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Introducing Concepts of Equitable Climate Adaptation

This is an introduction to a series of case studies that examine efforts by states and localities to conceptualize and implement climate adaptation policies and programs that focus on equity as a goal and guiding principle. Part 1 of the series (released with this introduction) focuses on procedural equity. Part 2 of the series will focus on distributional equity.

As attention increasingly turns to the palpable or insidious health impacts from climate change—impacts that more and more people in the United States are experiencing firsthand—communities and governments are searching with greater urgency for ways to ensure the safety of residents. Trust for America's Health (TFAH) aims to help make health equity—a condition in which everyone has an equitable opportunity to enjoy optimal health—a foundational principle of policymaking at all levels, including in climate policies. Hopefully, this empirical examination of promising approaches will spotlight and spread awareness of useful models for peer practitioners to tailor and emulate in their own locations, as well as inspire additional ideas.

The series is organized around two primary dimensions of equity: (1) procedural equity, which relates to the inclusiveness and accessibility of the process employed to conceptualize, design, and administer programs; and (2) distributional equity, which relates to the level of fairness in allocating program benefits and burdens.

Part 1 of the series, which focuses on procedural equity, includes the following cases:

- SB 1072 in California, a law meant to help build the capacity of disadvantaged communities to access competitive grants that support climate-related adaptation and mitigation.
- LA SAFE in Louisiana, a program intended to increase resilience and economic prosperity of coastal communities.
- Beat the Heat in Philadelphia, an initiative designed to increase residents' capacity to cope with extreme heat safely and comfortably, as well as to reduce its intensity.

Part 2 of the series, which focuses on distributional equity, includes three models of community land trusts (trusts formed to acquire, develop, and steward land for community uses):

- Dudley Neighbors, Inc., Boston, Massachusetts.
- Louisiana Land Trust.
- Sawmill Community Land Trust, Albuquerque, New Mexico.

The selection of these cases was informed in part by the Georgetown Climate Center's *Equitable Adaptation Legal & Policy Toolkit*, which was released in 2020 and contains a more expansive scan of exemplars. Cases were selected based on several factors, including replicability and diversity of geography, objective, and intervention type.

In December 2020, TFAH, in partnership with the Johns Hopkins Bloomberg School of Public Health, published a report, *Climate Change & Health: Assessing State Preparedness*, that examined states' readiness to protect residents from the health impacts of climate change in light of the nature and level of the risks that they face. The results provided a portrait of state-level preparedness, demonstrating that while every state had engaged in at least some level of planning and preparation, there was significant variation and, in many places, a great deal of room for further action. Critically, the report emphasized that people and places are not affected equally, with impacts varying due to environmental, social, and demographic factors. Of greatest concern, the report concluded that states with the highest levels of vulnerability—predominantly located in the Southeast—tended to be among the least prepared.

Building on those findings, TFAH is releasing a series of briefs that spotlight promising climate-adaptation approaches communities have employed to strengthen resilience and

protect residents. Importantly, each case shares a key feature: they center equity. That is, they were explicitly administered and/or designed to help ensure the frontline communities that typically bear the brunt of climate-related health impacts play a leadership role in conceptualizing plans and stand to receive their fair share of the benefits and burdens.

The aim of these briefs is to draw attention to successful efforts and to share practical information that might be useful to practitioners, such as the trigger or catalyst for action, who served as public point people, key obstacles and how they were overcome, and the priority populations of concern.

Health Threats Posed by Climate Change

Earth's climate is changing at a rate with little precedent,[1] posing serious threats to human health.

In its 2014 assessment, the Intergovernmental Panel on Climate Change (IPCC), the scientific body that informs the climate policies of the United Nations' member states, found that each of the past three decades were hotter than any preceding decade since 1850, and that 1983 to 2012 was likely the warmest 30-year period in the Northern Hemisphere over the past 1,400 years.[2] More recently, 2020 tied 2016 for the hottest year on record.[3] The past seven years have been the warmest observed.[4] This continues a trend that dates back to the 1960s: each decade has been warmer than the previous one.[5]

