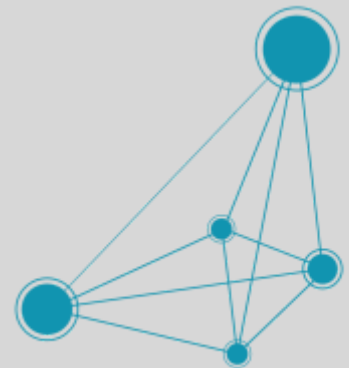


## New and Improved Hazard Mitigation Plan

### **PART III: INTEGRATING SOCIAL, ECOLOGICAL & CLIMATE CONSIDERATIONS BY CHAPTER**

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## What is this document? How do I use it?

Throughout this document, you will find boilerplate text that can be copied and pasted directly into your HMP or customized to meet your needs. This text is organized according to the HMP sections outlined by FEMA to streamline the process of helping you incorporate meaningful social, ecological, and climate considerations into your plan. At some points throughout this document, there will be call-out boxes like this one that are intended to offer guidance as well as give a heads up about content your team will need to generate independently or customize. For ease of use, any text that is **GRAY** can be directly copied and pasted. Any text in **RED** indicates an area for customization. All text meant to help guide you through this document will either be **BLACK** or in a **TEAL** call-out box.

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# SECTION I: INTRODUCTION

## I. SOCIAL EQUITY CONSIDERATIONS

### Social Equity Introduction – Global Context (ADVANCED)

Globally, free-markets and capitalism have created cultural and systemic infrastructures that prioritize consumption and economic growth above the welfare and sustainability of human and non-human communities. Notably, human health and wellbeing, ecological health, social equity, and egalitarianism have all been deprioritized in favor of profit. In every country, and across many different types of governmental structures, those with more resources depend on and enact the exploitation of those with fewer resources in an endless cycle. This results in fewer and fewer “uber-rich” individuals hoarding wealth while more and more people fall deeper into poverty or hover in a space of economic precarity. Additionally, wealth has been established as a key precipitant and indicator of societal achievement and reputation. Both wealth (economic capital) and one’s location in the social order (social capital) converge to predict one’s exposure to and rate of recovery from disasters ([Aldrich 2012](#)).

Particularly vulnerable populations that experience disproportionate impacts from climate change and disaster events include: people experiencing sudden and/or intergenerational poverty, people experiencing houselessness or housing precarity, people with disabilities, communities of color (especially Black Indigenous People of Color), people with legal and/or citizenship complications, older adults, people experiencing language barriers, people living in rural and isolated areas, people living in coastal regions and/or in island nations, people experiencing mental health crises, and people with chronic health conditions.

Capitalism on a global scale is inextricably intertwined with both racism and ableism. Capitalism cannot exist without racism. Robin D. G. Kelley, a Black historian and UCLA professor, describes that there is “no such thing” as a non-racist capitalism since capitalism developed and operates from within a racist system. [Kelley states](#): “Racism is essential for the production and reproduction of violence, and that violence is necessary for creating and maintaining capitalism.” This violence is enacted against the bodies of all living things, as well as the earth itself. Capital (and capitalism) did not begin with money, but rather with the seizure of natural resources (land, water, etc.) and the manipulation of cheap labor in order to commoditize these resources. The cheapest labor was free. Slavery, indentured servitude, and labor exploitation have been used repeatedly around the world to create a racially segmented working class, super-exploited by elites who are often whiter and wealthier.

Much like the violence of racism is used to maintain capitalism, ableism has historically been used as “justification” for both the oppression of disabled people as well as other marginalized groups ([Baynton, 2016](#)). For example, disability arguments were foundational in the maintenance of slavery, claiming that enslaved Africans lacked sufficient intelligence to be independent. In fact, Drapetomania and Dysaesthesia were two “formal” disabilities/mental illnesses invented in order to further subjugate enslaved Africans by describing them as untrustworthy and lazy. Similarly, eugenics movements relied on disability as justification for sterilization and mutilation, which was frequently racially motivated. In the 19th century, “freak shows” were spaces where racism and ableism intersected. Advertisements for soap during this time capitalized on the idea of dark skin as a defect in order to sell products ([Baynton, 2016](#)). These unscientific and inhumane classifications continue to have implications in the maintenance of racism today.

Racial capitalism and ableism have also contributed to the existence and maintenance of sexism, homophobia, and anti-immigrant nationalism on a global scale. Ableist and sexist beliefs that “overuse of the brain” would cause white women to become ill, and that they needed an education designed for their “frail constitutions,” were used flagrantly to justify their exclusion from receiving the same benefits as white men ([Baynton, 2016](#)). Women

of Color experienced the compounding and intersecting discriminations of ableism, sexism, and racism. The lingering stereotypes of women as emotional, irrational, and weak come from the historical roots of using disability as justification for oppression. For queer people, homosexuality was listed as a mental illness by the American Psychological Association until as recently as 1973. Trans, non-binary, and queer people with expansive relationships, sexualities, and gender expressions continue to be persecuted, harmed, and killed under the “justification” that they are disabled, ill, contagious, and dangerous. Black trans women represent a population made especially vulnerable to violence and murder, through their simultaneous exposure to racism, sexism, ableism, transphobia, homophobia, and other systems of oppression. Illustratively, the first major federal immigration law in the United States (Immigration Act of 1882) prohibited entry to any “lunatic, idiot, or any person unable to take care of himself or herself without becoming a public charge” ([Baynton, 2016](#)).

### **Social Equity Introduction – Global Context (INTERMEDIATE)**

Climate events and disasters have disproportionate effects on individuals, groups, and communities based on their access to resources, the presence of protective factors, and exposure to risk factors. Globally, wealth is a key protective factor, as is the social capital that predicts access to resources that can lessen exposure to disaster events, dampen their effects, and/or expedite recovery. Gaps between those with high means and those with low means are growing starker, resulting in poorer individuals, groups, and nations being hit first and worst by climate events.

Particularly vulnerable populations that experience disproportionate impacts from climate change and disaster events include: people experiencing sudden and/or intergenerational poverty, people experiencing homelessness or housing precarity, people with disabilities, communities of color (especially Black Indigenous People of Color), people with legal and/or citizenship complications, older adults, people experiencing language barriers, people living in rural and isolated areas, people living in coastal regions and/or in island nations, people experiencing mental health crises, and people with chronic health conditions.

### **Social Equity Introduction – Global Context (BEGINNER)**

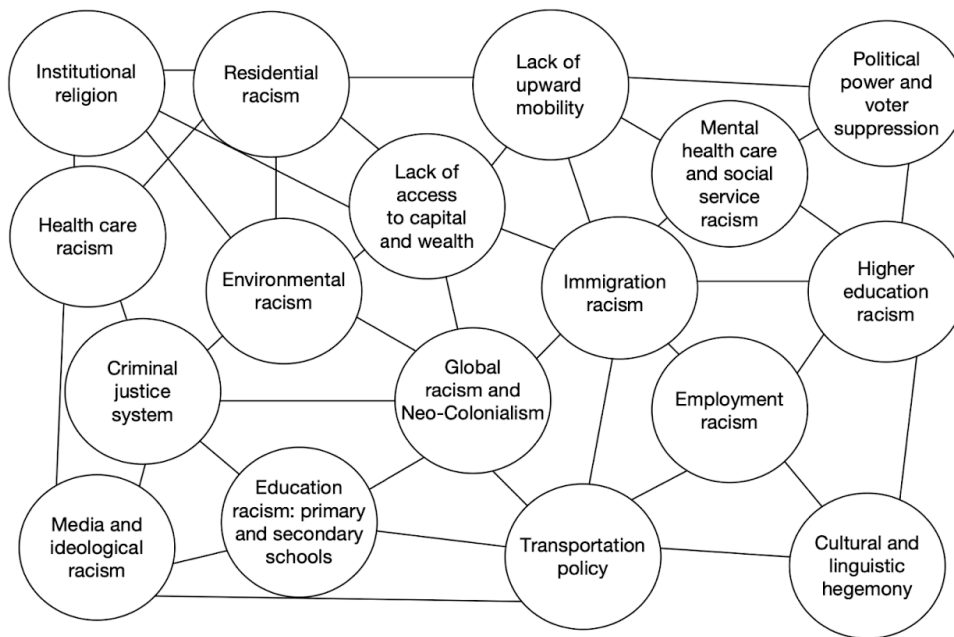
Hazard events and disasters have disproportionate effects on individuals, groups, and communities based on their access to resources, the presence of protective factors, and exposure to risk factors. Too many survivors of disasters struggle to access assistance programs and other resources (such as mental health supports) to help them progress through their recovery. Specifically, low-income neighborhoods, communities of color, people with disabilities and older adults, those with language barriers and those living in rural and isolated areas represent some of the populations disproportionately impacted by disasters. This plan supports [FEMA's initiative](#) to ensure that disaster assistance programs do not exacerbate inequitable conditions or outcomes for survivors.

Globally, access to financial resources is a key protective factor, as is the social capital that predicts access to resources that can lessen exposure to disaster events, dampen their effects, and/or expedite recovery. Gaps between those with high means and those with low means are growing starker, resulting in poorer individuals, groups, and nations being hit first and worst by climate events.

### **Social Equity Introduction – National Context (ADVANCED)**

In the United States, Black Indigenous People of Color (BIPOC), immigrants, and low-income people, known as frontline communities, have intentionally been made more vulnerable to the impacts of natural hazards and climate change due to decades of prejudiced policies and practices, inequitable power distribution, and withholding of assets and resources. Institutionalized racism, theft of land and water rights, and class bias began with colonization of the United States and have been foundational pillars that continue to create deep divisions within the country. Multiple, interlocking unjust systems have created higher levels of poverty and limited access to jobs, resources, transportation, and education for frontline communities (Figure 1 below). In an interview with Verso Books, Ruth Wilson Gilmore defined racism as “[group-differentiated vulnerability to premature death](#).” One such example of this is that BIPOC and low-income individuals are more likely to live in areas that environmental experts call [sacrifice zones](#). Over a quarter of a million Americans live in these zones,

and are exposed to rates of air pollution-caused cancer caused by air pollution that exceed the US government's determination of "acceptable risk." Often, just a few miles away from these sacrifice zones in wealthier, whiter communities, people die of cancer and other illnesses at much lower rates.



**Fig. 1.1 Web of Institutional Racism:** This Web indicates the multiple, interlocking and reinforcing forms of institutional racism affecting People of Color. Per original authors of this figure, "connecting lines are arbitrary and for illustration; in reality, each form of institutional racism connects with each other form in multiple ways." From: [Miller, J. & Garrañ, A. \(2017\). "The Web of Institutional Racism" \(pp. 72-116\). In \*Racism in the United States: Implications for the helping professions\*. Belmont, CA: Thomson Brooks/Cole.](#)

Prior to settler colonization by white Europeans in the 15<sup>th</sup> century, the lands occupied by the United States were home to many Indigenous nations and intricate and productive ecosystems that were intertwined with human livelihoods. Settler colonists intended to seize land for permanent inhabitation and exploitation. To do so, European settler colonists employed genocide, forced removal of indigenes, coercive labor (including chattel slavery), and forced assimilation ([Nakano-Glenn, 2015](#)). More specifically, settler colonists began by racializing the Native Americans and creating a norm of "whiteness" to which Indigeneity was a threat. Having 'othered' the Native Americans, the settlers engaged in genocidal practices and pursued the forced removal of Native Americans in order to get them off of the land they wanted to colonize. Any Native Americans who survived these genocidal raids were enslaved and sold. Removal and relocation was another strategy through which disputes over land were settled, with Native Americans being coerced to sign treaties under duress. Finally, policy turned toward assimilation, with the goal of wiping out Native American culture and replacing it with settler ideologies and gender norms ([Nakano-Glenn, 2015](#)).

Despite the rich history of Native American nations, they have also been subject to intense violence, persecution, and swindling at the hands of white colonizers, which has resulted in massive disparities in income and land and home ownership, as well as inequities in basic public health, bodily safety, and civil rights. Much of the current land possession within the United States, state boundaries, city plans, housing developments, and land rights are implicit records of white supremacy that preserve the assets and historical renderings of white populations at the expense of the rights of native peoples. Native Americans are now one of the populations most vulnerable to climate change resulting from higher exposure to hazard impacts and lower adaptive capacity due to historical and current disenfranchisement. Over the period of colonization in the United States, Indigenous peoples have been forcibly restricted to lands with limited resources and have struggled to have rights of ownership recognized by state and federal governments. The impacts of this on communities are exacerbated by climate



change as sovereign lands of many Indigenous nations are becoming increasingly dry, and the scant water rights afforded to Indigenous Americans are insufficient for their needs.

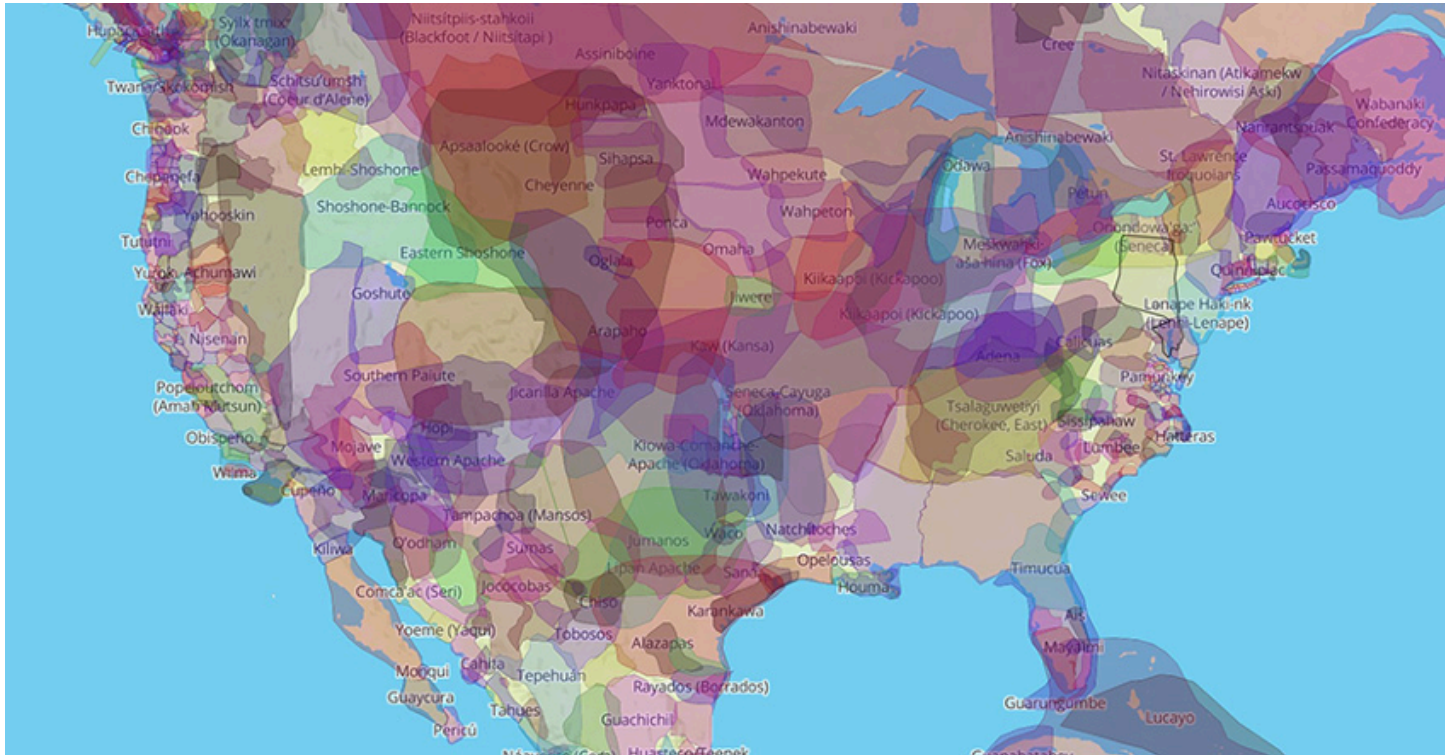


Fig. 1.2 Map showing the various boundaries of Indigenous American tribes in what is now the United States

In addition to the disenfranchisement of Native Americans, practices such as “redlining,” where the Federal Housing Authority refused to insure mortgages in and around Black neighborhoods, have created massive income inequalities between racial categories, and continue to segregate communities of color into areas with more pollution, less economic opportunity, and higher rates of incarceration. Redlining is an example of the deep entrenchment of racism and racist policies within federal, state, and local governments that historic prejudice and bias have created and still uphold today. These government funded “Jim Crow” policies that barred BIPOC individuals and families from the opportunities, facilities, and cultural institutions of White America, have made race the single greatest determinant of disparity in terms of economic and educational achievement, public health, and all other components of social systems within the United States. Though most segregation laws have been technically removed, they continue to exist in practice, resulting in their myriad impacts continuing to affect BIPOC individuals and families across the country.

Laws that discriminate specifically against Black people have been replaced by less overtly racist policies, such as revitalization and civic improvement efforts, many of which serve to displace entire Black communities from affordable housing. The resulting neighborhoods are upgraded and improved or gentrified for White families that can afford higher rents and home prices. Other so-called public safety policies such as “stop and frisk” and “stand your ground” laws directly target BIPOC and immigrant communities. This over-policing has resulted in the mass incarceration of Black people, especially Black men. Today in the United States, one out of every three Black boys will be sentenced to prison in their lifetime, compared with one out of six for Latinos, and one out of 17 for White boys (NAACP 2020). These racist policies are directly responsible for intergenerational cycles of poverty, lost economic and educational opportunities, and severe disparities in mental and physical health between races in the United States.

Beyond marginalizing and stifling the growth of communities of color, the practice of redlining and its continued effects has exacerbated the impact of hazards, reduced resource access, and ensured finite and fragile mechanisms of system-level resilience within BIPOC communities. The impacts of systemic racism within the



housing market are so stark that Black homeownership has lagged far behind white homeownership for decades. Estimates on the overall equity gap indicate that it would take Black families over 200 years to accumulate the same amount of wealth that white people possess, and this disparity is only increased through the impacts of natural hazards.

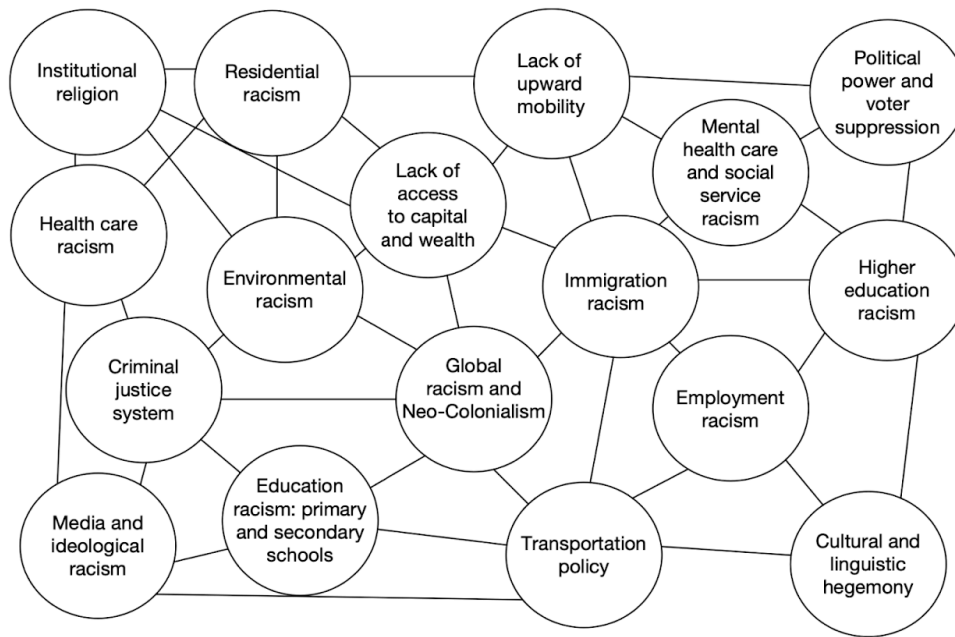
In Houston after Hurricane Harvey, reporting found that white, wealthier homeowners were provided with more resources for recovery than Black, poor families. This pattern holds true across the United States, whereby the wealthy and the white get more federal aid after a disaster, while minorities and the poor receive less (NPR 2019; [Tormos-Aponte, García-López, & Painter, 2021](#)). The cycle of poverty increased by homeownership policies is also visible on Native American reservations, where the lack of addresses on homes that are legible to white bureaucracy has prevented distribution of aid for years. A series of flooding events on the Oglala Sioux Pine Ridge reservation from 2015 forward showcased the haphazard approach that FEMA had in distributing aid to Native American nations, as assistance was distributed only in piecemeal fashion because of the burden of proof laid on homeowners for deeds to their homes and maintenance reports. In subsequent years, including 2019, no disaster declaration was granted to the Oglala Sioux Pine Ridge even though major disaster declarations were given to neighboring states.

This lack of bureaucratic recognition and stifling of aid distribution contributes to ongoing poverty and increased income disparities during recovery. Other ways in which income disparities are exacerbated and inhibit community recovery include lack of insurance for BIPOC and low-income communities. Data on damage estimates and disaster impact is created through insurance reporting. For underinsured communities, lack of reporting means lack of recognition in recovery resources and may result in exclusion from rebuilding and resiliency efforts.

The effects of climate change are not singularly future-based; they are already impacting our communities today. Daily stresses are compounded when one or more of these climate-related impacts occur. The mental health impacts of disaster exposure are clear. Notably, 39% of individuals in neighborhoods affected by Hurricane Katrina experienced moderate post-traumatic stress disorder (PTSD) symptoms, and 24% had severe symptoms; the area's baseline rate of suicide attempts was 78.6 times higher" ([Davenport 2017](#)).

