$30 billion. *Id.*

³⁰ See generally, MATTHIAS RUTH ET AL., THE US ECONOMIC IMPACTS OF CLIMATE CHANGE AND THE COSTS OF INACTION (2007), available at: <http://www.cier.umd.edu/documents/US%20Economic%20Impacts%20of%20Climate%20Change%20and%20the%20Costs%20of%20Inaction.pdf>. Climate mitigation efforts, like a cap-and-trade program or carbon tax, could conceivably generate revenue that would finance climate adaptation efforts. See RACHEL MORELLO-FROSCH ET AL., THE CLIMATE GAP: INEQUALITIES IN HOW CLIMATE CHANGE HURTS AMERICANS & HOW TO CLOSE THE GAP 19 (2010), available at: http://dornsife.usc.edu/pere/documents/ClimateGapReport_full_report_web.pdf.

³¹ These challenges are described in more detail in the longer version of this article. See Alice Kaswan, *Domestic Climate Change Adaptation and Equity*, 42 ENVIRONMENTAL LAW REPORTER 11125 (2012). Equity concerns are even more dramatic internationally. Many poor developing countries, like small-island states, Bangladesh, and African nations, are simultaneously the least responsible for, but the most at risk from, global climate change. See, e.g., IPCC, *Summary for Policymakers*, *supra* note 4, at 12 (describing high risks from sea level rise for low-lying African and Asian deltas and for small island states). The importance of international adaptation and equity concerns does not, however, erase the significance of addressing equity in U.S. adaptation measures.

³² See VERCHICK, *supra* note 6, at 106.

³³ See NAT'L RESEARCH COUNCIL, *supra* note 7, at 29; Chen, *supra* note 6, at 3-5.

³⁴ See IPCC, *MANAGING THE RISKS*, *supra* note 9, at 7, 10; USGCRP REPORT, *supra* note 4, at 100-101; Verchick, *supra* note 6, at 38-41 (observing that the degree of hazard a community faces is "a combination of a community's physical vulnerability and its social vulnerability") (emphasis in original). See generally PASTOR ET AL., *supra* note 13, at 2 (observing that environmental equity focuses on both cumulative exposure and social vulnerability).

³⁵ See DANIEL A. FARBER ET AL., *DISASTER LAW AND POLICY* 217 (2d ed. 2010) (quoting PIERS BLAIKIE ET AL., *AT RISK: NATURAL HAZARDS, PEOPLE'S VULNERABILITY AND DISASTERS* 9 (1994)).

³⁶ See U.S. CLIMATE CHANGE SCIENCE PROGRAM, *ANALYSES OF THE EFFECTS OF GLOBAL CHANGE ON HUMAN HEALTH AND WELFARE AND HUMAN SYSTEMS* 64 (2008) (listing socioeconomic factors affecting vulnerability), available at: <http://www.climatechange.gov/Library/sap/sap4-6/final-report/>; *id.* at 64 (noting greater impacts on those with lower socioeconomic status); *id.* at 123 (listing factors affecting vulnerability to disasters); VERCHICK, *supra* note 6, at 106; BULLARD & WRIGHT, *supra* note 2, at 52-54 (describing disparities in climate impacts for disadvantaged populations). Large-scale aggregate analyses have isolated the important role of social vulnerability as a determinant of disaster impacts. A study of 832 floods in 74 Texas counties found a statistically significant correlation between social vulnerability, as measured by racial minority or low-income status, and flood deaths or injuries. Sammy Zahran et al., *Social Vulnerability and the Natural and Built Environment: A Model of Flood Casualties in Texas*, 32 *DISASTERS* 552-553, 555 (2008).

³⁷ See Alice Kaswan, *Environmental Justice and Domestic Climate Change Policy*, 38 ENVTL. L. REP. 10,287, 10,289 (2008) (describing the environmental justice movement's distributive, participatory, and social justice goals and their influence on the movement for climate justice); see generally LUKE W. COLE & SHEILA FOSTER, *FROM THE GROUND UP: ENVIRONMENTAL RACISM AND THE RISE OF THE ENVIRONMENTAL JUSTICE MOVEMENT* (2001) (describing the environmental justice movement's focus on distributional outcomes, participatory processes, and institutional structures).

³⁸ See M. L. PARRY ET AL., *supra* note 29, at 102-113; RUTH ET AL., *supra* note 30. In addition to economic considerations, avoiding harm has important social, cultural, and psychological benefits.