The evidence is clear that the climate is changing and that it will continue changing for at least the next century. A certain amount of global warming can no longer be avoided: carbon dioxide and other greenhouse gases can persist in the atmosphere for hundreds of years or longer, and oceans are slowly absorbing the heat trapped by these gases.[6,7] Climate change is, therefore, a manifestation of past actions over decades. Global average temperature rose by about 1.8 degrees Fahrenheit (1.0 degrees Celsius) from 1901 to 2016,[8] and scientists predict that past greenhouse gas emissions will result in at least an additional 1.1 degrees Fahrenheit (0.6 degrees Celsius) of warming over this century.[9] Absent considerable emissions reductions going forward, annual average temperatures could rise by 9 degrees Fahrenheit (5 degrees Celsius) or more by the end of this century, relative to preindustrial times, increasing the severity of future hazards, including extreme heat, heavy rains, flooding, wildfires, and drought, as well as the secondary implications for economies, political systems, and health.[10]

The United States is already experiencing the effects. From 1901 to 2016, average annual temperature over the contiguous United States increased by about 1.8 degrees Fahrenheit (1.0 degrees Celsius); and recent decades were the warmest in at least 1,500 years.[11] The western half of the country, including Alaska, experienced the largest increases in annual temperature, but warming in the Southeast has accelerated since the 1960s. As a consequence of past emissions, scientists expect the United States to see an additional 2.5 degrees Fahrenheit (1.4 degrees Celsius) increase in annual average temperature by around 2050.[12] Much larger increases are possible by the end of the century.

In parts of the United States, extreme weather events are becoming almost commonplace. Western states, particularly California, have experienced record-breaking droughts and high temperatures, coupled with ruinous wildfires and mudslides. Three-quarters of California's 20 most destructive fires—measured by the number of structures destroyed—had happened since 2015, as of April 2021.[13] Unusually powerful hurricanes have plagued the Caribbean, the Southeast, and Texas, with Hurricane Harvey dumping four feet of rain on Houston and Hurricane Maria devastating Puerto Rico in 2017.[14,15] Although it is difficult to attribute any single event to climate change, scientists are increasingly confident of its link to the greater frequency and intensity of these extreme events.[16,17]

Hurricanes, wildfires, and other extreme events pose a clear threat to human health and safety. Other health impacts of climate change are less apparent, but no less important. Many health outcomes are linked to environmental factors and, as such, are sensitive to changes in climate and weather. These changes affect human health through a variety of pathways. Climate variables such as temperature and precipitation, for example, can act directly as stressors on human health; they can also create conditions that give rise to other health threats, such as infectious diseases or changes in air and water quality.

The U.S. federal government has identified several categories of climate-related health impacts (see Figure 1.):[18]

- Temperature-related death and illness.
- Air quality impacts (e.g., particulate matter and ozone precursors from wildfires).

- Impacts of extreme events (e.g., hurricanes, floods, wildfires, major storms) on human health.
- Vector-borne diseases (e.g., Lyme disease, West Nile virus, Zika virus).
- Water-related illness (e.g., contamination of drinking and recreational water sources from increased runoff or infrastructure failures).
- Food safety, nutrition, and distribution.
- Mental health and well-being.