## **Social Equity Introduction – National Context (INTERMEDIATE)**

In the United States, Black Indigenous People of Color (BIPOC), immigrants, and low-income people, known as frontline communities, have intentionally been made more vulnerable to the impacts of natural hazards and climate change due to decades of prejudiced policies and practices, inequitable power distribution, and withholding of assets and resources. Institutionalized racism, theft of land and water rights, and class bias began with colonization of the United States and have been foundational pillars that continue to create deep divisions within the country. Multiple, interlocking unjust systems have created higher levels of poverty and limited access to jobs, resources, transportation, and education for frontline communities (Figure 1 below). In an interview with Verso Books, Ruth Wilson Gilmore defined racism as "[group-differentiated vulnerability to premature death](#)." One such example of this is that BIPOC and low-income individuals are more likely to live in areas that environmental experts call [sacrifice zones](#). Over a quarter of a million Americans live in these zones, and are exposed to rates of air pollution-caused cancer caused by air pollution that exceed the US government's determination of "acceptable risk." Often, just a few miles away from these sacrifice zones in wealthier, whiter communities, people die of cancer and other illnesses at much lower rates.



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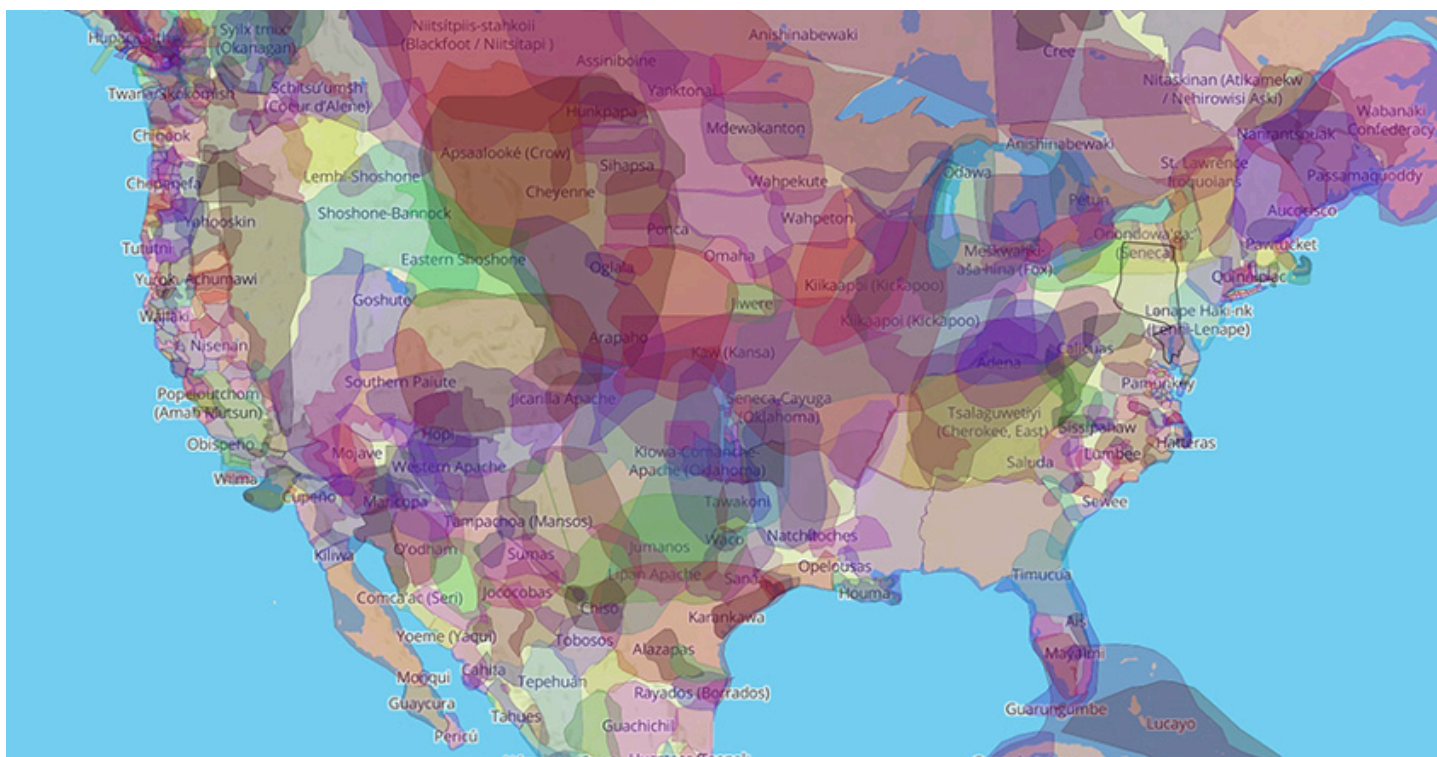


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In addition to the disenfranchisement of Native Americans, practices such as “redlining,” where the Federal Housing Authority refused to insure mortgages in and around Black neighborhoods, have created massive income inequalities between racial categories, and continue to segregate communities of color into areas with more pollution, less economic opportunity, and higher rates of incarceration. Redlining is an example of the deep entrenchment of racism and racist policies within federal, state, and local governments that historic prejudice and bias have created and still uphold today. These government funded “Jim Crow” policies that barred BIPOC individuals and families from accessing the same opportunities, facilities, and cultural institutions as white people, have made race the single greatest determinant of disparity in terms of economic and educational achievement, public health, and all other components of social systems within the United States. Though most segregation laws have been technically removed, they continue to exist in practice, resulting in their myriad impacts continuing to affect BIPOC individuals and families across the country.

Laws that discriminate specifically against Black people have been replaced by less overtly racist policies, such as revitalization and civic improvement efforts, many of which serve to displace entire Black communities from affordable housing. The resulting neighborhoods are upgraded and improved or gentrified for White families that can afford higher rents and home prices. Other so-called public safety policies such as “stop and frisk” and “stand your ground” laws directly target BIPOC and immigrant communities. This over-policing has resulted in the mass incarceration of Black people, especially Black men. Today in the United States, one out of every three Black boys will be sentenced to prison in their lifetime, compared with one out of six for Latinos, and one out of 17 for White boys (NAACP 2020). These racist policies are directly responsible for intergenerational cycles of poverty, lost economic and educational opportunities, and severe disparities in mental and physical health between races in the United States.

Beyond marginalizing and stifling the growth of communities of color, the practice of redlining and its continued effects has exacerbated the impact of hazards, reduced resource access, and ensured finite and fragile mechanisms of system-level resilience within BIPOC communities. The impacts of systemic racism within the housing market are so stark that Black homeownership has lagged far behind white homeownership for decades. Estimates on the overall equity gap indicate that it would take Black families over 200 years to

accumulate the same amount of wealth that white people possess, and this disparity is only increased through the impacts of natural hazards.

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## **Social Equity Introduction – National Context (BEGINNER)**

As was evidenced by Hurricane Katrina, a profound public health concern exists in the [disproportionate distribution of disaster impacts](#) among different subpopulations in a community, creating environmental, public health, and social injustices. Long-term social challenges (e.g. poverty, racism, a lack of opportunity, high burden of chronic diseases, etc.) can delay and severely complicate recovery from disaster events.

In the United States, disproportionate exposure to disaster events and their impacts affect various groups. These groups, referred to as frontline communities, often include low-income people. Other specific frontline communities include African Americans, the Latinx community, and Indigenous peoples. Frontline communities experience higher levels of poverty as well as limited access to jobs, resources, transportation, and education. Low-income individuals are also more likely to live in areas that environmental experts call [sacrifice zones](#). Over a quarter of a million Americans live in these zones, and are exposed to rates of air pollution-caused cancer caused by air pollution that exceed the US government's determination of "acceptable risk." Higher income communities that are often only a few miles away from these sacrifice zones often have much lower rates of cancer and other illness-related deaths.

Prior to the 15th century, the lands currently known as the United States of America were home to many Indigenous nations as well as complex, productive ecosystems. Both Indigenous nations and natural ecosystems were subjected to significant disruption and destruction during this time. Many fewer Indigenous nations exist in the United States today, and those that remain experience ongoing discrimination as well as significant disparities in income, land and home ownership, public health, and civil rights. Indigenous populations experience higher exposure to hazard impacts and greater difficulties with adaptation and recovery due to present and historical disenfranchisement. Indigenous peoples have been restricted to lands with limited resources and have struggled to have their rights of ownership recognized by state and federal governments. The lands of many Indigenous nations are becoming increasingly dry, and water rights afforded to Indigenous Americans are becoming increasingly insufficient for their needs.



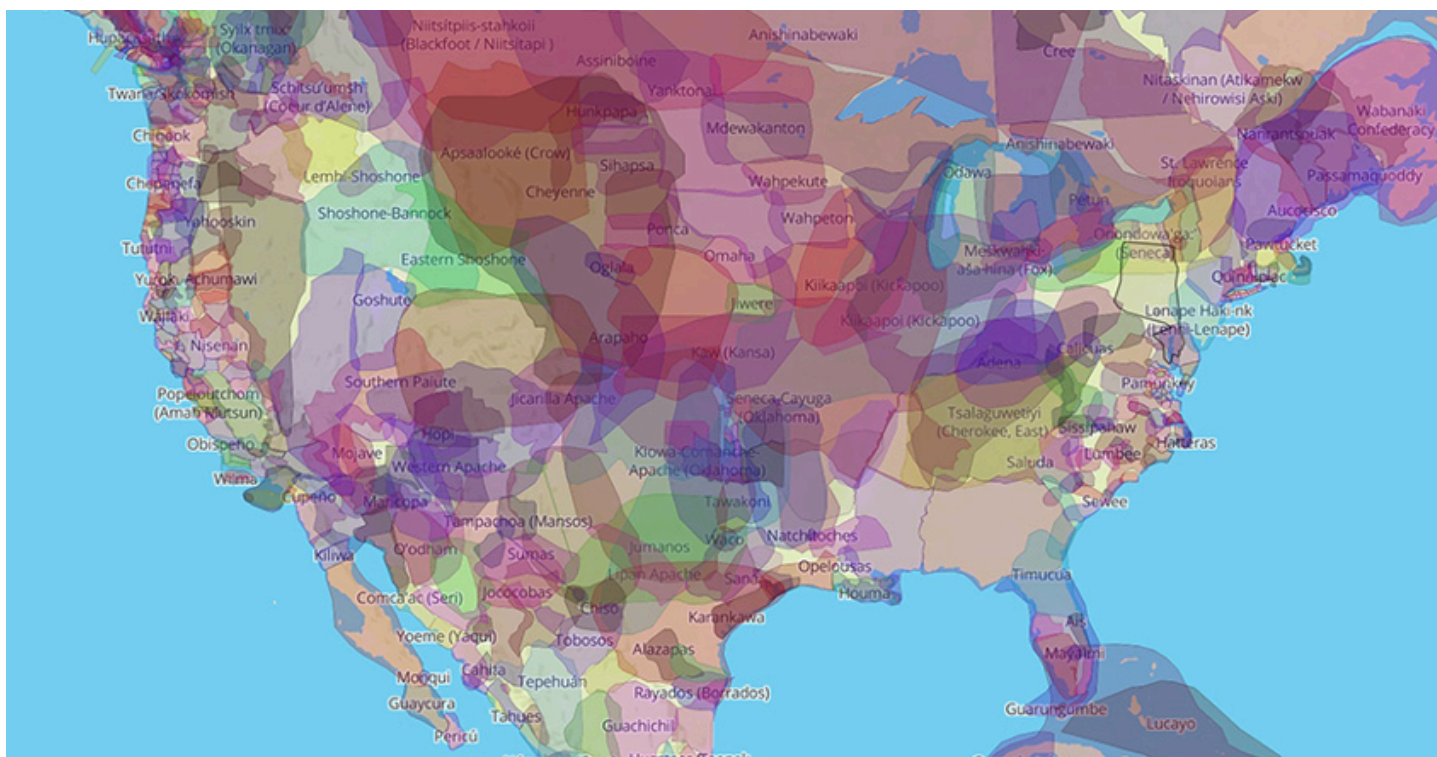


Fig. 1.1 Map showing the various boundaries of Indigenous American Nations in what is now the United States

In addition to practices that disenfranchised Indigenous populations, many practices throughout the United States' history have enslaved and exploited Black individuals and communities. Beyond the institution of slavery, which has lasting economic, psychological, and structural impacts today, practices such as "redlining" have created massive income inequalities between racial categories. "Redlining" refers to refusal by the Federal Housing Authority to insure mortgages in and around Black neighborhoods, which continued segregation of communities of color into areas with more pollution, less economic opportunity, and higher rates of incarceration. Jim Crow policies, including redlining, have made race the single greatest determinant of disparity in terms of economic and educational achievement, public health, and all other components of social systems within the United States.

Though most segregation laws have been technically removed, they continue to exist in practice. Laws that discriminate specifically against Black people have been replaced by less overtly racist policies, such as revitalization and civic improvement efforts, many of which serve to displace Black communities from affordable housing. The resulting neighborhoods are upgraded and improved for families that can afford higher rents and home prices, resulting in a process of gentrification. Other policies coded as public safety such as "stop and frisk" and "stand your ground" laws directly target People of Color and immigrant communities. This over-policing has resulted in the mass incarceration of Black people, especially Black men. Today in the United States, one out of every three Black boys will be sentenced to prison in their lifetime, compared with one out of six for Latinos, and one out of 17 for White boys (NAACP 2020). These policies are directly responsible for intergenerational cycles of poverty, lost economic and educational opportunities, and severe disparities in mental and physical health between races in the United States.

Redlining, combined with other systemically disenfranchising housing policies, have led to Black homeownership lagging far behind white homeownership for decades. Estimates on the overall equity gap indicate that it would take Black families over 200 years to accumulate the same amount of wealth that white people possess, and this disparity is only increased through the impacts of natural hazards. In Houston after Hurricane Harvey, reporting found that white, wealthier homeowners were provided with more resources for recovery than Black, poor families. This pattern holds true across the United States, whereby the wealthy and the white get more federal aid after a disaster, while minorities and the poor receive less (NPR 2019). The cycle of poverty increased

by homeownership policies is also visible on Native American reservations, where the lack of addresses on homes that are legible to white bureaucracy has prevented distribution of aid for years. A series of flooding events on the Oglala Sioux Pine Ridge reservation from 2015 forward showcased the haphazard approach that FEMA had in distributing aid to Native American nations, as assistance was distributed only in piecemeal fashion because of the burden of proof laid on homeowners for deeds to their homes and maintenance reports. In subsequent years, including 2019, no disaster declaration was granted to the Oglala Sioux Pine Ridge even though major disaster declarations were given to neighboring states.

Without bureaucratic recognition and unimpeded aid distribution, poverty and income disparities increase during recovery. Additionally, income disparities are exacerbated and inhibit community recovery through a lack of insurance for BIPOC and low-income communities. Data on damage estimates and disaster impact is created through insurance reporting. For underinsured communities, lack of reporting means lack of recognition in recovery resources and may result in exclusion from rebuilding and resiliency efforts.

Beyond marginalizing and stifling the growth of communities of color, the practice of redlining and its continued effects has exacerbated the impact of hazards, reduced resource access, and ensured finite and fragile mechanisms of system-level resilience within BIPOC communities. The impacts of systemic racism within the housing market are so stark that Black homeownership has lagged far behind white homeownership for decades. Estimates on the overall equity gap indicate that it would take Black families over 200 years to accumulate the same amount of wealth that white people possess, and this disparity is only increased through the impacts of natural hazards.

In Houston after Hurricane Harvey, reporting found that white, wealthier homeowners were provided with more resources for recovery than Black, poor families. This pattern holds true across the United States, whereby the wealthy and the white get more federal aid after a disaster, while minorities and the poor receive less (NPR 2019). The cycle of poverty increased by homeownership policies is also visible on Native American reservations, where the lack of addresses on homes that are legible to white bureaucracy has prevented distribution of aid for years. A series of flooding events on the Oglala Sioux Pine Ridge reservation from 2015 forward showcased the haphazard approach that FEMA had in distributing aid to Native American nations, as assistance was distributed only in piecemeal fashion because of the burden of proof laid on homeowners for deeds to their homes and maintenance reports. In subsequent years, including 2019, no disaster declaration was granted to the Oglala Sioux Pine Ridge even though major disaster declarations were given to neighboring states. This lack of bureaucratic recognition and stifling of aid distribution contributes to ongoing poverty and increased income disparities during recovery. Other ways in which income disparities are exacerbated and inhibit community recovery include lack of insurance for BIPOC and low-income communities. Data on damage estimates and disaster impact is created through insurance reporting. For underinsured communities, lack of reporting means lack of recognition in recovery resources and may result in exclusion from rebuilding and resiliency efforts.



## Social Equity Introduction – Regional & Local Contexts (ADVANCED)

### Guiding Questions

- Who are the people that live in the area covered by the HMP? What identities and social locations are represented? How are these groups viewed and treated within global, national, regional, and local contexts? Using tools, [such as this one](#) or [this one](#), may be helpful in identifying some of this information; however, both of these tools are incomplete and will not provide comprehensive pictures. Searching for and consulting place-based research studies from local universities, research institutions, or NGOs may help to bridge gaps.
- What are the Indigenous Nations that are the original inhabitants of the land? What [reparations](#), if any, have been offered?
- How are historical legacies (e.g. theft of Indigenous lands, chattel slavery, the War on Drugs, police brutality, redlining, neoliberal policies such as trickle-down economics, etc.) still affecting the community today? Who in the community is bearing the impacts of these legacies and how? Who has benefitted from these historical legacies and how? How have these individuals or the communities they represent been involved in decision-making processes leading up to the present?
- How are fiscal resources allocated? How are other kinds of resources allocated?
- What are the economic conditions under which people are living, and how does that affect their resiliency or vulnerability to disasters? Consider the following by race, geographic area, gender, and other markers of identity or social location: minimum wage; median household income; % of individuals at, below or just above poverty level; homeowners vs. renters; etc.
- How have different groups benefited from intergenerational wealth? How have other groups struggled as a result of intergenerational economic precarity?
- What examples of environmental racism or environmental injustice exist within the community, city, or region? How did these come to be, and how are groups differentially affected?
- In what ways have past and current investments in various forms of infrastructure created or exacerbated inequities? How are these currently being addressed?

## Social Equity Introduction – Regional & Local Contexts (INTERMEDIATE)

### Guiding Questions

- Who are the people that live in the area covered by the HMP? What identities and social locations are represented? How are these groups viewed and treated within global, national, regional, and local contexts? Using tools, [such as this one](#) or [this one](#), may be helpful in identifying some of this information; however, both of these tools are incomplete and will not provide comprehensive pictures. Searching for and consulting place-based research studies from local universities, research institutions, or NGOs may help to bridge gaps.
- What are the Indigenous Nations that are the original inhabitants of the land?
- How are historical legacies (e.g. theft of Indigenous lands, chattel slavery, the War on Drugs, police brutality, redlining, neoliberal policies such as trickle-down economics, etc.) still affecting the community today?
- How are fiscal resources allocated? How are other kinds of resources allocated?
- What are the economic conditions under which people are living, and how does that affect their resiliency or vulnerability to disasters? Consider the following by race, geographic area, gender, and other markers of identity or social location: minimum wage; median household income; % of individuals at, below or just above poverty level; homeowners vs. renters; etc.
- How have different groups benefited from intergenerational wealth? How have other groups struggled as a result of intergenerational economic precarity?

## Social Equity Introduction – Regional & Local Contexts (BEGINNER)

### Guiding Questions

- Who are the people that live in the area covered by the HMP? What subpopulations are represented? Using tools, [such as this one](#) or [this one](#), may be helpful in identifying some of this information; however, both of these tools are incomplete and will not provide comprehensive pictures. Searching for and consulting place-based research studies from local universities, research institutions, or NGOs may help to bridge gaps.
- How are these subpopulations differentially affected by disaster events?
- What are the Indigenous Nations that are the original inhabitants of the land?
- How are historical legacies (e.g. redlining, discriminatory policies) still affecting the community today?
- How are fiscal resources allocated? How are other kinds of resources allocated?
- What are the economic conditions under which people are living, and how does that affect their resiliency or vulnerability to disasters? Consider the following by race, geographic area, and gender: minimum wage; median household income; % of individuals at, below or just above poverty level; homeowners vs. renters; etc.

## II. ECOLOGICAL CONSIDERATIONS

### Ecological Considerations Introduction – Global Context (ADVANCED)

Natural hazards are part of geophysical processes that are constantly at work across the Earth. Movements of tectonic plates, alterations in water availability, precipitation, wind, lightning, etc. are all natural processes that both create and destroy natural resources. Human activities have affected landscape processes and resource availability for millennia. Just some of the most egregious examples have included habitat destruction, the introduction of invasive species, building dams and hard infrastructure that disrupt the natural flow of rivers and streams, the hardening of waterfronts, mountaintop removal, fracking for natural gas, and deforestation. These centuries of human behavior – and in particular the burning of fossil fuels – have disrupted natural rhythms and increased the frequency and intensity of many conditions that lead to disaster-scale events. As [NASA's Climate Time Machine](#) indicates, the speed and intensity of human activity has significantly changed global surface temperatures since 1884 as well as sea ice coverage, sea level, and atmospheric carbon dioxide levels. In fact, [carbon dioxide levels](#) today are higher than at any point in at least the past 800,000 years.

The [USGS](#) has identified that, with increasing global surface temperatures, more droughts and increasingly intense storms will likely occur. More water vapor being evaporated into the atmosphere becomes fuel for the development of more powerful storms; more heat in the atmosphere paired with warmer ocean surface temperatures has the potential to lead to tropical storms with higher wind speeds; rising sea levels cause higher elevation locations to experience erosion from waves and currents. A 2021 report from the World Meteorological Organization (WMO) found that climate change has helped drive a fivefold increase in the number of weather-related disasters in the last 50 years, and that despite decreases in fatalities, the [economic, interpersonal, and intrapersonal costs](#) of these disasters are rising.