³⁹ PASTOR ET AL., *supra* note 13, at 30-31; VERCHICK, *supra* note 6, at 165.

⁴⁰ See, e.g., VERCHICK, *supra* note 6; Craig, *supra* note 18.

⁴¹ See James K. Boyce, *Let Them Eat Risk? Wealth, Rights and Disaster Vulnerability*, 24 *DISASTERS* 254, 257 (2000) (stating that "the wealth-based approach holds that ... those individuals who are willing (and, perforce, able) to pay more, deserve to get more [disaster vulnerability reduction]").

⁴² See PASTOR ET AL., *supra* note 13, at 7 (arguing that a market-based approach to disaster preparedness "is a recipe for targeting those with the least

power in the social calculus"); VERCHICK, *supra* note 6, at 149; See Debra Lyn Bassett, *Place, Disasters, and Disability*, in *LAW AND RECOVERY FROM DISASTER*, *supra* note 6, at 51, 68.

⁴³ See Debra Lyn Bassett, *The Overlooked Significance of Place in Law and Policy: Lessons from Hurricane Katrina*, in *RACE, PLACE, AND ENVIRONMENT*, *supra* note 23, at 49, 57; Boyce, *supra* note 41, at 257 (observing that relying on individual willingness-to-pay for disaster reduction would distribute reductions in a manner "strongly correlated with wealth").

⁴⁴ See generally PASTOR ET AL., *supra* note 13, at 25-27 (describing how reconstruction programs have not been sufficient to fully address the needs of low-income disaster victims). For example, in post-Katrina New Orleans, the Mayor proposed that the city should decide where to invest in new infrastructure and support rebuilding by evaluating where rebuilding was already occurring. That approach would privilege areas where residents had sufficient resources to rebuild and disadvantage areas where residents did not have sufficient resources. John R. Logan, *Unnatural Disaster: Social Impacts and Policy Choices After Katrina*, in *RACE, PLACE, AND ENVIRONMENTAL JUSTICE*, *supra* note 23, at 249, 257.

⁴⁵ See PASTOR, ET AL., *supra* note 13, at 11 (observing, in the environmental justice context, that "lower-income residents may be willing to trade off health risks for cheaper housing").

⁴⁶ See HEATHER COOLEY ET AL., *SOCIAL VULNERABILITY TO CLIMATE CHANGE IN CALIFORNIA* 1 (2012); NAT'L RESEARCH COUNCIL, *supra* note 7, at 55; MORELLO-FROSCH ET AL., *supra* note 30, at 22. The California Energy Commission commissioned a study that not only identified 19 discrete physical and social vulnerability factors, but evaluated their cumulative impact by creating an overarching climate vulnerability index to score different areas of the state, and then indicated where high social vulnerability "intersects with the most severe projected climate change impacts." COOLEY, *supra* at ii.

⁴⁷ Statistical Abstract of the United States, *Table 711, People Below Poverty Level and Below 125 % of Poverty Level by Race and Hispanic Origin: 1980-2009*, available at <http://www.census.gov/compendia/statab/2012/tables/12s0711.pdf> (indicating that, as of 2009, African-Americans and Hispanics were twice as likely as whites to be below the poverty level: over 25 percent, in comparison with the white population's 12.3 percent poverty rate).

⁴⁸ See, e.g., PASTOR ET AL., *supra* note 13, at 19-21; CALIFORNIA CLIMATE CHANGE CENTER, *THE IMPACTS OF SEA-LEVEL RISE ON THE CALIFORNIA COAST* 46 (2009) [hereinafter *THE IMPACTS OF SEA-LEVEL RISE*], available at: <http://www.energy.ca.gov/2009publications/CEC-500-2009-024/CEC-500-2009-024-F.PDF> (describing income- and race-based disparities in disaster preparation).

⁴⁹ The Federal Emergency Management Agency has several programs that provide some resources for hazard mitigation both pre- and post-disaster, resources that could be targeted toward the most vulnerable populations. See FEMA, *HAZARD MITIGATION GRANT PROGRAM*, <http://www.fema.gov/hazard-mitigation-grant-program> (describing). See also USGCRP REPORT, *supra* note 4, at 91 (describing Philadelphia's "Cool Home Program," which provides low-income elderly residents with roof retrofits to cool their homes and save energy).