Figure 1. Examples of Climate-Related Health Impacts

	Climate Driver	Exposure	Health Outcome	Impact
Extreme Heat	More frequent, severe, prolonged heat events	Elevated temperatures	Heat-related death and illness	Rising temperatures will lead to an increase in heat-related deaths and illnesses.
Outdoor Air Quality	Increasing temperatures and changing precipitation patterns	Worsened air quality (ozone, particulate matter, and higher pollen counts)	Premature death, acute and chronic cardiovascular and respiratory illnesses	Rising temperatures and wildfires and decreasing precipitation will lead to increases in ozone and particulate matter, elevating the risks of cardiovascular and respiratory illnesses and death.
Flooding	Rising sea level and more frequent or intense extreme precipitation, hurricanes, and storm surge events	Contaminated water, debris, and disruptions to essential infrastructure	Drowning, injuries, mental health consequences, gastrointestinal and other illness	Increased coastal and inland flooding exposes populations to a range of negative health impacts before, during, and after events.
Vector-Borne Infection (Lyme Disease)	Changes in temperature extremes and seasonal weather patterns	Earlier and geographically expanded tick activity	Lyme disease	Ticks will show earlier seasonal activity and a generally northward range expansion, increasing risk of human exposure to Lyme disease-causing bacteria.
Water-Related Infection (*Vibrio vulnificus*)	Rising sea surface temperature, changes in precipitation and runoff affecting coastal salinity	Recreational water or shellfish contaminated with *Vibrio vulnificus*	*Vibrio vulnificus* induced diarrhea & intestinal illness, wound and bloodstream infections, death	Increases in water temperatures will alter timing and location of *Vibrio vulnificus* growth, increasing exposure and risk of waterborne illness.
Food-Related Infection (*Salmonella*)	Increases in temperature, humidity, and season length	Increased growth of pathogens, seasonal shifts in incidence of *Salmonella* exposure	*Salmonella* infection, gastrointestinal outbreaks	Rising temperatures increase *Salmonella* prevalence in food; longer seasons and warming winters increase risk of exposure and infection.
Mental Health and Well-Being	Climate change impacts, especially extreme weather	Level of exposure to traumatic events, like disasters	Distress, grief, behavioral health disorders, social impacts, resilience	Changes in exposure to climate- or weather-related disasters cause or exacerbate stress and mental health consequences, with greater risk for certain populations.

Source: U.S. Global Change Research Program[19]

Each of these categories represents known and, in many cases, longstanding threats to human health. That is, climate change exacerbates existing threats through increased frequency, duration, and intensity of exposure. It also shifts or expands the locations of exposures, introducing threats to populations that were not previously at risk.

In addition to its direct effects on human health, climate change may also produce disruptions to healthcare, social services, and other systems that are critical to a community's ability to manage or respond to health needs. This threat is particularly evident with natural disasters, which often destroy infrastructure, disrupt power and water supplies, and require a large-scale response. Even a prolonged heat wave or an extremely hot day may overwhelm power grids as people rely more heavily on fans and air conditioners.

While meaningful steps must be taken to reduce future emissions and to curtail the warming trend, such actions would only limit the magnitude and intensity of climate change and its impacts; past emissions and limitations of current carbon-dioxide removal technologies mean that these impacts cannot be entirely averted. Thus, it is essential that people everywhere prepare to adapt.

Mitigation and Adaptation

The policy response to climate change falls into two major categories: (1) mitigation and (2) adaptation. Mitigation refers to actions that slow down or reduce the magnitude of climate change, primarily by reducing emissions of greenhouse gases or removing such gases from the atmosphere. Adaptation refers to the process of adjusting to the effects of actual or expected climate change by making decisions or investments to counter specific risks.[20,21] The global IPCC and the U.S. Global Change Research Program's Fourth National Climate Assessment both stress that mitigation and adaptation are complementary strategies, each essential to minimizing the human impacts of climate change.

Both mitigation and adaptation can reduce injuries, illnesses, and deaths from climate-related health outcomes, but there are differences related to how quickly and locally some benefits may be realized. Much of the work of mitigation operates over a long time horizon to reduce future risks, while adaptation focuses on limiting the risk and impact of changes that are already underway and fueled by past greenhouse gas emissions.[22] Adaptation is grounded in the recognition that, based on past emissions, some level of climate change is inevitable, and people must prepare to live in a changing environment.[23] Its benefits are more immediate than many mitigation efforts. The risks posed by climate change are context- and place-specific, so adaptation takes place primarily at the state and local level, though they require federal support and assistance.[24,25] Because adaptation focuses on addressing specific risks, interventions can be directed toward reducing vulnerabilities and increasing the resilience of specific groups or communities.