## Additional Resources

- Consulting the [IPCC Climate Change Sixth Assessment Report \(2022\)](#) may also provide useful information for the development of this section, including some city-specific chapters.

## CARBON DIOXIDE OVER 800,000 YEARS

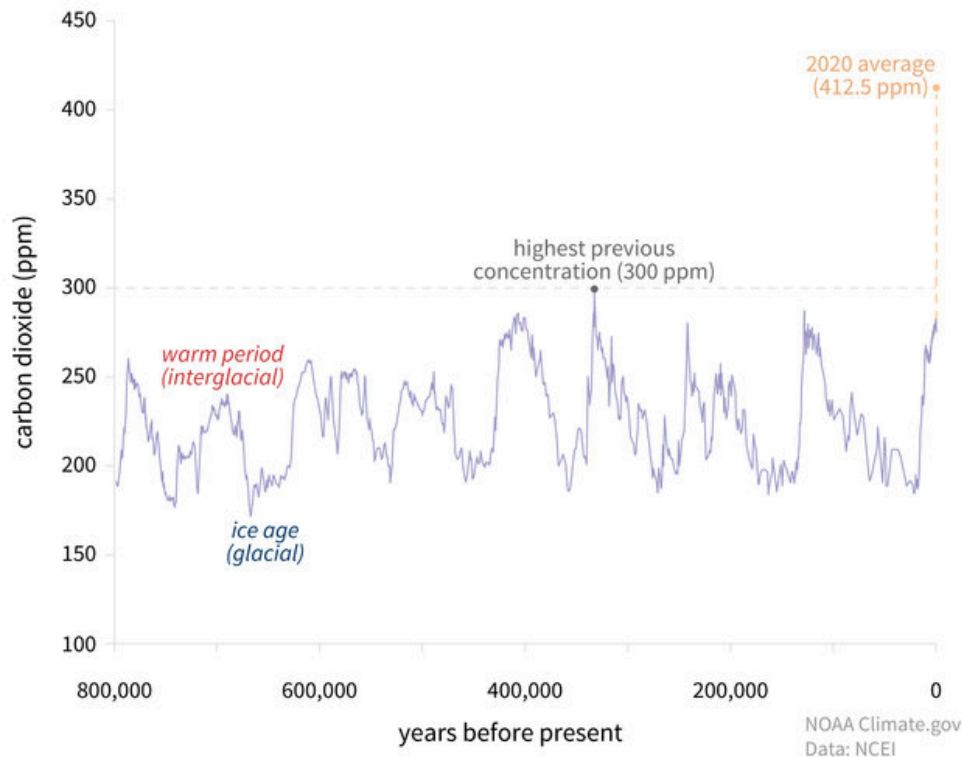


Fig. 1.3 NOAA: Global atmospheric carbon dioxide concentrations (CO<sub>2</sub>) in parts per million (ppm) for the past 800,000 years. The peaks and valleys track ice ages (low CO<sub>2</sub>) and warmer interglacials (higher CO<sub>2</sub>). During these cycles, CO<sub>2</sub> was never higher than 300 ppm. On the geologic time scale, the increase (orange dashed line) looks virtually instantaneous. Graph by NOAA Climate.gov based on data from Lüthi, et al., 2008, via NOAA NCEI Paleoclimatology Program.

## Ecological Considerations Introduction – Global Context (INTERMEDIATE)

Natural hazards are part of geophysical processes that are constantly at work across the Earth. Movements of tectonic plates, alterations in water availability, precipitation, wind, lightning, etc. are all natural processes that both create and destroy natural resources. Human activities have affected landscape processes and resource availability for millennia. Just some of the most egregious examples have included habitat destruction, the introduction of invasive species, building dams and hard infrastructure that disrupt the natural flow of rivers and streams, the hardening of waterfronts, mountaintop removal, fracking for natural gas, and deforestation. These centuries of human behavior – and in particular the burning of fossil fuels – have disrupted ecosystem services and increased the frequency and intensity of many conditions that lead to disaster-scale events. As [NASA's Climate Time Machine](#) indicates, the speed and intensity of human activity has significantly changed global surface temperatures since 1884 as well as sea ice coverage, sea level, and atmospheric carbon dioxide levels. In fact, [carbon dioxide levels](#) today are higher than at any point in at least the past 800,000 years.

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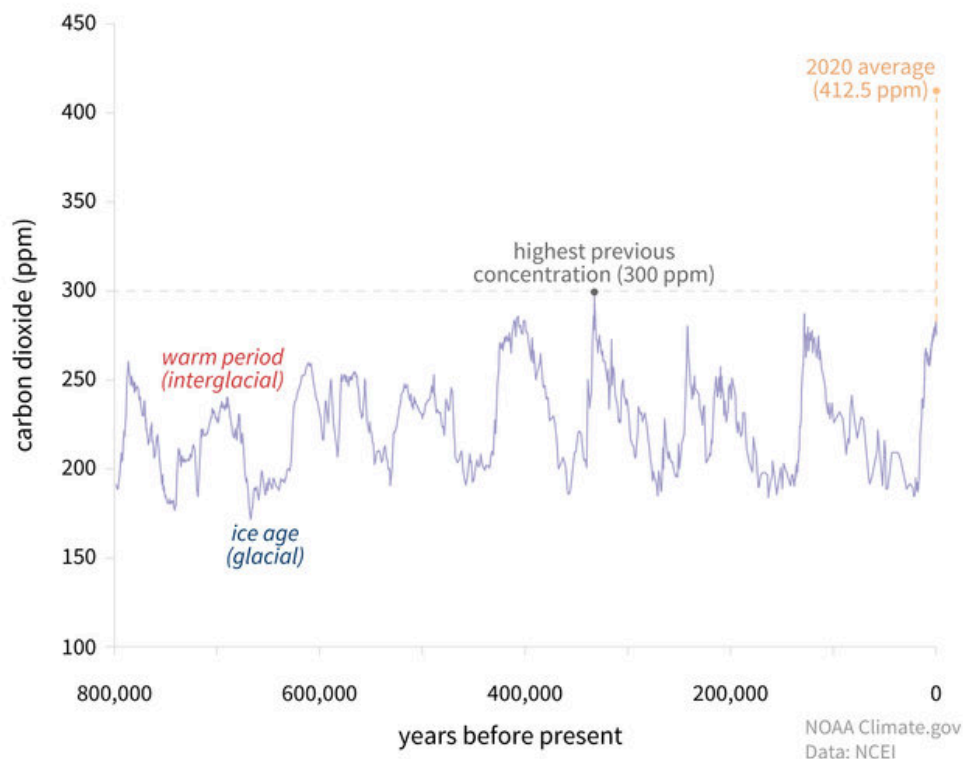


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## Ecological Considerations Introduction – Global Context (BEGINNER)

Natural hazards are part of geophysical processes that are constantly at work across the Earth. Movements of tectonic plates, alterations in water availability, precipitation, wind, lightning, etc. are all natural processes that both create and destroy natural resources. Human activities have affected landscape processes and resource availability for millennia. Examples of this human behavior include habitat destruction, the introduction of invasive species, building dams and hard infrastructure that disrupt the natural flow of rivers and streams, the hardening of waterfronts, mountaintop removal, fracking for natural gas, and deforestation. These centuries of

human behavior – and in particular the burning of fossil fuels – have disrupted ecosystem services and increased the frequency and intensity of many conditions that lead to disaster-scale events. As [NASA's Climate Time Machine](#) indicates, the speed and intensity of human activity has significantly changed global surface temperatures since 1884 as well as sea ice coverage, sea level, and atmospheric carbon dioxide levels. In fact, [carbon dioxide levels](#) today are higher than at any point in at least the past 800,000 years.

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## CARBON DIOXIDE OVER 800,000 YEARS

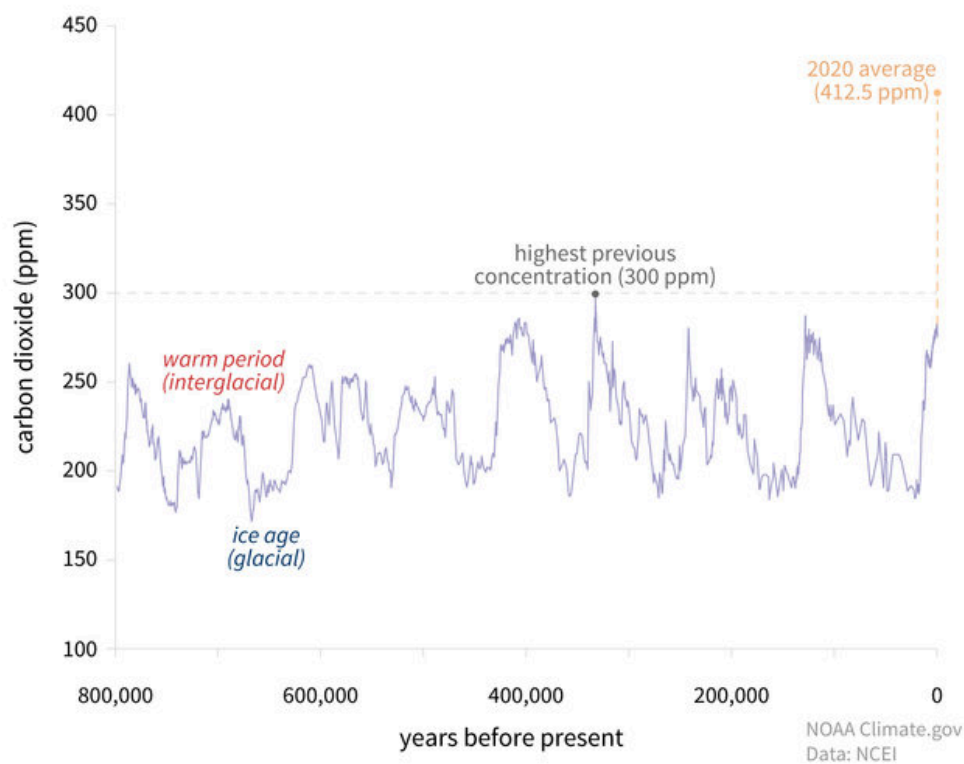


Fig. 1.2 NOAA: Global atmospheric carbon dioxide concentrations (CO<sub>2</sub>) in parts per million (ppm) for the past 800,000 years. The peaks and valleys track ice ages (low CO<sub>2</sub>) and warmer interglacials (higher CO<sub>2</sub>). During these cycles, CO<sub>2</sub> was never higher than 300 ppm. On the geologic time scale, the increase (orange dashed line) looks virtually instantaneous. Graph by NOAA Climate.gov based on data from Lüthi, et al., 2008, via NOAA NCEI Paleoclimatology Program.

## Ecological Considerations Introduction – National Context (ADVANCED)

Throughout North America, human activities affecting landscape processes have included Indigenous practices of prescribed burns in forests and grasslands, rotational agriculture, hunting and fishing, etc. With the colonization of the United States, exploitation of natural resources and disruption to natural systems accelerated, and practices such as overlogging of forests, fire suppression, cattle ranching, and mining reduced the availability and resiliency of intact ecological systems. These exploitative practices have at times increased the occurrence and severity of hazards. No impact, however, has caused so much disruption as human-induced



climate change, which has accelerated rapidly since the beginning of the Industrial Revolution around 1750. The advent of fossil fuel powered machines has been shown to have begun warming parts of the world as early as 1830. The increase in greenhouse gas emissions and warming global temperatures are disrupting ecological systems on both large and small scales. Documentation of anticipated changes resulting from climate change have increased rapidly over the last several decades, though mounting evidence has not yet been sufficient to garner a response congruent to the threat at hand. [Anticipated changes are expected to include](#): (1) significant increases in heavy precipitation events in the Northeast, Midwest, and Great Plains states, with degrees of magnitude in that order; (2) sea-level rise (ranging from one to four feet in the coming century) that puts at risk extensive areas of low-lying coastal real estate and infrastructure, particularly in the East and Gulf Coast; (3) decreased water availability in areas such as California and the Southeast, as well as Hawaii and the Pacific islands; and (4) potential for increases in prolonged droughts in areas like the Midwest and Great Plains, as well as the possibility of drought and high heat fostering increased and more intense wildfires.

Given the context of increased development, the clear cutting of forests, and the destruction of habitat around the world and throughout the United States, including for continued oil and gas development, the world is facing an ecological crisis. This includes rapid temperature swings that stress plant life and reduce soil health (which can lead to increased wildfire risk); loss of ocean current strength with an accompanying collapse of aquatic food chains; loss of pollinators that would maintain viability of crops and flowering plant life; and many other damaging consequences that threaten human life as well as the robustness of the built environment.



Fig. 1.4 EPA: Urbanization map of the U.S. derived from city lights data (2009 data). Urban areas are colored red (representative of larger cities), while peri-urban areas are colored yellow. Image created by Flashback Imaging Corporation, under contract with NOAA and NASA [accessed 7/16/09].

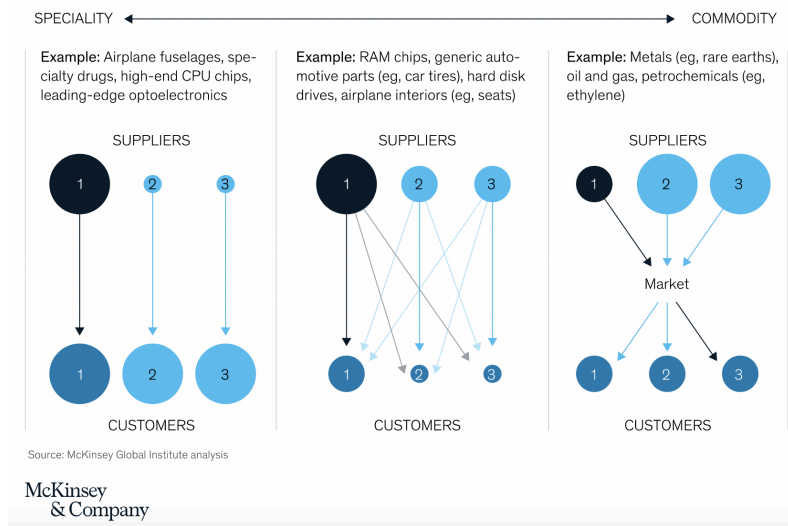
Ecological systems provide the foundation for human technologies and community construction, and ecological health is a fundamental driver of human life and economic viability. Nationally, the United States is unprepared for the ecological impacts of climate change on nearly all points. The hazards that arise from geophysical processes will become more extreme and more difficult to predict as climate change effects increase in strength. [Natural resources will become scarcer](#), and economic sectors that are entirely dependent on the environment, such as tourism, will provide less income and fewer jobs. Climate change will also [disrupt supply chains](#), transportation systems, and trade networks. These economic impacts in addition to hazard impacts will increase strain on government resources and reduce community capacities for resilience and recovery.

#### Supply chains face different knock-on effects from production disruption depending on the degree of commoditization.

Strength of impact on suppliers and customers, by degree of commoditization (illustrative)







**Fig. 1.5 McKinsey Global Institute analysis.** This image delineates the strength of climate disruption impacts on suppliers and customers based on the degree of commoditization. (Credit: McKinsey Global Institute analysis.)

## Ecological Considerations Introduction – National Context (INTERMEDIATE)

Throughout North America, human activities affecting landscape processes have included Indigenous practices of prescribed burns in forests and grasslands, rotational agriculture, hunting and fishing, etc. With the colonization of the United States, extraction of natural resources and disruption to natural systems accelerated, and practices such as overlogging of forests, fire suppression, cattle ranching, and mining reduced the availability and resiliency of intact ecological systems. These practices have at times increased the occurrence and severity of hazards. No impact, however, has caused so much disruption as human-induced climate change, which has accelerated rapidly since the beginning of the Industrial Revolution around 1750. The advent of fossil fuel powered machines has been shown to have begun warming parts of the world as early as 1830. The increase in greenhouse gas emissions and warming global temperatures are disrupting ecological systems on both large and small scales. Documentation of anticipated changes resulting from climate change have increased rapidly over the last several decades. [Such changes are expected to include:](#) (1) significant increases in heavy precipitation events in the Northeast, Midwest, and Great Plains states, with degrees of magnitude in that order; (2) sea-level rise (ranging from one to four feet in the coming century) that puts at risk extensive areas of low-lying coastal real estate and infrastructure, particularly in the East and Gulf Coast; (3) decreased water availability in areas such as California and the Southeast, as well as Hawaii and the Pacific islands; and (4) potential for increases in prolonged droughts in areas like the Midwest and Great Plains, as well as the possibility of drought and high heat fostering increased and more intense wildfires.

Given the context of increased development, the clear cutting of forests, and the destruction of habitat around the world and throughout the United States, including for continued oil and gas development, the world is facing an ecological crisis. This includes rapid temperature swings that stress plant life and reduce soil health (which can lead to increased wildfire risk); loss of ocean current strength with an accompanying collapse of aquatic food chains; loss of pollinators that would maintain viability of crops and flowering plant life; and many other damaging consequences that threaten human life as well as the robustness of the built environment.



## Ecological Considerations Introduction – National Context (BEGINNER)

Throughout North America, human activities affecting landscape processes have included Indigenous practices of prescribed burns in forests and grasslands, rotational agriculture, hunting and fishing, etc. With the European settlement, extraction of natural resources and disruption to natural systems accelerated, and practices such as unsustainable logging, fire suppression, cattle ranching, and mining reduced the availability and resiliency of intact ecological systems. These practices have at times increased the occurrence and severity of hazards. However, fossil fuel powered machines have been shown to have begun warming parts of the world as early as 1830. The increase in greenhouse gas emissions and warming global temperatures are disrupting ecological systems on both large and small scales. Documentation of anticipated changes resulting from this warming have increased rapidly over the last several decades. [Such changes are expected to include](#): (1) significant increases in heavy precipitation events in the Northeast, Midwest, and Great Plains states, with degrees of magnitude in that order; (2) sea-level rise (ranging from one to four feet in the coming century) that puts at risk extensive areas of low-lying coastal real estate and infrastructure, particularly in the East and Gulf Coast; (3) decreased water availability in areas such as California and the Southeast, as well as Hawaii and the Pacific islands; and (4) potential for increases in prolonged droughts in areas like the Midwest and Great Plains, as well as the possibility of drought and high heat fostering increased and more intense wildfires.

Given the context of increased development, the clear cutting of forests, and the destruction of habitat around the world and throughout the United States, including for continued oil and gas development, the world is facing unprecedented ecological challenges. This includes rapid temperature swings that stress plant life and reduce soil health (which can lead to increased wildfire risk); loss of ocean current strength with an accompanying collapse of aquatic food chains; loss of pollinators that would maintain viability of crops and flowering plant life; and many other damaging consequences that threaten human life as well as the robustness of the built environment.

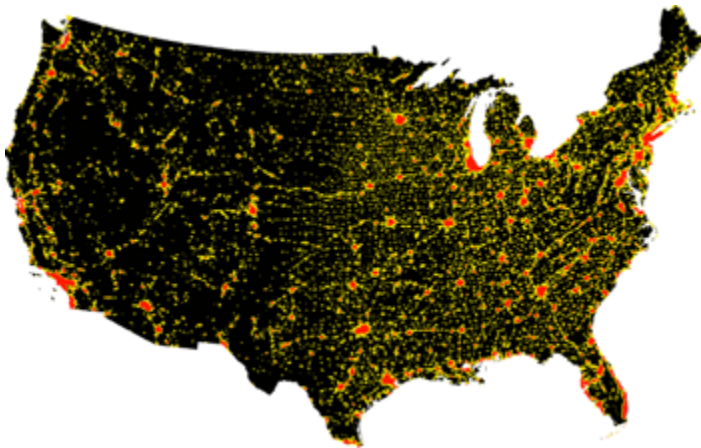


Fig. 1.3 EPA: Urbanization map of the U.S. derived from city lights data (2009 data). Urban areas are colored red (representative of larger cities), while peri-urban areas are colored yellow. Image created by Flashback Imaging Corporation, under contract with NOAA and NASA [accessed 7/16/09].

Ecological systems provide the foundation for human technologies and community construction, and ecological health is a fundamental driver of human life and economic viability. Nationally, the United States is unprepared for the ecological impacts of warming temperatures. The hazards that arise from geophysical processes will become more extreme and more difficult to predict as climate change effects increase in strength. [Natural resources will become scarcer](#), and economic sectors that are entirely dependent on the environment, such as tourism, will provide less income and fewer jobs. There will also be significant disruptions to [supply chains](#), transportation systems, and trade networks. These economic impacts in addition to hazard impacts will increase strain on government resources and reduce community capacities for resilience and recovery.

## Supply chains face different knock-on effects from production disruption depending on the degree of commoditization.

Strength of impact on suppliers and customers, by degree of commoditization (illustrative)

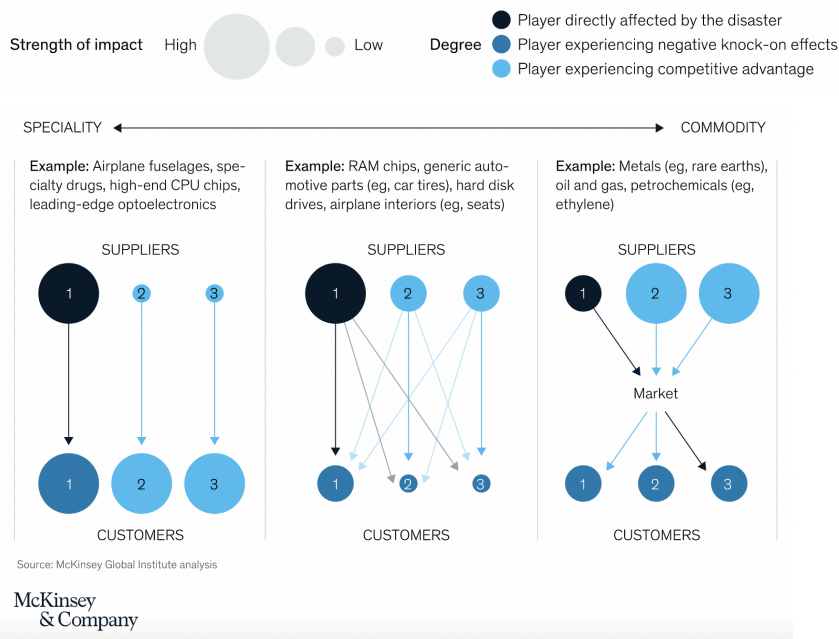


Fig. 1.4 McKinsey Global Institute analysis. This image delineates the strength of climate disruption impacts on suppliers and customers based on the degree of commoditization. (Credit: McKinsey Global Institute analysis.)