⁵⁰ See Robert D. Bullard, Glenn S. Johnson, and Angel O. Torres, *Transportation Matters: Stranded on the Side of the Road Before and After Disasters Strike*, in *RACE, PLACE, AND ENVIRONMENTAL JUSTICE*, *supra* note 23, at 63, 66-67 (noting racial disparities in automobile ownership). In Hurricane Katrina, 55 percent of those who failed to evacuate did not own cars. See *THE IMPACTS OF SEA-LEVEL RISE*, *supra* note 48, at 49.

⁵¹ See PASTOR, ET AL., *supra* note 13, at 23 (describing disaster studies indicating that poor and minority populations are more likely to resort to tent cities and mass shelters); Scott Gold, *Trapped in the Superdome: Refuge Becomes a Hellhole*, SEATTLE TIMES (Sept. 1, 2005) (describing horrific shelter conditions, conditions that could deter residents from evacuating).

⁵² See Shonkoff, *supra* note 24, at S488 (observing that low-income and of-color residents are less likely to have air conditioning); COOLEY ET AL., *supra* note 46, at 6 (citing study that poor people are less likely to use air conditioning, even if they have it, due to financial concerns).

⁵³ See Bullard, et al., *supra* note 23, at 70. Recent data suggests that, despite some recent improvements, many states and local governments have not adequately addressed evacuation needs for carless and special-needs populations. See Bullard et al, *supra* note 23, at 69, 76, and 77-78 (describing studies).

⁵⁴ See BULLARD & WRIGHT, *supra* note 2, at 75, 98 (noting that green building "that fails to address issues of affordability, access, and equity may open the floodgates for permanent displacement of low-income and minority homeowners and business owners").

⁵⁵ See PASTOR ET AL., *supra* note 13, at 11.

⁵⁶ See Craig, *supra* note 18, at 55 (discussing possibility of mass migrations in response to climate impacts).