Many of the benefits of mitigation actions are more diffuse, accruing globally instead of locally, though some—improved health owed to safer air quality or more active modes of transportation—materialize more swiftly for the communities engaged in them and can reduce related inequities.[26]

Adaptive actions are meant to manage climate-related risks, which are driven by exposure and sensitivity to hazards. The greater the adaptive capacity and follow-through—among individuals, businesses, governments, and other sectors—the lower the risk. With respect to health impacts, adaptation involves assessing vulnerabilities of a location or community to specific threats (e.g., extreme heat, flooding, vector-borne diseases), identifying evidence-based interventions, developing and implementing a plan, and then monitoring and evaluating the interventions to pinpoint and address weaknesses. The U.S. Centers for Disease Control and Prevention, through its Climate and Health Program, provides a step-by-step guide for governments and others to follow.[27]

There are numerous adaptive approaches to address the most pressing threats. For example, to help protect people from extreme heat, an area might employ a mix of early warning systems, infrastructure upgrades to prevent blackouts, cooling shelters, and an expansion of green spaces. To combat West Nile virus and other mosquito-borne infections, a community might look to destroy breeding sites. Localities might employ crisis-counseling services to people whose mental health has been harmed by a traumatic disaster.

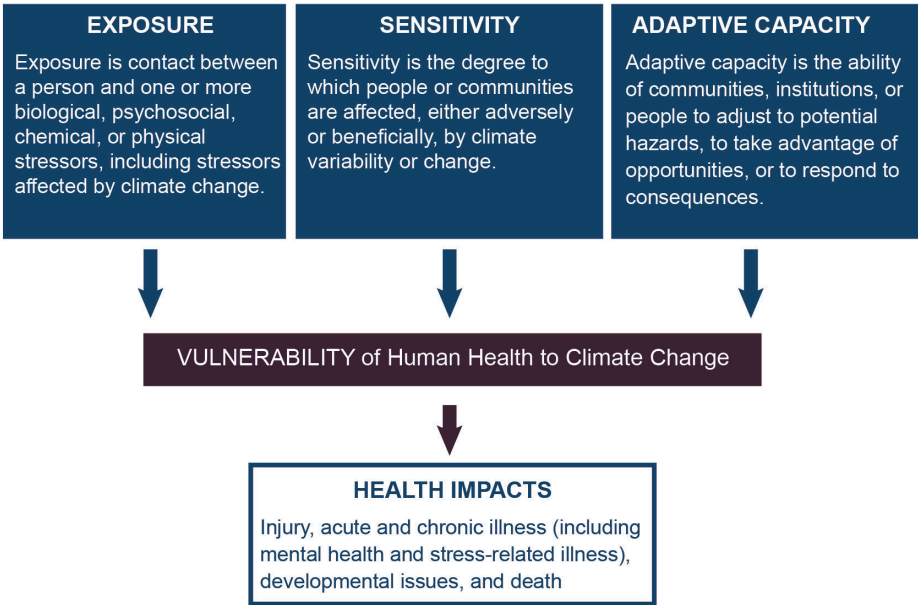
Climate-related adaptation, a vital element of public health preparedness efforts, is the focus of this series.

Disparate Impacts and Equitable Adaptation

Climate change in the United States will affect the health of some communities or people more than others. Vulnerability incorporates place-based exposure to climate-related impacts (e.g., proximity to a coastline), as well as demographic characteristics (e.g., age, socioeconomic status) that shape a person's sensitivity to exposures and their ability to cope.[28] (See Figure 2.) Some are more vulnerable because of age (e.g., children, older adults) or preexisting medical conditions (e.g., diabetes, asthma). People who work outdoors or as first responders may face greater exposure. Climate-related power failures and other service disruptions have a disproportionate impact on people with existing health conditions who require daily medication or treatment (e.g., dialysis), who have limited mobility, or who are more sensitive to exposures such as high temperatures or poor air quality. Many medications and life-saving medical devices require a stable supply of electricity. People who lack reliable transportation or financial resources may find it more difficult to access services elsewhere in the event of a disruption.

Large portions of some populations and communities, such as immigrants, people of color, and people living in poverty, may have less access to resources that would allow them to avoid exposures, seek care or treatment, or navigate long-term recovery, such as rebuilding after a fire or flood. Communities with fewer resources may be unable to meet demand for services like cooling centers, even as they suffer from greater sun exposure without the natural protection afforded to wealthier communities with more extensive tree canopies, a difference with historical ties to discriminatory housing policies such as "redlining."[29,30]

FIGURE 2. Exposure, Sensitivity, and Adaptive Capacity Determine Vulnerability



Source: U.S. Global Change Research Program[34]

In many cases, vulnerability to the health impacts of climate change reflects and exacerbates preexisting health risk factors and disparities.[31] In the United States, the legacy of colonization, slavery, and ongoing structural and systemic racism—including concentrated poverty and inequities in wealth, health, education, housing, and transportation—contribute mightily to health disparities between white and nonwhite populations and, in particular, between white and Black and white and Native American populations.