## Ecological Considerations Introduction – Regional & Local Contexts (ADVANCED)

Describe diversity of ecological systems, including ecotones, topography, transition zones, and critical natural resources such as rivers, aquifers, etc. Discuss diversity of plant and animal species, mountain ranges, riparian zones, fault lines, etc. Introduce history (e.g. displacement of Indigenous Nations, extractive practices led by settlers, and economic industries of past and present).

### Guiding Questions

- How does the landscape vary according to where different groups of people live within your geographic area? Are certain populations closer to potential hazards (e.g. power plants, levees, fault lines, sea level, etc.)?
- How are green infrastructure and nature-based solutions allocated?
- Which biomes and ecotones are present? What biomes and ecotones have been disrupted by development over time, and how do these disruptions continue to affect the area?
- Which flora and fauna are uniquely endemic to the geographic area your HMP applies to? Which flora and fauna within the area are endangered or threatened?
- Which biomes and ecotones are most important or sacred to the groups of people who live in your area? Which flora and fauna are culturally significant or important for food or medicinal practices?

\* Reference the Level 1, Level 2, and Level 3 ecoregions of North America [here](#).

\* Use the [EPA's interactive EnviroAtlas](#) for a multilayered analysis of your area.

\* Use [this map](#) to learn more about the Indigenous nations who are the original and rightful inhabitants of the lands that now make up the area covered by your HMP.

\* Read [this guide](#) on how to write and speak about the Indigenous nations of the area. Even better: develop mutual, non-extractive partnerships with local nations over time.

## Ecological Considerations Introduction – Regional & Local Contexts (INTERMEDIATE)

Describe diversity of ecological systems, including ecotones, topography, transition zones, and critical natural resources such as rivers, aquifers, etc. Discuss diversity of plant and animal species, mountain ranges, riparian zones, fault lines, etc. Introduce history (e.g. displacement of Indigenous Nations, extractive practices led by settlers, and economic industries of past and present).

### Guiding Questions

- How does the landscape vary according to where different groups of people live within your geographic area? Are certain populations closer to potential hazards (e.g. power plants, levees, fault lines, sea level, etc.)?
- How are green infrastructure and nature-based solutions allocated?
- Which biomes and ecotones are present? What biomes and ecotones have been disrupted by development over time, and how do these disruptions continue to affect the area?
- Which flora and fauna are uniquely endemic to the geographic area your HMP applies to? Which flora and fauna within the area are endangered or threatened?

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\* Read [this guide](#) on how to write and speak about the Indigenous nations of the area. Even better: develop mutual, non-extractive partnerships with local nations over time.

## Ecological Considerations Introduction – Regional & Local Contexts (BEGINNER)

Describe diversity of ecological systems, including ecotones, topography, transition zones, and critical natural resources such as rivers, aquifers, etc. Discuss diversity of plant and animal species, mountain ranges, riparian zones, fault lines, etc.

### Guiding Questions

- How does the landscape vary according to where different groups of people live within your geographic area? Are certain populations closer to potential hazards (e.g. power plants, levees, fault lines, sea level, etc.)?
- Which biomes and ecotones are present? What biomes and ecotones have been disrupted by development over time, and how do these disruptions continue to affect the area?
- Which flora and fauna are uniquely endemic to the geographic area your HMP applies to? Which flora and fauna within the area are endangered or threatened?

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\* Use the [EPA's interactive EnviroAtlas](#) for a multilayered analysis of your area.



### III. CLIMATE CONSIDERATIONS

#### Climate Considerations Introduction – Global Context (ADVANCED)

The earth is warming at an unprecedented rate. Since 1880, the global average surface temperature has increased by two degrees Fahrenheit (NASA). Increasing air and ocean temperatures affect the planet's weather and climate systems leading to increases in extreme weather events and natural disasters. Although the planet has been through several cycles of heating and cooling, human activities that increase carbon dioxide and other emissions into the atmosphere have led to record warming over the past 40 years, and with it, record-setting extreme weather events. All but one of the 16 hottest years in NASA's 134-year record have occurred since the year 2000.

To date, scientists have been able to document precipitation (rain and snowfall) variability globally, with increased average precipitation in some areas contrasting severe drought in other areas; ice sheets and mountain glaciers melting which reduces the earth's ability to reflect sunlight; shifts in wildlife habitats including altered migration patterns, the loss of several species, and the thriving of disease-carriers such as mosquitoes and ticks (NASA).

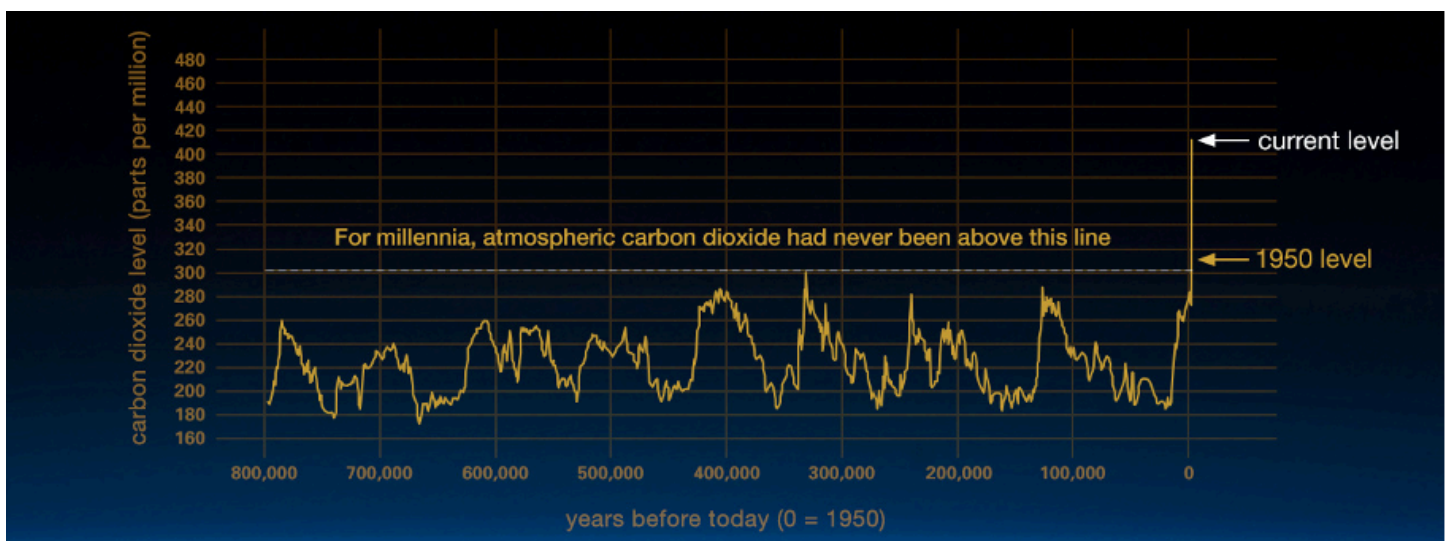


Fig. 1.6 Climate.nasa.gov: Global carbon dioxide levels over time. This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO<sub>2</sub> has increased since the Industrial Revolution. (Credit: Luthi, D., et al.. 2008; Etheridge, D.M., et al. 2010; Vostok ice core data/J.R. Petit et al.; NOAA Mauna Loa CO<sub>2</sub> record.)

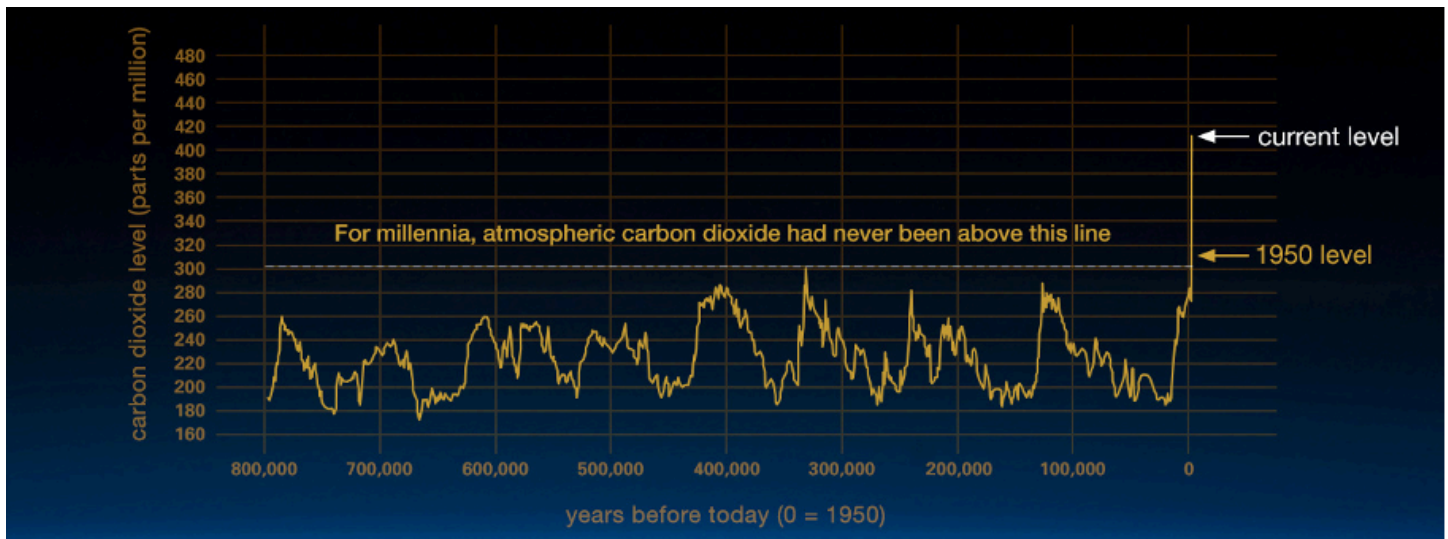
The Intergovernmental Panel on Climate Change (IPCC) is made up of over 1300 scientists from around the world. Utilizing best available data, these scientists have amassed evidence that average global temperatures can be expected to rise between 2.5 and 10-degrees Fahrenheit by the end of this century (IPCC). Impacts from a two-degree rise have already led to increased extreme heat days, precipitation variability, bigger hurricanes and storm events, increased likelihood of wildfires, and sea level rise. If trends continue, there will be catastrophic impacts to the economic, social, and environmental systems we all rely on.

#### Climate Considerations Introduction – Global Context (INTERMEDIATE)

The earth is warming at an unprecedented rate. Since 1880, the global average surface temperature has increased by two degrees Fahrenheit (NASA). Increasing air and ocean temperatures affect the planet's weather and climate systems leading to increases in extreme weather events and natural disasters. Although the planet has been through several cycles of heating and cooling, human activities that increase carbon dioxide and other emissions into the atmosphere have led to record warming over the past 40 years, and with it, record-setting extreme weather events. All but one of the 16 hottest years in NASA's 134-year record have occurred since the year 2000.



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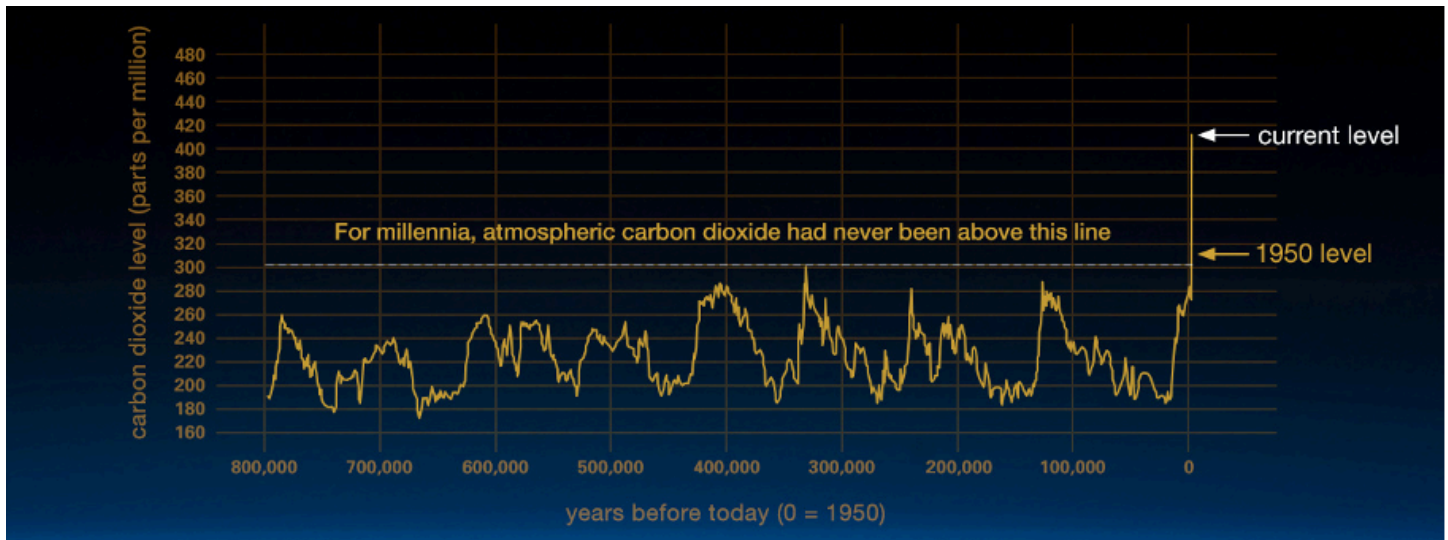
**Fig. 1.6 Climate.nasa.gov: Global carbon dioxide levels over time.** This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO<sub>2</sub> has increased since the Industrial Revolution. (Credit: Luthi, D., et al., 2008; Etheridge, D.M., et al., 2010; Vostok ice core data/J.R. Petit et al.; NOAA Mauna Loa CO<sub>2</sub> record.)

The Intergovernmental Panel on Climate Change (IPCC) is made up of over 1300 scientists from around the world. Utilizing best available data, these scientists have amassed evidence that average global temperatures can be expected to continue to rise between 2.5 and 10-degrees Fahrenheit by the end of this century (IPCC). Impacts from a two-degree rise have already led to increased extreme heat days, precipitation variability, bigger hurricanes and storm events, increased likelihood of wildfires, and sea level rise. If trends continue, there will be catastrophic impacts to the economic, social, and environmental systems we all rely on.

### Climate Considerations Introduction – Global Context (BEGINNER)

Since 1880, global average surface temperatures have increased by two degrees Fahrenheit (NASA). Increasing air and ocean temperatures affect the planet's weather and climate systems leading to increases in extreme weather events and natural disasters. Record warming over the past 40 years has brought with it record-setting extreme weather events. All but one of the 16 hottest years in NASA's 134-year record have occurred since the year 2000.

To date, scientists have been able to document precipitation (rain and snowfall) variability globally, with increased average precipitation in some areas contrasting severe drought in other areas; ice sheets and mountain glaciers melting which reduces the earth's ability to reflect sunlight; shifts in wildlife habitats including altered migration patterns, the loss of several species, and the thriving of disease-carriers such as mosquitoes and ticks (NASA). If trends continue, economic, social, and environmental impacts can be expected to be significant, costly, and potentially irreversible.



**Fig. 1.5 Climate.nasa.gov: Global carbon dioxide levels over time.** This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO<sub>2</sub> has increased since the Industrial Revolution. (Credit: Luthi, D., et al.. 2008; Etheridge, D.M., et al. 2010; Vostok ice core data/J.R. Petit et al.; NOAA Mauna Loa CO<sub>2</sub> record.)

### Climate Considerations Introduction – National Context (ADVANCED)

The Fourth National Climate Assessment (NCA4) states that in the coming decades the United States will experience “high temperature extremes, heavy precipitation events, and high tide flooding events along the U.S. coastline,” among other effects. With these changes will also come “more frequent and intense extreme weather and climate-related events, as well as changes in average climate conditions.” As experienced and observed in recent years, these extreme hazard events disrupt lives and local economies, strain social services, damage infrastructure, and cause harm to ecosystems.

Recent trends in annual average temperature variability will not only persist but also accelerate in the coming decades. According to NCA4, “annual average temperature over the contiguous United States has increased by 1.2°F for the period 1986-2016 relative to 1901-1960[v].” In the future, the annual average temperature of the contiguous United States is expected to increase by about twice as much (2.5°F) by 2050, as compared to the average from 1976-2005, and even larger increases are expected to occur by the end of the 21<sup>st</sup> century. Daily extreme temperatures are also expected to increase, with the largest increases affecting the coldest temperatures of the year, especially in the northern half of the country. Changes in the warmest daily temperatures of the year will be more uniform across the contiguous United States.[vi] However, overall average temperatures will continue to increase leading to more frequent and intense heatwave and extreme heat events. In addition to temperature changes, heavy precipitation events are also likely to continue increasing in frequency and intensity leading to more flash flooding.

### Climate Considerations Introduction – National Context (INTERMEDIATE)

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### **Climate Considerations Introduction – National Context (BEGINNER)**

As experienced and observed in recent years, extreme hazard events disrupt lives and local economies, strain social services, damage infrastructure, and cause harm to ecosystems. Recent trends in annual average temperature variability will not only persist but also accelerate in the coming decades. According to NCA4, “annual average temperature over the contiguous United States has increased by 1.2°F for the period 1986-2016 relative to 1901-1960[v].” In the future, the annual average temperature of the contiguous United States is expected to increase by about twice as much (2.5°F) by 2050, as compared to the average from 1976-2005, and even larger increases are expected to occur by the end of the 21<sup>st</sup> century. Daily extreme temperatures are also expected to increase, with the largest increases affecting the coldest temperatures of the year, especially in the northern half of the country. Changes in the warmest daily temperatures of the year will be more uniform across the contiguous United States.[vi] However, overall average temperatures will continue to increase leading to more frequent and intense heatwave and extreme heat events. In addition to temperature changes, heavy precipitation events are also likely to continue increasing in frequency and intensity leading to more flash flooding.

### **Climate Considerations Introduction – Regional & Local Contexts (ADVANCED)**

#### **Guiding Questions**

- Who in the community has been impacted by disruptions and extreme events? In what ways, and for how long?
- How have your previous plans directly addressed climate change as a contributing factor to disaster events, and how has this awareness impacted both mitigation and response efforts?
- What is the history of Indigenous land practices (e.g. prescribed burns) in your area? How has their prevalence changed over time, and why? How might Indigenous land practices support the environment in your area?
- How has the average year-to-year temperature increased in your area? How have increases in rainfall, drought, fire, flood affected the region?
- How has water security changed over time? Has this affected agriculture or key industries in your area? How does water insecurity differentially impact subpopulations in your area?
- How has food security changed along with the climate in your area? How does food insecurity differentially impact subpopulations in your area?
- Localities in the Great Lakes, Carolinas, and Mid-Atlantic regions may find utility in referencing this [CHaMP tool](#) for regional, state, and local contexts.

### **Climate Considerations Introduction – Regional & Local Contexts (INTERMEDIATE)**

#### **Guiding Questions**

- Who in the community has been impacted by disruptions and extreme events? In what ways, and for how long?

- What is the history of Indigenous land practices (e.g. prescribed burns) in your area? How has their prevalence changed over time, and why?
- How has the average year-to-year temperature increased in your area? How have increases in rainfall, drought, fire, flood affected the region?
- How has water security changed over time? Has this affected agriculture or key industries in your area?
- How has food security changed along with the climate in your area?
- Localities in the Great Lakes, Carolinas, and Mid-Atlantic regions may find utility in referencing this [CHaMP tool](#) for regional, state, and local contexts.

## Climate Considerations Introduction – Regional & Local Contexts (BEGINNER)

### Guiding Questions

- Who in the community has been impacted by disruptions and extreme events? In what ways?
- How has the average year-to-year temperature increased in your area? How have increases in rainfall, drought, fire, flood affected the region?
- How has water security changed over time? Has this affected agriculture or key industries in your area?
- How has food security changed along with the climate in your area?
- Localities in the Great Lakes, Carolinas, and Mid-Atlantic regions may find utility in referencing this [CHaMP tool](#) for regional, state, and local contexts.