- ⁵⁷ See Bassett, *supra* note 42, at 64-65.
- ⁵⁸ See COOLEY ET AL., *supra* note 46, at 5 (noting the role of age in vulnerability to heat). In the 2003 European heat wave, many of the deaths were among the elderly. See “Over 11,000” Dead in French Heat, *BBC News*, Aug. 29, 2003, <http://newsvote.bbc.co.uk/mpapps/pagetools/print/news.bbc.co.uk/2/hi/europe/3190585.stm>.
- ⁵⁹ See Bassett, *supra* note 42 and 43; Janet E. Lord, Michael E. Waterstone, & Michael Ashely Stein, *Natural Disasters and Persons with Disabilities*, in *Law and Recovery from Disaster*, *supra* note 6, at 71.
- ⁶⁰ See THE IMPACTS OF SEA-LEVEL RISE, *supra* note 48, at 48.
- ⁶¹ See PASTOR ET AL., *supra* note 13, at 24; THE IMPACTS OF SEA-LEVEL RISE, *supra* note 48, at 50.
- ⁶² Although property owners, unlike renters, have lost an asset, renters nonetheless encounter severe post-disaster conditions. Post-disaster, the demand for rental housing skyrockets, leading to significant increases in rents and serious shortages of affordable rentals. See PASTOR ET AL., *supra* note 13, at 24; see also Lisa K. Bates & Rebekah A. Green, *Housing Recovery in the Ninth Ward: Disparities in Policy, Process, and Prospects*, in *RACE, PLACE, AND ENVIRONMENTAL JUSTICE*, *supra* note 23, at 229, 231 (describing renters post-Katrina challenges).
- ⁶³ See, e.g., VERCHICK, *supra* note 5, at 138-39 (describing insufficient development of rental housing in post-Katrina New Orleans); Robbie Whelan, *A Texas-Size Housing Fight*, *THE WALL STREET JOURNAL*, Aug. 3, 2012, at A3 (describing local resistance to re-building affordable public housing in Galveston, Texas).
- ⁶⁴ See Shonkoff, *supra* note 24, at S489-90; COOLEY ET AL., *supra* note 46, at 6.
- ⁶⁵ See, e.g., NAT’L RESEARCH COUNCIL, *supra* note 7, at 70, 71 (observing importance of “early warning systems” and “public outreach” to adapting to extreme events and disease risks from contaminated water and disease outbreaks) and 71. See also Sari Kovats & Shakoori Hajat, *Heat Stress and Public Health: A Critical Review*, 29 *ANN. REV. PUB. HEALTH* 41, 49 (2008) (observing importance of health education to reducing impacts from heat waves).
- ⁶⁶ See NAT’L RESEARCH COUNCIL, *supra* note 7, at 70.
- ⁶⁷ See TED WANG & LUNA YASUI, *INTEGRATING IMMIGRANT FAMILIES IN EMERGENCY RESPONSE, RELIEF AND REBUILDING EFFORTS 1-3* (2008), available at <http://www.aecf.org/~media/PublicationFiles/IR3622H122.pdf>.
- ⁶⁸ See *id.* at 9-11.
- ⁶⁹ See PASTOR, *supra* note 13, at 25. As states begin to enact laws requiring police officers to check and report on immigration status, a practice upheld by the Supreme Court in *Arizona v. United States*, 132 S.Ct. 2492, 183 L.Ed.2d 351 (2012), immigrants are likely to become increasingly reluctant, rather than more willing, to interface with government officials. See ‘Copycat Immigration Laws,’ *THE WASHINGTON POST*, Sept. 29, 2011, http://www.washingtonpost.com/politics/copycat-immigration-laws/2011/09/29/gIQA993Y7K_graphic.html.
- ⁷⁰ See WANG & YASUI, *supra* note 67, at 4.
- ⁷¹ See *id.* at 1 and 6-7 (describing important role that community organizations could play in enhancing emergency response for “limited-English proficient (LEP) residents and immigrants”).
- ⁷² See Bates & Green, *supra* note 62, at 243 (observing that post-Katrina recovery would have better served African-American neighborhoods if community-based organizations had been involved in planning and outreach early in the recovery process); BULLARD & WRIGHT, *supra* note 2, at 215-16 (describing the importance of cultural awareness in disaster communications and detailing several techniques for developing effective communication).
- ⁷³ As the Department of Health and Human Services has recognized, as a result of experiences of racial discrimination, “racial and ethnic minority groups may distrust offers of outside assistance . . . even following a disaster . . . They may be unfamiliar with the social and cultural mechanisms of receiving assistance and remain outside the network of aid.” DEP’T OF HEALTH AND HUMAN SERVICES, *supra* note 56; BULLARD & WRIGHT, *supra* note 2, at 216-17 (discussing studies showing blacks’ mistrust of white relief agencies).
- ⁷⁴ Recognizing the importance of personal outreach, Philadelphia instituted a “buddy system” run by block captains to check on elderly residents during heat waves. See USGCRP REPORT, *supra* note 4, at 91.
- ⁷⁵ See THE IMPACTS OF SEA-LEVEL RISE, *supra* note 48, at 89; PASTOR, ET AL., *supra* note 13, at 35; MORELLO-FROSCH ET AL., *supra* note 30, at 24.
- ⁷⁶ See Verchick, *supra* note 6, at 61-62, 67 (identifying the fundamental importance of democratic participation in mechanisms to reduce vulnerability).
- ⁷⁷ See Luke W. Cole, *Empowerment as the Key to Environmental Protection: The Need for Environmental Poverty Law*, 19 *ECOLOGY L. QUARTERLY* 619 (1992) (describing the environmental justice movement’s community empowerment goals); Sheila Foster, *Justice from the Ground Up: Distributive Inequities, Grassroots Resistance, and the Transformative Politics of the Environmental Justice Movement*, 86 *CAL. L. REV.* 775 (1998).