Importantly, vulnerability is not an intrinsic or static characteristic; it varies over time and place, as well as across life stages.[32] Moreover, in many cases, it is not innate, but rather the result of past and ongoing policies and practices rooted in structural and systemic inequities or discrimination.[33] Therefore, it can be reduced through strategic planning and preparation, as well as through equitable policymaking and investment.

Owing to the disparate impacts of climate-related health hazards, centering equity in adaptation efforts is a just imperative and a chance to right past wrongs by fostering broad-based opportunity, security, and resilience. In general, equitable adaptive actions can be divided into two categories: (1) procedural equity and (2) distributional equity.[35] (See Figure 3.)

As its name implies, procedural equity relates to the process employed to conceptualize, design, and administer adaptive policies and programs. Adaptation has five general stages:[36,37]

1. Exploration of hazards.

2. Assessment of vulnerability and risks.

3. Investigation of options.

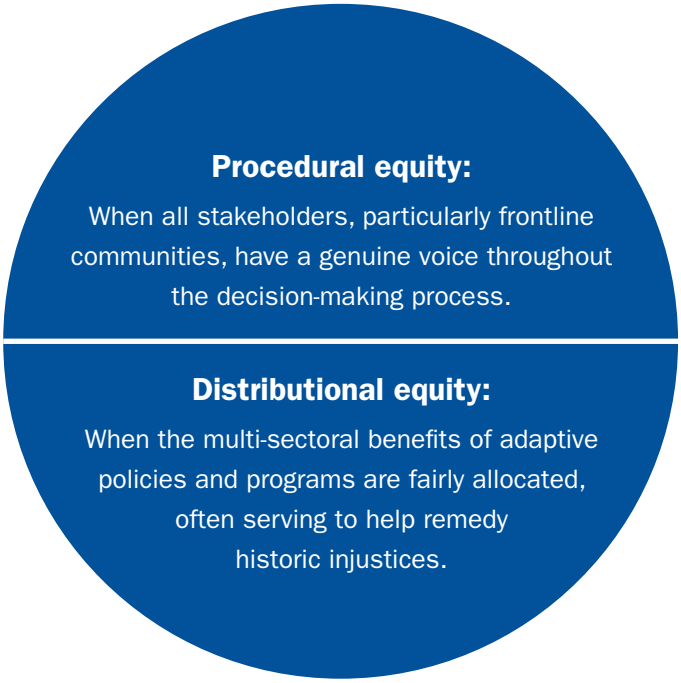
4. Prioritization and planning.

5. Implementation and evaluation.

Procedural equity is achieved when a wide range of stakeholders, particularly those who stand to be most harmed by the hazards a community is attempting to address, have a genuine voice and decision-making role at each stage, rather than perfunctory inclusion after options have been narrowed or decisions have been effectively made. Equitable processes are informed throughout by the insights, priorities, and needs of people who have first-hand lived experience navigating relevant threats.

Distributional equity is tied to outcomes. That is, it reflects the extent to which adaptive actions result in a fair allocation (i.e., one that prioritizes those at highest risk) of benefits and burdens across a host of interrelated sectors, including economic; housing; natural space (e.g., green space); affordable and reliable renewable energy; water management, access, and quality; disaster preparedness, response, and recovery; health; and program funding.[38] Often distributional equity requires an allocation of benefits and burdens that takes account of past or ongoing injustices and underinvestment in communities that have been marginalized and serves as a remedy or partial redress.

Figure 3. Equity in the Climate Adaptation Context



Together, procedural equity and distributional equity represent two interdependent halves of an essential continuum of concerns for communities and governments to prioritize with intention. In some cases, procedural equity can be a prerequisite of or contributor to distributional equity. This series will explore cases that reflect a range of promising strategies. If we are to confront a changing climate in ways that are inclusive and ensure no one is systematically neglected or left behind, a fair and just approach requires an intentional focus on equity.

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