## Social, Ecological, Technological Systems (SETS) Framework Context – (ADVANCED ONLY)

Natural hazards such as earthquakes, winter storms, wildfires, and even zoonotic diseases do not impact one jurisdiction, community, or sector in isolation. Hazard impacts are wide-ranging and felt at many scales, and response and recovery take many forms and require a variety of resources. Recognizing the diverse nature of hazard impacts across human, natural, and built environments, this document uses a social, ecological, and technological systems (SETS) framework to explore interconnections and identify co-existing risks and vulnerabilities within these systems ([Kim, et al., 2022](#); [Markolf et al. 2018](#)). This framework is based on the understanding that past efforts to harden infrastructure and create robust systems have depended on an ability to control or prevent disruption on infrastructure/technological systems from hazards. With increasing volatility from climate change and the inability to predict hazard occurrence or scales of return with confidence, hardening infrastructure and relying solely on engineered control has become maladaptive. That is, an overreliance on engineered solutions has the potential to lead to incomplete solutions, unintended tradeoffs, or can lock communities into fragile infrastructure design that cannot adapt to new hazards and risks – making one part of the interconnected system better while introducing vulnerabilities elsewhere ([Iwaniec et al. 2021](#)). **A glaring example of this is Houston. As the city has massively increased the amount of impervious surface coverage without regard for ecological systems, FEMA floodplain maps failed to account for 75% of insured losses between the years 1999 and 2009.**

In addition to its utility in identifying risks and vulnerabilities ([Chang et al., 2021](#)), the SETS framework offers solutions-oriented adaptation and mitigation strategies designed to avoid the pitfall of using a singular, dominant solution type ([McPhearson et al., 2022](#)).

For citations, the Chang et al paper noted above is good citation for using SETS to identify risks/vulnerabilities. The McPherson et al paper is good for using SETS to improve solutions.

In order to increase system flexibility, adaptive capacity, and long term solutions creation, the SETs framework considers the intertwined nature of human, natural environment, and infrastructure systems. Examining the impacts that these systems have on one another and the ways in which they interact leads to increased ability to meet the demands of changing climate and increasing hazard impacts. **This document uses the SETs framework throughout Chapter 4** in order to better analyze hazard profiles and functionally address the risks and vulnerabilities that community members, ecological systems, and the built environment have and will experience within **[insert Nation, County, or City]**. For each hazard profile, consideration of social, ecological, and technological systems is included in each hazard profile. Likewise, vulnerability and risk assessments consider how interactions between these systems result in increased risk for certain populations.

# SECTION II: STRATEGY & PLANNING PROCESS

FEMA Requirements	
<b>§201.6(b)</b>	An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:
<b>§201.6(b)(1)</b>	(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
<b>§201.6(b)(2)</b>	(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
<b>§201.6(b)(3)</b>	(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
<b>§201.6(c)(1)</b>	[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.
<b>§201.6(c)(4)(i)</b>	[The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.
<b>§201.6(c)(4)(iii)</b>	[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

FEMA Requirements	
Element	Requirements
<p><b>A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?</b>  <b>44 CFR 201.6(c)(1)</b></p> <p><b>Intent:</b> To inform the public and other readers about the overall approach to the plan's development and serve as a permanent record of how decisions were made and who was involved. This record also is useful for the next plan update.</p>	<p><b>a.</b> Documentation of how the plan was prepared must include the schedule or timeframe and activities that made up the plan's development as well as who was involved. Documentation typically is met with a narrative description, but may also include, for example, other documentation such as copies of meeting minutes, sign-in sheets, or newspaper articles. Document means provide the factual evidence for how the jurisdictions developed the plan.</p> <p><b>b.</b> The plan must list the jurisdiction(s) participating in the plan that seek approval.</p> <p><b>c.</b> The plan must identify who represented each jurisdiction. The Plan must provide, at a minimum, the jurisdiction represented and the person's position or title and agency within the jurisdiction.</p> <p><b>d.</b> For each jurisdiction seeking plan approval, the plan must document how they were involved in the planning process. For example, the plan may document meetings attended, data provided, or stakeholder and public involvement activities offered. Jurisdictions that adopt the plan without documenting how they participated in the planning process will not be approved. Involved in the process means engaged as participants and given the chance to provide input to affect the plan's content. This is more than simply being invited (See "opportunity to be involved in the planning process" in A2 below) or only adopting the plan.</p> <p><b>e.</b> Plan updates must include documentation of the current planning process undertaken to update the plan.</p>
<p><b>A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process?</b>  <b>44 CFR 201.6(b)(2)</b></p>	<p><b>a.</b> The plan must identify all stakeholders involved or given an opportunity to be involved in the planning process. At a minimum, stakeholders must include:</p> <ol style="list-style-type: none"> <li>1) Local and regional agencies involved in hazard mitigation activities;</li> <li>2) Agencies that have the authority to regulate development; and</li> <li>3) Neighboring communities. An opportunity to be involved in the planning process means that the stakeholders are engaged or invited as participants and given the chance to provide input to affect the plan's content.</li> </ol> <p><b>b.</b> The Plan must provide the agency or organization represented and the person's position or title within the agency.</p> <p><b>c.</b> The plan must identify how the stakeholders were invited to participate in the process. Examples of stakeholders include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Local and regional agencies involved in hazard mitigation include public works,</li> </ul>



	<p>zoning, emergency management, local floodplain administrators, special districts, and GIS departments.</p> <ul style="list-style-type: none"> <li>• Agencies that have the authority to regulate development include planning and community development departments, building officials, planning commissions, or other elected officials.</li> <li>• Neighboring communities include adjacent counties and municipalities, such as those that are affected by similar hazard events or may be partners in hazard mitigation and response activities.</li> <li>• Other interests may be defined by each jurisdiction and will vary with each one. These include, but are not limited to, business, academia, and other private and non-profit interests depending on the unique characteristics of the community.</li> </ul>
<p><b>A3. Does the Plan document how the public was involved in the planning process during the drafting stage?</b>  <b>44 CFR 201.6(b)(1) and 201.6(c)(1)</b></p> <p><u><b>Intent:</b></u> To ensure citizens understand what the community is doing on their behalf, and to provide a chance for input on community vulnerabilities and mitigation activities that will inform the plan's content. Public involvement is also an opportunity to educate the public about hazards and risks in the community, types of activities to mitigate those risks, and how these impact them.</p>	<p><b>a.</b> The plan must document how the public was given the opportunity to be involved in the planning process and how their feedback was incorporated into the plan. Examples include, but are not limited to, sign-in sheets from open meetings, interactive websites with drafts for public review and comment, questionnaires or surveys, or booths at popular community events.</p> <p><b>b.</b> The opportunity for participation must occur during the plan development, which is prior to the comment period on the final plan and prior to the plan approval / adoption.</p>
<p><b>A4. Does the Plan document the review and incorporation of existing plans, studies, reports, and technical information?</b>  <b>44 CFR 201.6(b)(3)</b></p> <p><u><b>Intent:</b></u> To identify existing data and information, shared objectives, and past and ongoing activities that can help inform the mitigation plan. It also helps identify the existing capabilities and planning mechanisms to implement the mitigation strategy.</p>	<p><b>a.</b> The plan must document what existing plans, studies, reports, and technical information were reviewed. Examples of the types of existing sources reviewed include, but are not limited to, the state hazard mitigation plan, local comprehensive plans, hazard specific reports, and flood insurance studies.</p> <p><b>b.</b> The plan must document how relevant information was incorporated into the mitigation plan.</p> <p><b>Incorporate</b> means to reference or include information from other existing sources to form the content of the mitigation plan.</p>
<p><b>A5. Is there discussion on how the community(ies) will continue public participation in the plan maintenance process?</b>  <b>44 CFR 201.6(c)(4)(iii)</b></p> <p><u><b>Intent:</b></u> To identify how the public will continue to have an opportunity to participate in the plan's maintenance and implementation over time.</p>	<p><b>a.</b> The plan must describe how the jurisdiction(s) will continue to seek public participation after the plan has been approved and during the plan's implementation, monitoring and evaluation.</p> <p><b>Participation</b> means engaged and given the chance to provide feedback. Examples include, but are not limited to, periodic presentations on the plan's progress to elected officials, schools or other community groups, annual questionnaires or surveys, public meetings, postings on social media and interactive websites.</p>
<p><b>A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)?</b>  <b>44 CFR 201.6(c)(4)(i)</b></p> <p><u><b>Intent:</b></u> To establish a process for jurisdictions to track the progress of the plan's implementation. This also</p>	<p><b>a.</b> The plan must identify how, when, and by whom the plan will be monitored. <b>Monitoring</b> means tracking the implementation of the plan over time. For example, monitoring may include a system for tracking the status of the identified hazard mitigation actions.</p> <p><b>b.</b> The plan must identify how, when, and by whom the plan will be evaluated. <b>Evaluating</b> means assessing the effectiveness of the plan at achieving its stated purpose and goals.</p> <p><b>c.</b> The plan must identify how, when, and by whom the plan will be updated. <b>Updating</b> means reviewing and revising the plan at least once every five years.</p> <p><b>d.</b> The plan must include the title of the individual or name of the department/ agency responsible for leading each of these efforts.</p>

# I. SOCIAL EQUITY CONSIDERATIONS

## **Social Equity in Strategy & Planning Process – Global Context (ADVANCED)**

In nearly every culture and in every country, those in power and in control of land and wealth are often the decision-makers. These decision-makers most commonly seek to further consolidate power and wealth, so that fewer and fewer people hold the majority of the world's social, economic, and ecological resources. As a result, entire groups of people (with Black, Indigenous, poor, and disabled people being just a few examples) have been made increasingly vulnerable over time. Year over year, decade over decade, and century over century, those who are intentionally excluded from decision making processes experience less of the benefits and more of the burdens of what life has to offer. A common idiom expresses this dilemma: if you're not at the table, you're on the menu...and you're footing the bill.

Social resources are at least as important as material resources for predicting resilience and recovery ([Aldrich 2012](#); [Carvalhoes et al., 2022](#); [Delilah Roque et al., 2020](#)). On neighborhood and individual levels, heightened social capital results in people working together more effectively to direct resources to where they're most needed. As a result, drawing from existing channels of social capital with a community as well as developing new ones is key in recovery efforts. However, care must be taken not to exacerbate or condone inequities throughout the recovery process; social capital can serve as a double-edged sword that supports in-groups in recovering more quickly while delaying or preventing marginalized groups from recovering well ([Aldrich 2012](#)).

## **Social Equity in Strategy & Planning Process – Global Context (INTERMEDIATE)**

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## **Social Equity in Strategy & Planning Process – Global Context (BEGINNER)**

Decision-makers in nearly every culture and country are most often able to be in such positions due to amassed material and/or social capital. Even if they are elected representatives, decision-makers operating alone cannot adequately represent all the needs and perspectives of their constituents. In fact, the powerful often have their own interests: mainly, to maintain systems of power and their place within them. Collaborative, coalitional efforts in any and all planning processes is essential – especially for ensuring that conditions for the most vulnerable are not reproduced or made worse.

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### **Social Equity in Strategy & Planning Process – National Context (ADVANCED)**

North America is founded on racism, prejudice, theft of land from Indigenous peoples, and theft of humans from their lands in West Africa by European colonizers. Manipulation and extraction of resources and human labor, both within and outside North American borders, continues to benefit and uphold white supremacy, which permeates institutions, structures, and the culture of this continent such that the egregiousness of these injustices has been normalized and invisibilized. Unchecked extraction and concentration of resources has destabilized the earth's natural systems. Those who have contributed and benefited least are also the ones most impacted by this legacy, meaning that BIPOC individuals today are disproportionately exposed to the impacts of climate-related hazards and are often without the resources to withstand and recover from those impacts. Climate disruption is therefore a multiplier of the inequities, injustices, and burden of loss for the benefit of a few that this country is founded on.

While many government agencies and decision makers perceive disaster aid work to be “apolitical” and based on need, the resources available to community members preceding a crisis prove to be one of the strongest determinants of their receipt of assistance afterward ([Aldrich 2012: 106](#)). In this way, historical dynamics of disaster aid resource allocation have followed a pattern in which power, privilege, and resources (inputs and outputs of social capital) are cyclically magnetized to themselves. This reality, in addition to directly affecting a community's *received support* (actual receipt of help), also impacts *perceived support* (the belief that help will be available if needed), further spurring on cycles of neglect and disempowerment for communities most in need ([Saul 2022: 10](#)). Further complicating this dynamic is Patrick Colm Hogan's concept of empathy inhibition, in which in-group and out-group divisions position and construct certain groups as “stereotypically different and less worthy of an empathetic response” ([Weik Von Mossner 2017: 82](#)).

Due to the current distribution of environmental burdens and benefits that has been created, informed, and reproduced by the social and historical traumas of systems of oppression such as racism, sexism, classism, ableism, and ageism, among others, some of the identity groups most likely to be disproportionately affected by the endogenous vulnerability of climate change in the United States include: People of Color (e.g. African-American, Latinx, and Indigenous populations), migrant workers, refugees and New Americans, people with disabilities, women, children, and the elderly ([Aldrich 2012: 5](#); Solnit 2009: 240). This vulnerability occurs across various temporal scales. Before a climate disaster, for example, the burning of fossil fuels that contributes to climate change positions low-income children as being more likely to develop asthma than their counterparts coming from wealthy families. Following a disaster, these same children are four times more likely than privately insured children to be prescribed antipsychotic medicines. Such pathologization of poverty affects motivation, play, and curiosity, all key for developing the imagination necessary to envision ourselves out of the disasters in our lives ([Van der Kolk 2015: 37](#)).

Statistically less likely to – or forbidden from – occupying formally recognized positions of power (e.g. elected community leadership roles), members of marginalized identity groups are especially vulnerable to continual exclusion from the decision-making processes critical to communal recovery post-disaster. This systematic exclusion from occupying positions of power may be furtive (for example, when implicit biases and dominant narratives position Latinx community members as “illegal”) or explicit (such as the partial or total barriers preventing young people, formerly incarcerated individuals, and people not born in the United States, for example, from running for office).

## Social Equity in Strategy & Planning Process – National Context (INTERMEDIATE)

Foundational to North American history is the theft of land from Indigenous peoples and the enslavement of people from West Africa. To this day, land and labor continue to be exploited both within and outside North American borders in service of maintaining power dynamics that are both racialized and class stratified. Unchecked extraction and concentration of resources has destabilized the earth's natural systems. Those who have contributed and benefited least are also the ones most impacted by this legacy, meaning that BIPOC individuals today are disproportionately exposed to the impacts of climate-related hazards and are often without the resources to withstand and recover from those impacts. Climate disruption is therefore a multiplier of the inequities, injustices, and burden of loss for the benefit of a few that this country is founded on.

While many government agencies and decision makers perceive disaster aid work to be “apolitical” and based on need, the resources available to community members preceding a crisis prove to be one of the strongest determinants of their receipt of assistance afterward ([Aldrich 2012: 106](#)). In this way, historical dynamics of disaster aid resource allocation have followed a pattern in which power, privilege, and resources (inputs and outputs of social capital) are cyclically magnetized to themselves. This reality, in addition to directly affecting a community's *received support* (actual receipt of help), also impacts *perceived support* (the belief that help will be available if needed), further spurring on cycles of neglect and disempowerment for communities most in need ([Saul 2022: 10](#)). Further complicating this dynamic is Patrick Colm Hogan's concept of empathy inhibition, in which in-group and out-group divisions position and construct certain groups as “stereotypically different and less worthy of an empathetic response” ([Weik Von Mossner 2017: 82](#)).

## Social Equity in Strategy & Planning Process – National Context (BEGINNER)

Historical abuses against Indigenous and African peoples are an egregious bedrock of North American history. In addition, continued exploitation of land and labor – including unchecked extraction and concentration of resources – continues to destabilize the resiliency of natural systems and human communities. Those who have contributed and benefited least are also the ones most impacted by this legacy, meaning that BIPOC individuals today are disproportionately exposed to the impacts of hazards and are often without the resources to withstand and recover from those impacts.

The resources available to community members preceding a crisis prove to be one of the strongest determinants of their receipt of assistance afterward ([Aldrich 2012: 106](#)). In this way, historical dynamics of disaster aid resource allocation have followed a pattern in which those with existing resources continue to receive more resources than those with less. This reality, in addition to directly affecting a community's *received support* (actual receipt of help), also impacts *perceived support* (the belief that help will be available if needed), further spurring on cycles of neglect and disempowerment for communities most in need ([Saul 2022: 10](#)). Further complicating this dynamic is Patrick Colm Hogan's concept of empathy inhibition, in which in-group and out-group divisions position and construct certain groups as “stereotypically different and less worthy of an empathetic response” ([Weik Von Mossner 2017: 82](#)).

## Social Equity in Strategy & Planning Process – Regional & Local Contexts (ADVANCED)

Perhaps as should be intuitive, people whose livelihoods depend upon the outcome of recovery efforts are best suited to lead them ([Aldrich 2012: 50](#)). Better positioned to author plans that recognize the unique historical period and cultural environment in which a disaster occurs, and that foster trust, coalitions between individuals and community leaders are able to proactively avert the key challenge that most top-down, post-disaster plans face: resistance from people who feel ignored, invalidated, or explicitly harmed by the plan ([Aldrich 2012: 41, 155](#); [Saul 2022: 13](#)). Additionally, community-led adaptation plans are more effective at addressing disparities ([Guardaro et al., 2020](#)). As trauma expert Dr. Bessel Van der Kolk succinctly illustrates, “After trauma the world becomes sharply divided between those who know and those who don't. People who have not shared the traumatic experience cannot be trusted, because they can't understand it” ([Van der Kolk 2015: 18](#)). Additionally, the response of a community to an instance of trauma – personal or collective – is integral to the resolution of such trauma. Should a community successfully build a response around the pillars of recognition and restitution

while creating space for mourning, their internal capacity to lead an empowered, self-actualized healing process will exceed that of any external entity ([Herman 1992: 70, 190](#)).

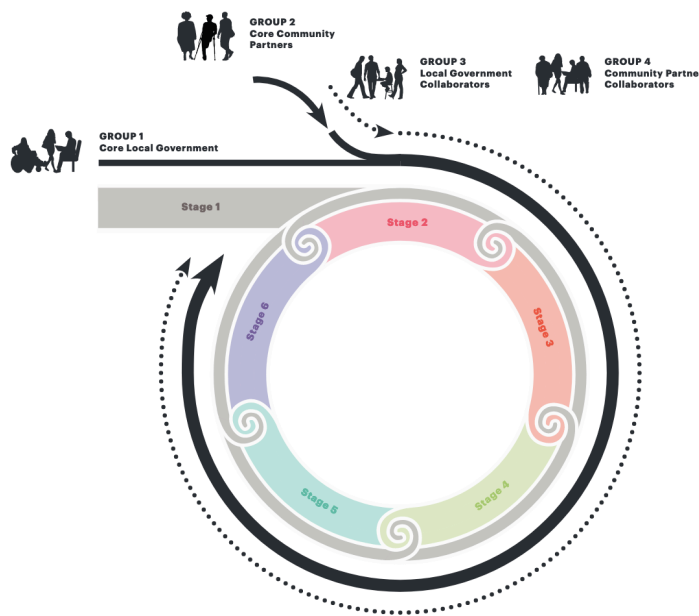
## Co-development and collaborative governance

The process of power shifting begins with the Core Local Government Team unlearning inaccurate history, becoming aware of their place in the system, and increasing self-awareness. Work on privilege, power and implicit bias that then moves into organizing as a team.

The Core Local Government team is joined by Core Community Partners in Stage 2, and moving forward, these groups work together as copilots or co-leads.

They are joined by other Local Government and community collaborators as needed to support the effort.

The shifting of power happens through the collaboration of the core partners (illustrated by the solid gray circle surrounding the full process). Accountability happens between the core partners and collaborators at each stage (illustrated by the swirls at each transition in the process).



**Fig. 1.7 USDN Stages of Co-development and collaborative governance.** This image illustrates the process of power shifting that must occur in order to ensure HMPs are the most representative and effective possible, and that they have meaningful buy-in from the community. (Credit: USDN).

### Guiding Questions

- How are decisions made at various scales? Who is involved in these decision making processes, and how did they come to hold this power? Are local Indigenous Nations involved in decision-making processes within your current structure?
- What identities, lived experiences, perspectives, and values are represented among decision makers and planners in your area? Why might these identities, lived experiences, perspectives, and values be represented but not others?
- Has the community identified marginalized or vulnerable populations that need to be intentionally brought into decision making processes? In what ways do you value and compensate people for the expertise inherent in their lived experiences and/or enhanced by their credentials?
- What systemic, interpersonal, and/or individual barriers exist that might prevent different groups of people from participating? For example, is there a systemic expectation that all meetings are conducted in English? Do BIPOC individuals experience racism that complicates or prevents their participation? Are meetings held at times that would not allow a working parent the opportunity to engage?
- How are different ways of knowing celebrated in decision making and strategizing? For example, is Indigenous knowledge regarding climate change valued in comparison to Western scientific data, and to what degree? Best results come from “unique, indigenous, and community based approaches” rather than “generalizable, technical, and targeted approaches” ([Saul 2022](#)).
- How are existing community groups, organizations, academic and public institutions, etc. brought into decision-making processes? What can community groups and organizations comprised of or focused on serving BIPOC, queer people, people with disabilities, and other groups of people who are historically



and presently subjugated teach you about how to partner with them and achieve mutually-beneficial outcomes?

## Social Equity in Strategy & Planning Process – Regional & Local Contexts (INTERMEDIATE)

Perhaps as should be intuitive, people whose livelihoods depend upon the outcome of recovery efforts are best suited to lead them ([Aldrich 2012: 50](#)). Better positioned to author plans that recognize the unique historical period and cultural environment in which a disaster occurs, and that foster trust, coalitions between individuals and community leaders are able to proactively avert the key challenge that most top-down, post-disaster plans face: resistance from people who feel ignored, invalidated, or explicitly harmed by the plan ([Aldrich 2012: 41, 155](#); [Saul 2022: 13](#)). Additionally, community-led adaptation plans are more effective at addressing disparities ([Guardaro et al., 2020](#)). As trauma expert Dr. Bessel Van der Kolk succinctly illustrates, “After trauma the world becomes sharply divided between those who know and those who don’t. People who have not shared the traumatic experience cannot be trusted, because they can’t understand it” ([Van der Kolk 2015: 18](#)). Additionally, the response of a community to an instance of trauma – personal or collective – is integral to the resolution of such trauma. Should a community successfully build a response around the pillars of recognition and restitution while creating space for mourning, their internal capacity to lead an empowered, self-actualized healing process will exceed that of any external entity ([Herman 1992: 70, 190](#)).