- ⁷⁸ See PASTOR ET AL., *supra* note 13, at 21; WANG & YASUI, *supra* note 67, at 7.
- ⁷⁹ See WANG & YASUI, *supra* note 67, at 5.
- ⁸⁰ See Foster, *supra* note 77, at 834-36.
- ⁸¹ See Craig, *supra* note 13, at 536-37 (discussing contamination from inundated sewage treatment facilities); see also PASTOR ET AL., *supra* note 13, at 30; VERCHICK, *supra* note 5, at 133 (discussing risks of inundated industries, landfills, or hazardous waste sites).
- ⁸² Craig, *supra* note 18, at 43-45 (articulating climate change adaptation principle #2: “Eliminate or Reduce Non-climate Stresses and Otherwise Promote Resilience,” and sub-principle: “Decontaminate Land, Water, and Air, and Reduce New Pollution as Much as Possible”).
- ⁸³ See, e.g., COLE & FOSTER, *supra* note 37, at 167-83 (Appendix: “An Annotated Bibliography of Studies and Articles that Document and Describe the Disproportionate Impact of Environmental Hazards by Race and Income”); see also VERCHICK, *supra* note 6, at 167-70 (suggesting that policymakers should prioritize addressing existing hazards, like landfills and contaminated sites, in at-risk areas).
- ⁸⁴ See EPA, OFFICE OF WATER, NATIONAL WATER PROGRAM STRATEGY: RESPONSE TO CLIMATE CHANGE 45-47 (2008), available at <http://water.epa.gov/scitech/climatechange/upload/2008-National-Water-Program-Strategy-Response-to-Climate-Change.pdf> (discussing need to manage storm water and infrastructure to reduce contamination).
- ⁸⁵ See Craig, *supra* note 13, at 538 (suggested expedited cleanup of contaminated sites in coastal areas). Disaster considerations could also significantly impact the choice of remedy, reducing the desirability of “institutional controls,” like land use restrictions, that leave contamination in place and at risk of flooding.
- ⁸⁶ See USGCRP REPORT, *supra* note 4, at 92-94 (describing how increasing temperatures could worsen air quality).
- ⁸⁷ See NAT’L RESEARCH COUNCIL, *supra* note 7, at 71. The IPCC has noted that many initiatives to address projected increases in extreme events have multiple co-benefits that render them “low regrets” policies. IPCC, *MANAGING THE RISKS*, *supra* note 9, at 16, 17.
- ⁸⁸ This Essay addresses mitigation measures that create equity issues, a subset of the larger issue of maladaptation. Non-equity related maladaptive mitigation measures, like thermal solar power plants that consume large volumes of water in areas expecting future shortages, are important but beyond the scope of this Essay.
- ⁸⁹ See Alice Kaswan, *Climate Change, Consumption, and Cities*, *FORDHAM URB. L.J.* 253, 280-81 (2009).
- ⁹⁰ See BRIAN STONE, JR., *THE CITY AND THE COMING CLIMATE: CLIMATE CHANGE IN THE PLACES WE LIVE* 75-76 (2012).
- ⁹¹ See USGCRP REPORT, *supra* note 4, at 92 (noting that poor air quality is an especially serious concern in cities); EPA, *supra* note 21, at 19 (noting that toxic air pollution levels are higher in urban areas).
- ⁹² See Lisa Grow Sun, *Smart Growth in Dumb Places: Sustainability, Disaster, and the Future of the American City*, 2011-6 *BYU L. REV.* 2157, 2168-69.
- ⁹³ See *id.* Increased development is inconsistent with a sustainable long-term land use strategy in many of these high-risk areas. *Id.* at 2160-61. See also *id.* at 2166-68 (describing disaster risks associated with increasing density in urban areas).
- ⁹⁴ See NAT’L RESEARCH COUNCIL, *supra* note 7, at 70 (noting that, in the long term, reducing health risks could require “urban design to minimize the urban heat island effect through greater use of trees and green spaces”).
- ⁹⁵ See Sun, *supra* note 92, at 2199-200 (describing urban design patterns that facilitate long-term strategic retreat if it proves necessary).
- ⁹⁶ See NAT’L RESEARCH COUNCIL, *supra* note 7, at 49 (regarding potential increases in energy costs from a switch to renewable energy).
- ⁹⁷ See USGCRP REPORT, *supra* note 4, at 54-55; ENVIRONMENTAL HEALTH PERSPECTIVES & THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES, *A HUMAN HEALTH PERSPECTIVE ON CLIMATE CHANGE: A REPORT OUTLINING THE RESEARCH NEEDS ON THE HUMAN HEALTH EFFECTS OF CLIMATE CHANGE* 30-31 (2010), available at: http://www.cdc.gov/climateandhealth/pubs/HHCC_Final_508.pdf.
- ⁹⁸ See NAT’L RESEARCH COUNCIL, *supra* note 7, at 50.
- ⁹⁹ IPCC REPORT, *MANAGING THE RISKS*, *supra* note 9, at 20.
- ¹⁰⁰ IPCC REPORT, *MANAGING THE RISKS*, *supra* note 9, at 11.
- ¹⁰¹ See Susan L. Cutter, *The Geography of Social Vulnerability: Race, Class, and Catastrophe*, in *Understanding Katrina: Perspectives from the Social Sciences*, Jun. 11, 2006, available at <http://forums.ssrc.org/understandingkatrina/the-geography-of-social-vulnerability-race-class-and-catastrophe/> (stating that “[s]ocial vulnerability involves the basic provision of health care, the livability of places, overall indicators of quality of life, and accessibility to lifelines (goods, services, emergency response personnel), capital, and political representation”).