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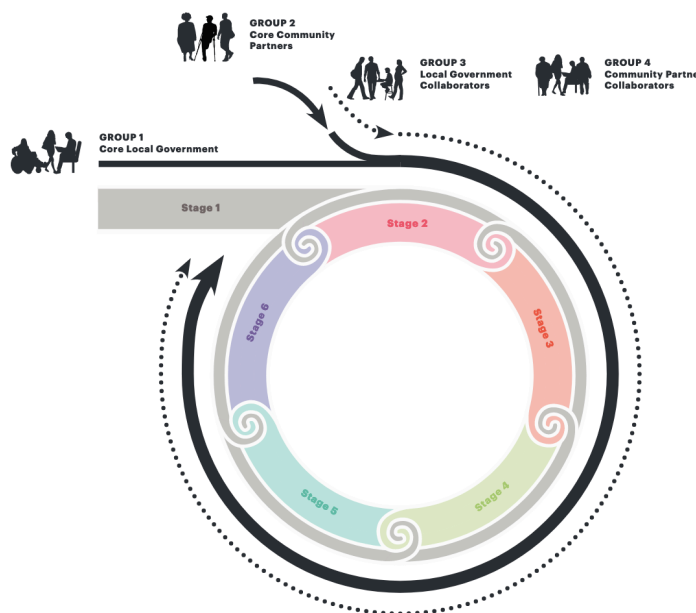


Fig. 1.7 USDN Stages of Co-development and collaborative governance. This image illustrates the process of power shifting that must occur in order to ensure HMPs are the most representative and effective possible, and that they have meaningful buy-in from the community. (Credit: USDN).

### Guiding Questions

- How are decisions made at various scales? Who is involved in these decision making processes, and how did they come to hold this power?
- What identities, lived experiences, perspectives, and values are represented among decision makers and planners in your area?



- Has the community identified marginalized or vulnerable populations that need to be intentionally brought into decision making processes?
- What systemic, interpersonal, and/or individual barriers exist that might prevent different groups of people from participating? For example, is there a systemic expectation that all meetings are conducted in English? Do BIPOC individuals experience racism that complicates or prevents their participation? Are meetings held at times that would not allow a working parent the opportunity to engage?
- How are existing community groups, organizations, academic and public institutions, etc. brought into decision-making processes? What can community groups and organizations comprised of or focused on serving BIPOC, queer people, people with disabilities, and other groups of people who are historically and presently subjugated teach you about how to partner with them and achieve mutually-beneficial outcomes?

## Social Equity in Strategy & Planning Process – Regional & Local Contexts (BEGINNER)

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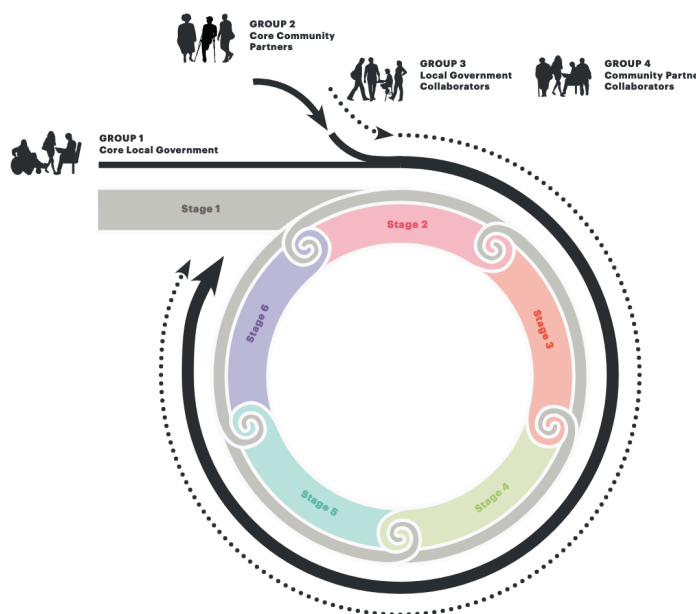


Fig. 1.6 USDN Stages of Co-development and collaborative governance. This image illustrates the process of power shifting that must occur in order to ensure HMPs are the most representative and effective possible, and that they have meaningful buy-in from the community. (Credit: USDN).

### Guiding Questions

- How are decisions made? Who is involved in these decision making processes and why?

- What subpopulations, perspectives, and values are represented among decision makers and planners in your area?
- Has the community identified marginalized or vulnerable populations that need to be intentionally brought into decision making processes? What barriers might exist to their participation?
- How are existing community groups, organizations, academic and public institutions, etc. brought into decision-making processes?

## II. ECOLOGICAL CONSIDERATIONS

### Ecological Considerations in Strategy & Planning Process – Global Context (ADVANCED)

Ecological actions or inactions that occur in one place have meaningful consequences – immediate or eventual – for all other locales. As ecological systems do not recognize geopolitical borders, their health is an inherently global concern. Deforestation and forest damage, as one example, [accounts for around 10% of global climate change](#). As a result, effective HMPs must take measures to: (1) acknowledge and address the remediation needs of ecosystems in the areas covered by the plan, (2) significantly reduce or eliminate future harms to vulnerable and valuable ecosystems and the life they sustain, and (3) collaborate with other jurisdictions, Nations, and countries to make progress toward ecological and climate goals.

Whereas groups of people around the world have been intentionally silenced or discredited in order to elicit compliance with stratified social and economic structures, our planet's ecosystems were never able to protest their own exploitation and destruction.

Additionally, as the destruction of ecological resources trends toward exacerbating existing fault lines between groups of people and widening wealth gaps, those with less may in turn move toward accelerating their own exploitation of the land and people in a mad dash to get a slice of the pie before it disappears ([Saul 2022](#)). Take, for example, the Democratic Republic of the Congo. As a country that has been the subject of colonial occupation, disastrous international involvement, and both intranational and international wars, the Democratic Republic of the Congo has certainly not been a top beneficiary of globalization. It would be a mistake, however, to interpret the genocide and myriad of other atrocious human rights violations taking place as a result of conflict mineral mining in the country as anything less than an inevitable consequence of a system of global capitalism that rewards those who exploit the vulnerable people and landscapes with profit and impunity. Part of any solution to global ecological collapse and climate change must also include social equity considerations in order to be truly just and effective.

Disaster events threaten to further exacerbate conflicts over materials such as the rare-earths being extracted from places like the Democratic Republic of the Congo. According to an [analysis by McKinsey](#), supply for select rare earth elements is unlikely to keep up with demand for use in “high-growth” sectors such as cleantech and consumer electronics as well as “high-end” sectors such as aerospace, defense, and medical appliances. The supply chain for these materials is currently wound so tightly that disruptions from climatic events could add more pressure than can be managed. When this happens, it is likely that extraction practices become even more dangerous for workers and civilians caught in the crossfires of the conflict.

### Ecological Considerations in Strategy & Planning Process – Global Context (INTERMEDIATE)

Ecological actions or inactions that occur in one place have meaningful consequences – immediate or eventual – for all other locales. As ecological systems do not recognize geopolitical borders, their health is an inherently global concern. Deforestation and forest damage, as one example, [accounts for around 10% of global climate change](#). As a result, effective HMPs must take measures to: (1) acknowledge and address the remediation needs of ecosystems in the areas covered by the plan, (2) significantly reduce or eliminate future harms to vulnerable

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### **Ecological Considerations in Strategy & Planning Process – Global Context (BEGINNER)**

Ecological actions or inactions that occur in one place have meaningful consequences – immediate or eventual – for all other locales. As ecological systems do not recognize geopolitical borders, their health is an inherently global concern. As a result, effective HMPs must take measures to: (1) acknowledge and address the remediation needs of ecosystems in the areas covered by the plan, (2) significantly reduce or eliminate future harms to vulnerable and valuable ecosystems and the life they sustain, and (3) collaborate with other jurisdictions, Nations, and countries to make progress toward ecological and social goals.

### **Ecological Considerations in Strategy & Planning Process – National Context (ALL LEVELS)**

HMPs are a necessary fixture in the process of planning for, responding to, and recovering from disaster events; yet conducting the kind of proactive work that can significantly reduce the frequency and/or intensity of disasters is impossible without addressing the systemic ecological conditions that result in or exacerbate such occurrences. For example, limiting or eliminating new development on floodplain regions can preserve beneficial ecosystem services such as bank stability, erosion control, and biodiversity. [FEMA](#) indicates that floodplain development can lead to the degradation and loss of natural functions and habitat when vegetation is cleared, areas are filled, impervious surfaces are laid, stormwater is rerouted, pollution sources increase, or rivers are channelized.

### **Ecological Considerations in Strategy & Planning Process – Regional & Local Contexts (ADVANCED)**

#### **Guiding Questions**

- What ecological conditions contribute to or result in the occurrence of disaster events in your area? Consider geomorphic and watershed conditions. Consider how human development has changed ecological conditions over time, including long-term effects that may not be fully understood yet.
- Ecological systems do not recognize geopolitical borders. Ecological actions or inactions that occur in one place have meaningful consequences – immediate or eventual – for all other locales. Conduct an assessment of actions that have been taken in your area that have significantly altered ecological systems, including how these changes may have (speculative assessment) or have (investigative assessment) impacted other areas at local, national, and global scales.
- Conduct a similar assessment for impending or anticipated actions in your area that may significantly alter ecological systems (projective assessment), especially those incorporated into your HMP.
- Conduct an assessment of how the technologies, products, and services used in mitigation and recovery efforts in your area may be (speculative assessment) or have (investigative assessment) contributing to social, ecological, or climate distress in other locales (e.g. technologies that contain conflict minerals will have implications for areas where conflict minerals are sourced, such as the Democratic Republic of the Congo).

## **Ecological Considerations in Strategy & Planning Process – Regional & Local Contexts (INTERMEDIATE)**

### **Guiding Questions**

- What ecological conditions contribute to or result in the occurrence of disaster events in your area? Consider geomorphic and watershed conditions. Consider how human development has changed ecological conditions over time, including long-term effects that may not be fully understood yet.
- Ecological systems do not recognize geopolitical borders. Ecological actions or inactions that occur in one place have meaningful consequences – immediate or eventual – for all other locales. Conduct an assessment of actions that have been taken in your area that have significantly altered ecological systems, including how these changes may have (speculative assessment) or have (investigative assessment) impacted other areas at local, national, and global scales.
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## **Ecological Considerations in Strategy & Planning Process – Regional & Local Contexts (BEGINNER)**

### **Guiding Questions**

- What ecological conditions contribute to or result in the occurrence of disaster events in your area? Consider geomorphic and watershed conditions. Consider how human development has changed ecological conditions over time, including long-term effects that may not be fully understood yet.

## **III. CLIMATE CONSIDERATIONS**

### **Climate Considerations in Strategy & Planning Process – Global Context (ADVANCED)**

Often, communities can become trauma-organized, instead of trauma resilient, as a result of climate change. Throughout the strategy and planning processes of this HMP, the following signs of a community or group becoming trauma-organized, identified by Bob Doppelt (2016), will be assessed and addressed:

- Group is confused over its purpose, vision of success, and guiding values
- Group operates with poor emotional management and communications
- There is not a set of widely agreed upon acceptable behaviors and practices
- People and functions are siloed, disconnected, and/or fragmented from each other
- Existence of rigid and often punitive rules and regulations
- Constant presence of groupthink, quick-fix thinking, and the inability to learn
- Group fails to acknowledge or correct injustices
- Group inability to mourn losses, leading to reenactment and learned helplessness
- Presence of authoritarian leadership and abuses of power
- Group or individuals within the group lack trust, empathy, compassion, and/or social support

The following precipitant factors resulting from climate change can lead to trauma organization ([Doppelt 2016](#)); strategies for addressing and mitigating each of these will be incorporated into this HMP:

- Economic disruptions and job losses
- Diminished physical health of community members
- Rising costs and the inability to provide basic services
- Rising poverty and other disproportionate impacts

- Involuntary and voluntary migration

Landau-Stanton's (1986) LINC Community Resilience Model encourages one possible strategy for circumnavigating symptoms of trauma-organization. The LINC Model recommends: (1) holding town meetings to map the community's strengths and resources and establish goals and work groups; (2) working with consultants to facilitate weekly and monthly work group meetings; and (3) developing a community-driven model that can respond to the immediate crisis, offer various interdisciplinary programs and services for trauma intervention, develop long-term family and community services to prevent the sequelae of trauma, and create exportable plans in case of future crises ([Saul 2022](#)). This HMP will ensure that consultants are members of the community who hold marginalized identities and/or are connected to existing community organizations advocating for marginalized groups.

Throughout the strategy and planning process of this HMP, planners will work to avoid the following common thinking distortions that can undermine thoughtful, comprehensive, and effective planning efforts: (1) being fixated on flaws; (2) dismissing the positive; (3) assuming; (4) labeling; (5) overgeneralizing; (6) engaging in all-or-nothing thinking; (7) catastrophizing; (8) using "should" statements; (9) personalizing; and (10) blaming ([Doppelt 2016](#)).

### **Climate Considerations in Strategy & Planning Process – Global Context (INTERMEDIATE)**

Often, communities can become trauma-organized, instead of trauma resilient, as a result of climate change. Throughout the strategy and planning processes of this HMP, the following signs of a community or group becoming trauma-organized, identified by Bob Doppelt (2016), will be assessed and addressed:

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- Rising poverty and other disproportionate impacts
- Involuntary and voluntary migration

### **Climate Considerations in Strategy & Planning Process – Global Context (BEGINNER)**

Often, communities can become trauma-organized, instead of trauma resilient, as a result of disruptions such as disasters. Throughout the strategy and planning processes of this HMP, the following signs of a community or group becoming trauma-organized, identified by Bob Doppelt (2016), will be assessed and addressed:

- Group is confused over its purpose, vision of success, and guiding values
- Group operates with poor emotional management and communications
- There is not a set of widely agreed upon acceptable behaviors and practices
- People and functions are siloed, disconnected, and/or fragmented from each other
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- Group fails to acknowledge or correct injustices
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- Presence of authoritarian leadership and abuses of power
- Group or individuals within the group lack trust, empathy, compassion, and/or social support

### **Climate Considerations in Strategy & Planning Process – National Context (ALL LEVELS)**

The following principles will be used to ensure that the strategy and planning process of this HMP represents ethical engagement with the community (Landau & Saul 2004, cited in [Saul 2022](#)). These principles will also be expectations held of any consultants or personnel who come into the community for mitigation, response, or recovery efforts:

- Ensuring that planners have invitation, authority, permission, and commitment from the community;
- Engaging the entire system of community, including the representation of individuals and subsystems from each cultural and ethnic group and all economic, cultural, and social strata;
- Identifying scripts, themes, and patterns across generations and community history;
- Maintaining sensitivity to issues of gender, culture, spirituality, race, etc.;
- Encouraging access to all natural and ancillary resources (biopsychosocial, cultural, ecological, etc.);
- Building an effective prevention/management context by collaborating across all systems;
- Fostering a balance of agency and communion across the community;
- Building on existing resources;
- Relating program needs to goals, future directions, and best interests of the community;
- Utilizing resources, turning goals into realistic tasks, and turning tasks into practical projects;
- Providing the process while the community itself takes responsibility for the content and goals;
- Encouraging community links (natural change agents) to become leaders in the community;
- Remaining peripheral in order to allow space for the success of programs and the community at large;
- Acknowledging and insisting that success of the project belongs to the community.

### **Climate Considerations in Strategy & Planning Process – Regional & Local Contexts (ADVANCED)**

#### **Guiding Questions**

- What groups, organizations, and/or initiatives in your area already have stated climate goals? How do these map to existing regional, state, or municipal climate goals? How can this HMP build upon and contribute toward these existing goals?
- What data tells the story of how climate is changing in your area, and how these changes are actively affecting people, landscapes, wildlife, and systems?
- How are these impacts projected to change?
- Given this data, how might your planning process change to amplify and reflect the voices of those most impacted by current and expected climate impacts?
- How can the makeup of the planning group change in order to be led by those representative of most impacted groups? How can this shift be meaningful and have decisional significance rather than being performative?

### **Climate Considerations in Strategy & Planning Process – Regional & Local Contexts (INTERMEDIATE)**

#### **Guiding Questions**

- What groups, organizations, and/or initiatives in your area already have stated climate goals? How do these map to existing regional, state, or municipal climate goals? How can this HMP build upon and contribute toward these existing goals?
- What data tells the story of how climate is changing in your area, and how these changes are actively affecting people, landscapes, wildlife, and systems?
- How are these impacts projected to change?
- Given this data, how might your planning process change to amplify and reflect the voices of those most impacted by current and expected climate impacts?

## **Climate Considerations in Strategy & Planning Process – Regional & Local Contexts (BEGINNER)**

### **Guiding Questions**

- What groups, organizations, and/or initiatives in your area already have stated climate goals? How do these map to existing regional, state, or municipal climate goals? How can this HMP build upon and contribute toward these existing goals?
- What data tells the story of how climate is changing in your area, and how these changes are actively affecting people, landscapes, wildlife, and systems?
- How are these impacts projected to change?

# SECTION III: HAZARD IDENTIFICATION & ASSESSMENT

## I. SOCIAL EQUITY CONSIDERATIONS

### **Social Equity in Hazard Identification & Assessment – Global Context (ADVANCED)**

Trauma can be understood as any experience that seriously undermines or completely shatters at least some, if not all, of an individual's core beliefs ([Doppelt 2016](#)). Traumatic events overwhelm the ordinary systems of care that allow people to experience control, connection, and meaning ([Herman 1992](#)). No two people or cultures will experience any same event in the same way. For example, instances of collective trauma such as disasters have a heightened impact on people who live in collectivist cultures ([Saul 2022](#)). Likewise, two people who have experienced many disasters may feel differentially more resilient or vulnerable to the occurrence of another. However, all responses to traumatic exposure are valid and deserve care and attention. Trauma expert Peter Levine states that "trauma occurs as a result of an initiation of an instinctual cycle that is not allowed to finish."

Notably, collective trauma is understood to have the following interpersonal and structural effects: (1) heightens structural and individual violence; (2) creates an inability to react to patterns of threat and opportunity; and (3) increases cycles of social fragmentation ([Saul 2022](#)).

Exposure to others' trauma doubles the risk that social workers, and those in similar supporting roles, will experience post-traumatic stress disorder ([van Dernoot Lipsky 2007](#)). Warning signs of trauma exposure response, or vicarious traumatization, include: feeling helpless and hopeless, experiencing a sense that one can never do enough, hypervigilance, diminished creativity, inability to embrace complexity, minimizing, chronic exhaustion and physical ailments, an inability to listen or deliberate avoidance, dissociative moments, experiencing a sense of persecution, guilt, fear, anger and cynicism, addictions, grandiosity (an inflated sense of importance), and an inability to empathize or "numbing" oneself ([van Dernoot Lipsky 2007](#)). When planning for or responding to traumatic events, such as disasters, it is common for the urgency of the need to distort priorities such that the methods and strategies are deprioritized over the end results. This can result in the use of methods and strategies that further exacerbate the experience of trauma. Additionally, a reliance on hyperintellectualization, the process by which people deny or reject the felt emotional experiences of self or others in order to devise "rational" solutions, can compound one's experience of trauma ([van Dernoot Lipsky 2007](#)).

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importance), and an inability to empathize or “numbing” oneself ([van Dernoot Lipsky 2007](#)). When planning for or responding to traumatic events, such as disasters, it is common for the urgency of the need to distort priorities such that the methods and strategies are deprioritized over the end results. This can result in the use of methods and strategies that further exacerbate the experience of trauma. Additionally, a reliance on hyperintellectualization, the process by which people deny or reject the felt emotional experiences of self or others in order to devise “rational” solutions, can compound one’s experience of trauma ([van Dernoot Lipsky 2007](#)).

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When planning for or responding to traumatic events, such as disasters, it is common for the urgency of the need to distort priorities such that the methods and strategies are deprioritized over the end results. This can result in the use of methods and strategies that further exacerbate the experience of trauma.

## **Social Equity in Hazard Identification & Assessment – National Context (ADVANCED)**

Communities of Color, specifically Black, Indigenous, and People of Color (BIPOC), are disproportionately affected by climate change due to the cumulative effects of centuries of discriminatory policies and practices that increase exposure to precarity and reduce resiliency that, for wealthier and/or whiter communities, buffers against impacts. The United States is founded on extraction of people and natural resources to enable the seeds of capitalism to grow. Race is the nation’s greatest disparity. When assessing vulnerability, it is critical to assess impacts of racism and prejudice against BIPOC communities first and to integrate a [targeted universalism](#) approach to solutions.

Other vulnerable people include children, the elderly, those with health conditions, and lower-income individuals; however, in all of these categories, race is still the greatest determinant of disparity and BIPOC people have a compromised capacity to anticipate, accommodate, and cope with hazard events. Hazard events intensify existing social stressors such as lack of access to resources and transportation, lack of affordable housing, living paycheck to paycheck, being beholden to unsafe or unjust working conditions, economic hardship, health issues, etc.

This plan recognizes the need to take a [‘targeted universalism’](#) approach to hazard mitigation by ensuring that resources, capacity, and action are prioritized in BIPOC communities with high vulnerability and risk. This approach will ensure that those with the most need are recognized, heard, and valued while also improving human health, infrastructure, and quality of life. This aligns with recent guidelines developed by FEMA, including the FEMA guide on expanding mitigation and making the equity connection, which identified 13 population groups that are likely to be disproportionately impacted by natural disasters. These groups include:

- People of Color
- Tribal and First Nation communities
- Underserved communities with a low socioeconomic status
- Women
- Members of the LGBTQ+ community
- Individuals experiencing homelessness or displacement
- Rural communities
- Elderly and youth populations
- Populations with limited English proficiency

- Service workers and migrant laborers
- Populations with limited cognitive or physical abilities
- Institutionalized populations such as those in prisons and nursing homes
- Renters

FEMA acknowledges the negative impacts of government policies that make it harder for BIPOC and low-income people to prepare for, anticipate, withstand, and recover from hazard impacts. Centuries of discrimination (which continue today) have led to inequitable impacts resulting in higher incidences of heart disease, respiratory illness, high blood pressure, diabetes, and other health issues that when combined with lack of access to resources and support led to higher likelihood of impact from natural hazards.

Importantly, no one person holds just a single identity, and not all people with shared identities have shared experiences. An Indigenous woman who rents will be subjected to not only racism, sexism, and the economic precarity implicit in renting, but each of these forces in addition to how they intersect, bolster, and exacerbate each other. Likewise, her elderly, white, and genderqueer neighbor will be differentially affected by ageism and a culture that invalidates their gender identity at the same time that the impacts of these forces will be buffered by power and privilege associated with their race.

### **Social Equity in Hazard Identification & Assessment – National Context (INTERMEDIATE)**

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## **Social Equity in Hazard Identification & Assessment – Regional & Local Contexts (ADVANCED)**

Many mental health resources in post-disaster settings provide responsive rather than preventative supports. Frontloading therapeutic resources is typically less effective, primarily because most individuals will need therapeutic support later on rather than earlier on, when individuals are tending to more base needs. Tragically, funding for therapeutic services is often diminished by the time that people exhibiting serious symptoms are ready for treatment ([Saul 2022](#)).

This plan recognizes that the response of the community has a significant impact on the ultimate resolution of the trauma, primarily through public acknowledgement of the traumatic event and a form of communal action ([Herman 1992](#)).

### **Guiding Questions**

- What mental health supports are available for individuals and families? Which of these services are available as preventative measures, and which are responsive?
- What is the timeline of availability for therapeutic services? Does this timeline match the best available science about how trauma operates and when people are most likely to need services?
- How is the disaster being publicly acknowledged? How are those responsible for any negligence or inadequacy of response taking accountability in a public forum? How are opportunities being provided

for community members to express frustrations, appreciations, and questions? How are restorative justice practices being employed to help address conflicts?

- What scaffolding is in place to support the community in coming together and generating collective responses to the collective trauma of the disaster? Some examples of creative and effective community healing events are: walking or exercise groups; community art projects such as painting a hopeful mural on a wall formerly part of a community structure; singing or dancing groups; cooking culturally significant meals and sharing food with members of the community; creating art displays or monuments to honor lost, injured, or deceased members of the community; etc.
- Which subpopulations within the community may be experiencing other instances of collective trauma (e.g. members of the BIPOC community experiencing the collective trauma of police violence against Black and Brown people; students whose school recently experienced an act of mass violence; religious practitioners or people of faith whose place of worship was recently vandalized; etc.)? How might these lingering experiences of collective trauma compound the effects of a disaster? What might be some unique or additional needs that these subpopulations would benefit from?

### **Social Equity in Hazard Identification & Assessment – Regional & Local Contexts (INTERMEDIATE)**

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## II. ECOLOGICAL CONSIDERATIONS

### Ecological Considerations in Hazard Identification & Assessment – Global Context (ADVANCED)

Ecological dimensions are the elements of nonhuman nature that connect throughout the environment. They include elements such as tree growth, soil formation, habitat formation, and hydrologic processes. All elements of the natural environment are subject to a range of impacts from climate change, including an inability to adapt to the rapid fluctuations in temperature and extreme changes to the hydrologic cycle.

Alterations to ecological systems will make hazard events less predictable and may increase hazard impacts. Extreme hazard events will increase damage to property and infrastructure while also disrupting productivity and accessibility. Economies are highly dependent on the health and resources generated by ecological systems and disruptions to the natural environment will have repercussions for all sectors, from agriculture to technology. In addition to local impacts, climate change is a global issue and hazard events will impact global and national systems with [repercussions for supply chains](#) and businesses with operations outside of human-imposed borders. In particular, climate change disrupts production and can raise costs and prices; the more specialized the production, the more severe the impacts of climate events that exceed what manufacturing assets are constructed to withstand. As average global temperatures continue to rise, we must proactively anticipate these disruptions and build adaptability into hazard mitigation projects and strategies.

### Ecological Considerations in Hazard Identification & Assessment – Global Context (INTERMEDIATE)

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## III. CLIMATE CONSIDERATIONS

### Climate Considerations in Hazard Identification & Assessment – Global Context (ADVANCED)

Climate change is real. Evidence from direct measurements of ocean and air temperatures unequivocally demonstrates that the earth's climate is rapidly warming due to human activities. In fact, the Earth is warming faster today than ever before in recorded history. Climate refers to patterns of weather that include variations in precipitation, wind, temperature, and humidity. Weather refers to short-term changes in the atmosphere, whereas climate refers to averages over a longer period of time. Scientists believe that global temperatures will continue to rise for decades to come due to significant and lasting consequences from human action.

Climate change exacerbates existing vulnerabilities while generating new risks. Changes in global climate patterns are already having visible impacts on social, ecological, and technical systems. Global communities will continue to experience more intense and frequent hazard events leading to increased loss of life, ecosystem services, and vulnerabilities ([IPCC Sixth Assessment Report](#)). As population increases, these losses will be further magnified along with severe economic disruptions.

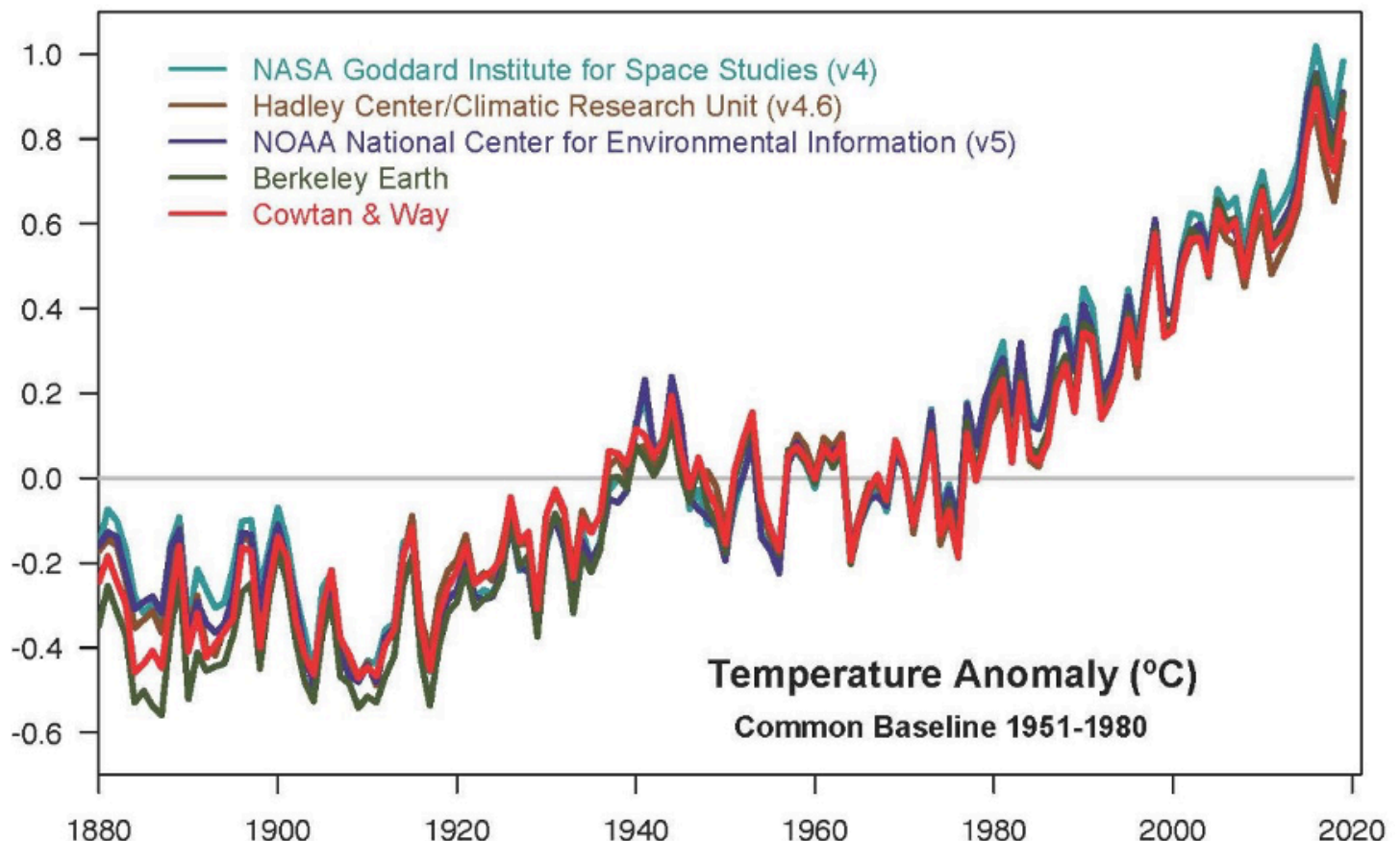


Fig. 1.8 Scientific Consensus: Earth's Climate is Warming. Temperature data showing rapid warming in the past few decades, the latest data going up to 2019. According to NASA data, 2016 was the warmest year since 1880, continuing a long-term trend of rising global temperatures. The 10 warmest years in the 140-year record all have occurred since 2005, with the six warmest years being the six most recent years. (Credit: NASA/NOAA).

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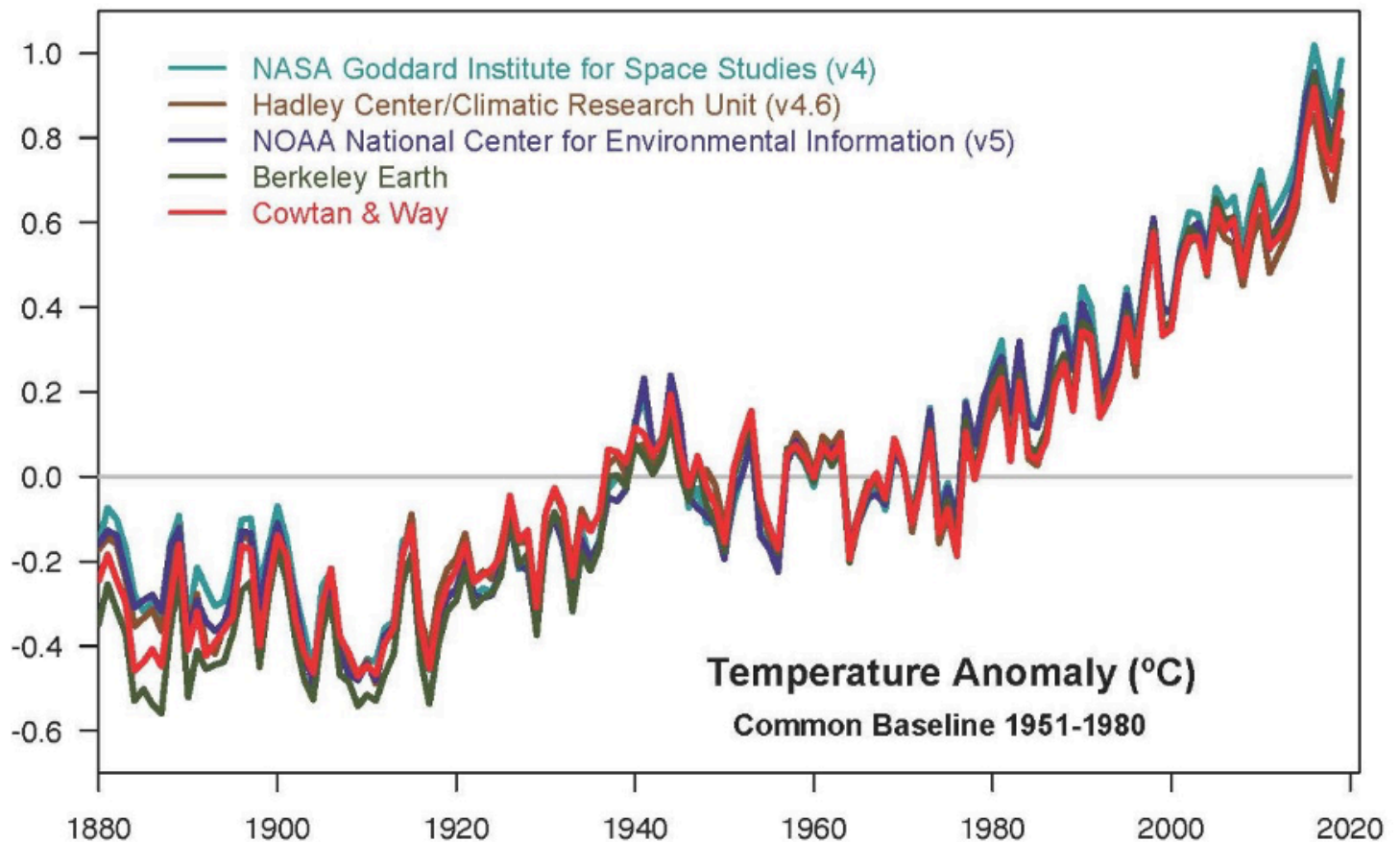


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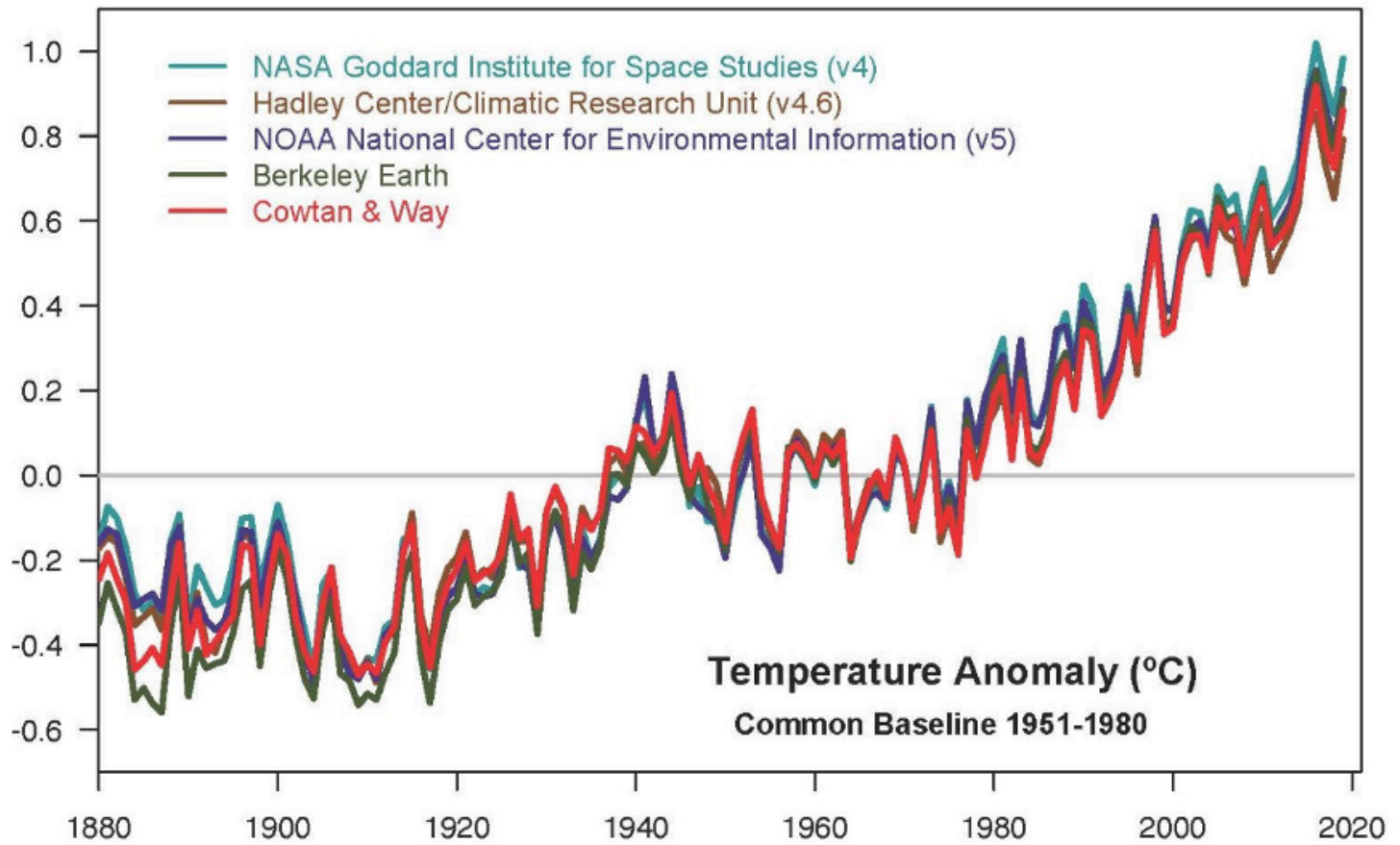


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### Climate Considerations in Hazard Identification & Assessment – National Context (ALL LEVELS)

The U.S. Global Change Research Program (USGCRP) is the national authority on climate change in the United States. In 2018, the USGCRP released the Fourth National Climate Assessment (NCA4) which confirms that climate change is impacting every region of the United States and provides peer reviewed data and information about how impacts are expected to become worse as average global temperatures continue to rise. The report breaks the country into regions.

Higher temperatures impact soil, water, and air quality leading to direct impacts on human health, livestock, crop yields, and wildlife. Additionally, climate impacts affect population groups differently. Black, Indigenous, and People of Color (BIPOC), age-advanced, youth, and people with disabilities or chronic health conditions are impacted disproportionately due to the combination of prejudice systems and structures with more frequent and intense hazard events.

#### By Hazard Breakdown

##### 1. Air Quality.

Environmental racism is a phenomenon through which BIPOC individuals are more likely to experience the burdens of development, ecological collapse, and climate change than white individuals.

Simultaneously, BIPOC individuals are less likely to experience the benefits that come from development, or from undeveloped ecological spaces. Specifically, BIPOC individuals are [more likely to live near power](#)

[plants and highways](#), among other air quality pollutants, contributing to [significantly higher rates of asthma-related hospitalizations](#). For example, Black individuals in the Mott Haven neighborhood in the South Bronx, which is 97% Hispanic or Black, are exposed to about 56% more pollution than is caused by their consumption; similarly, Hispanics in this neighborhood are exposed to 63% more pollution than is caused by their consumption.

## 2. **Avalanche.**

Avalanches can result in road and railway obstructions, blocking the transport of essential supplies. As with any disaster that disrupts the delivery of foods, medicines, and other essential products, avalanches have the potential to exacerbate existing resource inequities; the wealthy can typically better weather periods without usual access to these products, or can afford price hikes that occur in response to supply chain disruptions.

## 3. **Communicable/Zoonotic Disease Outbreak.**

[According to the CDC](#), BIPOC individuals experience heightened vulnerability to the economic, social, and secondary health consequences of communicable diseases such as COVID-19. BIPOC individuals face long-standing inequities in social determinants of health. One primary inequity is disproportionate difficulty finding affordable and quality housing, including housing options limited to neighborhoods and residences with crowded conditions and that lack access to reliable transportation, “which may make illnesses, diseases, and injuries more common and more severe, when experienced.” Access to nutritious, affordable foods may be limited when individuals live in food desert areas or have been affected by intergenerational poverty or low wages. For some people in some cultures, intergenerational households may increase exposure for older adults who are at increased risk for severe illness from communicable diseases such as COVID-19.

Pandemics such as COVID-19 also have the potential to significantly [disrupt supply chains and strain the economy](#), though strain occurs unevenly. Economic precarity and job insecurity will affect more people, with those who experienced these hardships before the pandemic experiencing them to even higher degrees.

## 4. **Dam and Levee Failure.**

Large dam failure has the potential to result in [more deaths and more destruction than the failure of any other human-made structure](#). Resultant flood waves from such a failure can lead to loss of life as well as ecosystem and property destruction. Scour and erosion can be extensive, depending on the terrain, and large-scale movement of sediment and debris is likely to occur. Further harm can come from the rapid dispersion of environmental toxins and contaminants, including heavy metals..

## 5. **Drought.**

While plants, animals, and ecological systems have evolved and adapted to manage drought exposure, anthropogenic climate change is resulting in the exacerbation of drought events through reduced rainfall and increasing temperatures. These droughts threaten limited water supplies and create conditions that exacerbate other hazards, such as fires. The [National Integrated Drought Information System](#) has identified that when ecosystems are driven beyond their natural capacity to adapt, ecosystems can cross critical thresholds that result in deleterious impacts on temporary or even permanent bases. Droughts can reduce plant growth over a season permanently and cause the reduction or extinction of local species. Forests may be converted into areas with non-forested vegetation, which can reduce water retention in soils. Additionally, vulnerable freshwater ecosystems may be damaged due to changing flow regimes that increase water temperature, deteriorate water quality, and result in fish kills. Droughts can also reduce opportunities for recreation and decrease hydropower production. Notably, they represent a type of disaster event that communicates scarcity (e.g. of freshwater resources) in ways that are different from any other hazard. This can place strain on social ties in a community, and create or exacerbate anxiety symptoms.

## 6. **Earthquake.**

Earthquakes not only consist of an initial event, but aftershocks that can be equally if not more damaging. Both the unpredictability and repetition of shocks may present unique mental health challenges for survivors. Studies of survivors in Christchurch, New Zealand following the 7.1 magnitude earthquake in 2010 demonstrate a widespread, though not universal, [increase in prevalence for](#)

[diagnoses such as Major Depressive Disorder and Bipolar Disorder](#). Importantly, not all mental health impacts can be measured in terms of prevalence of diagnoses or rates of therapy attendance.

## **7. Expansive Soils.**

Also known as swell-shrink soils, expansive soils swell when water is added and shrink when it drains away. Expansive soil clays, due to this continuous change in soil volume, are extremely detrimental to the integrity of infrastructure. [Water in soil is critical for sequestering carbon](#). Thus, soil changes could significantly influence the level of carbon dioxide in the air.

## **8. Extreme Heat.**

Development practices have simultaneously increased the amount of impervious surfaces and decreased tree canopy cover. As a result, heat can become trapped more easily in these areas. The EPA defines this phenomena as the [urban heat island effect](#), wherein buildings, roads, and other infrastructure absorb and re-emit the sun's heat to a greater degree than elements of the natural landscapes (forests, bodies of water, etc.) and cause urban areas to have daytime temperatures about 1–7°F higher and nighttime temperatures about 2–5°F higher than those in outlying areas. Extreme heat from the compounding effects of climate change and the urban heat island effect threaten rapidly growing urban settlements ([Tuholske, Caylor, & Funk, 2020](#)). Additionally, the effects of extreme heat are disproportionately burdened by poor individuals in urban areas.

## **9. Flooding and coastal flooding.**

Impervious surfaces not only have a detrimental impact on water quality, but they also [increase the risk of more frequent and more severe flooding](#) by giving stormwater less places to go. Climate change also greatly affects flood risk: [regional increases in precipitation due to climate change](#) may lead to less water infiltration, more runoff and erosion, and greater risk of flash flooding. Research indicates that increased flood risk will disproportionately impact Black communities ([Wing et al., 2022](#)).

## **10. Hailstorm.**

Hailstorms are both dangerous and costly. Hailstorms are responsible for [at least \\$10 billion in damage annually across North America](#). As more and more development moves into hail-prone areas, these costs are expected to rise. [As a result of anthropogenic warming](#), low-level moisture and convective instability are anticipated to increase, which will increase hailstorm likelihood and enable the formation of larger hailstones. Additionally, melting height will rise, which will increase hail melt as well as the average size of surviving hailstones.

## **11. Landslide/Mud and Debris Flow/Rockfall.**

["Landslides are natural phenomena that cause societal disruptions when humans place parts of the built environment in their path."](#) Landslides are considered "local events" due to the fact that even the largest landslides rarely result in the declaration of a national disaster. Direct costs of landslides include damages directly attributable to the landslide, such as to infrastructure. Other, more indirect costs can include costs accrued from travel detours, economic restrictions, and environmental impacts, and these impacts frequently exceed the direct costs.

## **12. Lightning.**

[Lightning is both a symptom and cause of climate change](#). There are approximately 1.5 billion lightning bolts every year, which occur mostly near the equator. Typically, the number of occurrences diminishes the farther away from the equator, but [climate change is shifting this dynamic](#) so that more and more lightning bolts strike outside of their normal range. Worldwide, lightning causes many fatalities and injuries on an annual basis, ignites forest fires, damages electrical infrastructure, and causes loss and damage to livestock, infrastructure, and more. Additionally, where there is lightning, there is often also a storm that can cause even more damage. [According to the EPA](#), increased levels of nitrogen oxides (NO<sub>x</sub>), nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), and nitrous oxide (N<sub>2</sub>O) have been observed in the atmosphere after the occurrence and in the proximity of lightning flashes; nitrous oxides are powerful greenhouse gasses.

## **13. Subsidence.**

NASA defines sea level measured relative to land as ["relative" sea level](#). In coastal areas, subsidence refers to sinking land that can lead to higher sea-level and increased flood risk. Uplifting land, however, reduces sea level and promotes the seaward migration of coastlines. Subsidence and uplift comprise a phenomena called vertical land motion (VLM), and usually occur at rates of a few millimeters per year.

Despite seeming small, this can result in a substantial portion of [sea-level change](#) and incalculable damage.

#### 14. Tornado.

Tornadoes are some of the most violent disaster events, ripping apart homes and infrastructure, sending debris flying, and resulting in significant fatalities. The [exact linkages between climate change and tornado prevalence](#) and strength are unknown. Tornadoes, compared to hurricanes, are relatively small and short lived, making them difficult to model in various climate simulations. However, scientists are monitoring how climate change affects the [individual weather “ingredients”](#) that support development of the supercell thunderstorms that produce tornadoes. This includes how climate change increases the prevalence of necessary conditions such as warm, moist air, an unstable atmosphere, and wind shear. NOAA data on tornado prevalence can be found [here](#).

#### 15. Tsunami.

The [CDC](#) identifies that there are several health effects resulting from tsunamis, including: (1) access to clean drinking water, food, shelter, and medical care for injuries, (2) contaminated water and food supplies due to flood waters, (3) loss of shelter, leaving people vulnerable to insect exposure, heat, and other environmental hazards, (4) deaths from drownings, (5) traumatic injuries such as head trauma and broken limbs from the physical impact of being washed into debris such as buildings, trees, and other stationary items, and (6) suction caused by the receding water can pull debris into large populated areas, causing further injuries and undermining buildings and services.

#### 16. Volcanic eruption.

Globally, [approximately 500 active volcanoes pose a threat to almost half a billion people](#). The eruption of volcanoes is damaging to the environment, public health, and the climate, and social and economic conditions trend toward deterioration following these events. Magma, steam (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), hydrogen sulfide (H<sub>2</sub>S), carbon sulfide (CS), carbon disulfide (CS<sub>2</sub>), hydrogen chloride (HCl), hydrogen (H<sub>2</sub>), methane (CH<sub>4</sub>), hydrogen fluoride (HF), hydrogen bromide (HBr) and various organic compounds, as well as heavy metals (mercury, lead, gold), all surface as a result of a volcanic eruption. Effects of an eruption depend on the distance from the volcano, with closer effects including pyroclastic flows, flows of mud, gasses and steam, earthquakes, blasts of air, and tsunamis; more distant areas suffer from the deleterious respiratory effects of toxic volcanic ashes, damage to the eyes and skin, and various mental health impacts. Volcanic eruptions and their aftermath characteristically include increased respiratory system morbidity. Other injuries and fatalities, transportation and communication challenges, waste disposal and water supplies issues, building collapse, power outages, the deterioration of water quality, fewer periods of rain, crop damages, and the destruction of vegetation are also notable consequences of eruptions.

#### 17. Wildfire.

Wildfire is essential for shaping and ensuring the health of ecosystems. Indigenous Nations knew of the importance of wildfire for ecosystem health, and some intentionally used fire by practicing prescribed burns. Climate change, however, has contributed to the increased risk and intensity of wildfires, particularly in the Western United States. The [U.S. Forest Service](#) has identified that temperature, soil moisture, and the presence of various types of fuel (trees, shrubs, etc.) all affect wildfire risk, and each of these factors are significantly impacted by climate change. Additionally, climate change increases the likelihood of large-scale fires. Not only are fires increasing in frequency and intensity due to climate change, but the fires themselves release carbon dioxide, which further exacerbates climate change. Fire can be deadly to humans and is destructive to homes, wildlife habitat, and natural resources such as timber. Increased pollutants in the air from emissions are also detrimental to human health. This can disproportionately harm those with [preexisting health conditions](#) or reduced access to health care, which frequently follows the [fault lines of racism and classism](#).

#### 18. Windstorm.

The annual average property and crop losses from windstorms in the U.S. total [\\$379 million](#). Windstorms break off tree limbs or blow them down either by uprooting them or causing trunk breakage. High winds also enhance existing woodland fires. Together, these impacts are most disruptive in heavily forested areas of the country such as the Pacific Northwest. Windstorms also compromise power and communication systems when lines break due to falling branches or trees. Loss of power can last several

days, which [disproportionately impacts low-income and BIPOC communities](#). High winds can also occasionally blow large trucks and rail cars over, and falling trees and their limbs can cause significant damage to automobiles and infrastructure. Crops such as corn, wheat, and soybeans can be damaged by windstorms at their mature stages if gusts break stalks. The annual average crop losses from high winds exceed [\\$68 million](#). Injuries and fatalities also result from downed power lines or damage to occupied vehicles. Buildings and houses sustain damages such as blown out windows, siding, and roofing; average annual losses to property is [\\$311 million](#).

#### 19. Winter Storm (Severe).

Due to climate change, winters on the whole are becoming warmer and milder. However, extreme weather events, especially in the Northeastern United States, are increasing in prevalence. [The New York Times reported](#) that from the winter of 2008-9 until 2017-18, there were 27 major Northeast winter storms; this prevalence was three to four times the totals for each of the previous five decades. Factors impacting the relationship between climate change and severe winter storms include the increased amount of water vapor that can be held by a warmer atmosphere. More water vapor can lead to increased precipitation as well as increased fuel for storms as heat is released when vapor forms clouds.

## Climate Considerations in Hazard Identification & Assessment – Regional & Local Contexts (ADVANCED)

### Guiding Questions

- What are the ecological impacts that are unique to this disaster, or exacerbated in comparison to other disasters? How do these impacts specifically affect your geographic area? How were impacts potentially made worse by the degradation of ecological systems?
- How has the natural landscape been altered (through deforestation, development, past climate events, damming, etc.) in your area since it was seized from Indigenous peoples? How did these alterations come to be, and how have they affected the ability of the landscape to tolerate climate events? Have disaster events increased in prevalence or intensity due to any of these changes to the landscape?
- What disasters were considered to be of little or moderate concern in your area 50 years ago? 100 years ago? How has this changed over time, and how has the community's preparedness for disaster events changed over time?
- How will your community's exposure to each type of disaster increase over time due to climate change? Which disasters are anticipated to become more prevalent or more intense, and what considerations may need to be made to support the community in adjusting to this new reality?
- How will the global nature of climate change affect your community? For example, will earthquakes or droughts in different parts of the country or world increase the climate refugees seeking a home in your area? How will your community meet this occasion?
- What are the mental health and relational impacts of different disasters in your community? For example, fires and floods can be particularly traumatic due to the ways in which they destroy or damage cherished personal possessions, family homes, and items of significance such as photographs.
- What additional mental health impacts might arise from the typical response and recovery efforts employed in your community? For example, could police or military involvement have unintended mental health impacts? Could top-down decisions delay individual and community healing?
- How do these mental health and relational impacts vary for different groups of people? For example, are there groups of people in your community that experience historical and/or present persecution that has led them to form small communities where buildings or homes might have had particularly powerful significance?
- What mental health resources are available for community members now? How accessible are these resources? What resources will be available following an event, and for how long? How will those services be made accessible?



## Climate Considerations in Hazard Identification & Assessment – Regional & Local Contexts (INTERMEDIATE)

### Guiding Questions

- What are the ecological impacts that are unique to this disaster, or exacerbated in comparison to other disasters? How do these impacts specifically affect your geographic area? How were impacts potentially made worse by the degradation of ecological systems?
- How has the natural landscape been altered (through deforestation, development, past climate events, damming, etc.) in your area since it was seized from Indigenous peoples? How did these alterations come to be, and how have they affected the ability of the landscape to tolerate climate events? Have disaster events increased in prevalence or intensity due to any of these changes to the landscape?
- What disasters were considered to be of little or moderate concern in your area 50 years ago? 100 years ago? How has this changed over time, and how has the community's preparedness for disaster events changed over time?
- How will your community's exposure to each type of disaster increase over time due to climate change? Which disasters are anticipated to become more prevalent or more intense?
- What are the mental health and relational impacts of different disasters in your community? For example, fires and floods can be particularly traumatic due to the ways in which they destroy or damage cherished personal possessions, family homes, and items of significance such as photographs.

## Climate Considerations in Hazard Identification & Assessment – Regional & Local Contexts (BEGINNER)

### Guiding Questions

- What are the ecological impacts that are unique to this disaster, or exacerbated in comparison to other disasters? How do these impacts specifically affect your geographic area? How were impacts potentially made worse by the degradation of ecological systems?
- How has the natural landscape been altered (through deforestation, development, past disasters, damming, etc.) in your area? How has the community's preparedness for disaster events changed over time?

# SECTION IV: RISK & VULNERABILITY ASSESSMENT

## FEMA Requirements

5.1

### Describe Hazards

- A. Review your State Hazard Mitigation Plan for information on hazards affecting the planning area.
- B. Document the disaster declaration history.
- C. Download weather-related events from online resources, such as the [National Climatic Data Center](#), the [Climate Shift Index](#), or, for some regions, [CHaMP](#) (which visualizes data from the NOAA NCEI Storm Events Database).
- D. Review existing studies, reports, and plans related to hazards in the planning area. State and Federal agencies are also good sources for hazard-related information.
- E. Use flood insurance rate maps (FIRM) and non-regulatory flood risk assessment products developed for your community by FEMA as part of the National Flood Insurance Program (NFIP) and the RiskMAP program.
- F. Contact colleges or universities that have hazard-related academic programs or extension services. Alternatively, consult your local [RISA](#) to view relevant data.
- G. Interview your planning team and stakeholders about which hazards affect the planning area and should be described in the mitigation plan.
- H. Consult local resources such as the newspaper, chamber of commerce, local historical society, or other resources with records of past occurrences (e.g. [CHaMP](#)).
- I. For plan updates, reference hazards previously identified and determine if they are still relevant.

For each hazard affecting the planning area, the risk assessment must include a description of location, extent, previous occurrences, and probability of future events. Plan updates will incorporate any additional hazards that have been identified and any new data that has become available, such as new flood studies. Plan updates must include hazard events that have occurred since the last plan was completed.

5.2

### Identify Community Assets

- A. **People**
  - a. Identify concentrations of residents and employees to help target preparedness, response, and mitigation actions.
  - b. Identify the types of visiting populations and their likely locations to assess potential problems.
  - c. Identify locations and concentrations of access and functional needs populations
  - d. to develop mitigation actions that will best assist them.
  - e. Consider demographics of projected population growth to predict vulnerability.
  - f. Identify locations that provide health or social services that are critical to disaster recovery.
- B. **Economy**
  - a. Identify major employers, primary economic sectors (e.g., agriculture), and commercial centers whose losses or inoperability would have severe impacts on the community and its ability to recover from a disaster.
  - b. Assess dependencies between economic sectors and businesses and the infrastructure needed to support them.
- C. **Built environment**
  - a. *Existing Structures*
    - i. Identify types of buildings, which include commercial, industrial, and single and multi-family residential.
    - ii. Determine the age and construction type of buildings to understand building codes in effect and quality of construction.
  - b. *Infrastructure and Critical Facilities*
    - i. Develop an inventory of the location, construction standards, age, and life expectancy of specific critical infrastructure and facilities in the planning area.
    - ii. Assess dependencies between infrastructure systems, critical facilities, and the people they serve.
  - c. *Cultural Resources*
    - i. Review state and national historic registries and identify cultural assets, such as museums, that have significance to the community.
  - d. *Future Development*
    - i. Identify areas planned and zoned for future development and annexation.
    - ii. Identify location, numbers, and types of structures of planned new development and redevelopment.
    - iii. Review plans for new facilities, infrastructure, and other capital improvements, such as stormwater management infrastructure, to support existing and future development.
- D. **Natural environment**
  - a. Identify the most valuable areas that can provide protective functions that reduce the magnitude of hazard events.
  - b. Identify critical habitat areas and other environmental features that are important to protect.

5.3

### Analyze Risk

# I. SOCIAL EQUITY CONSIDERATIONS

## Guiding Questions

- Which community needs are not currently being met, and for whom? In what ways would addressing these unmet needs reduce risk and vulnerability?
- What social and economic vulnerabilities will be increased or exacerbated by each of the disaster types? How do these vary across different groups of people?
- **Engage in a stakeholder power assessment.** Who are the key stakeholders, and how did they come to hold the influence and importance that they do? Which stakeholders are valued above others, and for what reasons? (For example, do stakeholders who contribute more funds hold the most influence? Do stakeholders who share racial, gender, or class affiliations with leadership typically hold more influence?)

## Population Characteristics and Health Vulnerabilities: Draft Indicators

[From New York State Climate Justice Working Group](#)

Income, Education, & Employment	Race, Ethnicity, & Language	Health Impacts & Sensitivities	Housing, Energy, & Communications
<ul style="list-style-type: none"> <li>• Pct &lt;80% Area Median Income</li> <li>• Pct &lt;100% of Federal Poverty Line</li> <li>• Pct without Bachelor's Degree</li> <li>• Unemployment rate</li> <li>• Pct Single-parent households</li> </ul>	<ul style="list-style-type: none"> <li>• Pct Latino/a or Hispanic</li> <li>• Pct Black or African American</li> <li>• Pct Asian</li> <li>• Pct Native American or Indigenous</li> <li>• Limited English Proficiency</li> <li>• Historical redlining score</li> </ul>	<ul style="list-style-type: none"> <li>• Asthma ED visits</li> <li>• COPD ED visits</li> <li>• Heart attack (MI) hospitalization</li> <li>• Premature Deaths</li> <li>• Low Birthweight</li> <li>• Pct without Health Insurance</li> <li>• Pct with Disabilities</li> <li>• Pct Adults age 65+</li> </ul>	<ul style="list-style-type: none"> <li>• Pct Renter-Occupied Homes</li> <li>• Housing cost burden (rental costs)</li> <li>• Energy Poverty / Cost Burden</li> <li>• Manufactured homes</li> <li>• Homes built before 1960</li> <li>• Pct without Internet (home or cellular)</li> </ul>

**For guidance on conducting a Health Vulnerability Assessment of your own, the following resources may be useful:**

- [Center for Disease Control's Guide for Health Departments on Assessing Health Vulnerability to Climate Change](#)
- [Ebi, K.L., Kovats R.S., & Menne, B. \(2006\) An Approach for Assessing Human Health Vulnerability and Public Health Interventions to Adapt to Climate Change](#)
- [Climate Change and Health Vulnerability Indicators for California](#)
  - [California Climate Investments to Benefit Disadvantaged Communities](#)

# II. ECOLOGICAL CONSIDERATIONS

## Guiding Questions

- Which ecosystems and ecotones are at greatest risk? Which of them have the greatest vulnerability?
- What would the costs be – ecological, economic, social – if these ecosystems were lost?
- How are the ecological needs of your area weighed against economic and social needs? Which people or processes represent the interest of the ecosystems' wellbeing?
- How is the precautionary principle being applied?

## Environmental Burdens and Climate Change Risks: Draft Indicators

[From New York State Climate Justice Working Group](#)

Potential Pollution Exposures	Land use and facilities associated with historical discrimination or disinvestment	Potential Climate Change Risks
<ul style="list-style-type: none"> <li>• Vehicle traffic density</li> <li>• Diesel truck and bus traffic</li> <li>• Particulate Matter (PM2.5)</li> <li>• Benzene concentration</li> <li>• Wastewater discharge</li> </ul>	<ul style="list-style-type: none"> <li>• Remediation Sites (e.g., NPL Superfund or State Superfund/Class II sites)</li> <li>• Regulated Management Plan (chemical) sites</li> <li>• Major oil storage facilities (including airports)</li> <li>• Power generation facilities</li> <li>• Active landfills</li> <li>• Municipal waste combustors</li> <li>• Scrap metal processors</li> <li>• Industrial/manufacturing/mining land use (zoning)</li> <li>• Housing vacancy rate</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme heat projections (&gt;90° days in 2050) <a href="#">*(can be found using CHaMP)</a></li> <li>• Flooding in coastal and tidally influenced areas (projected)</li> <li>• Flooding in inland areas (projected)</li> <li>• Low vegetative cover</li> <li>• Agricultural land</li> <li>• Driving time to hospitals or urgent/critical care</li> </ul>

**Environmental Burdens and Climate Change Risk Factors or Protective Factors : Draft Indicators (continued)**

Green Spaces	Public Perception	Food, Agriculture, & Waste
<ul style="list-style-type: none"> <li>• # or % of sq. ft. of green roofing/rooftop gardens</li> <li>• Concentration PM2.5 (outdoor) in mg/m<sup>3</sup></li> <li>• Concentration PM10 (outdoor) in mg/m<sup>3</sup></li> <li>• % of land supporting tree canopy</li> <li>• % Tree canopy density using <a href="#">iTree</a></li> <li>• # or % of sq. ft. green space</li> <li>• # of rain gardens</li> <li>• Gallons of rainwater collected</li> <li>• Acreage of stormwater mitigation plants</li> <li>• Daily air quality rating (outdoor)</li> <li>• Ambient temperature (outdoor; heat island)</li> <li>• # or % of sq. ft. of constructed wetlands</li> <li>• # or % of sq. ft. of constructed wetlands</li> <li>• # of pollinator supports (bat boxes, birdhouses, hummingbird feeders, beehives, pollinator hotels, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>• Survey individuals about their subjective experience of health outdoors in the area</li> <li>• Survey individuals about their subjective mood while outdoors in the area</li> <li>• Survey individuals about their subjective sense that the landscape will serve as an adequate buffer in the event of a disruption</li> <li>• Attendance/community participation at relevant programming (Zero waste, upcycling, and material reuse programming; Community solar energy installation support programming; etc.)</li> <li>• % of households taking advantage of local energy efficiency incentives and rebates</li> </ul>	<ul style="list-style-type: none"> <li>• # of sq. ft. of active food production space (garden and greenhouse)</li> <li>• # of community gardens</li> <li>• # of food co-ops</li> <li>• # of CSA programs</li> <li>• % of food sourced locally</li> <li>• # of incentives for healthful food outlets in underserved areas and/or mobile vendors that only sell fresh food</li> <li>• Weight or volume of food recovered/donated/accepted/served via food rescue and distribution programming</li> <li>• Savings from rescued/donated foods (\$)</li> <li>• # of food deliveries</li> <li>• Carbon dioxide emissions savings from rescued food</li> <li>• # of families served by rescued food/food distribution programming</li> <li>• Diversity of food delivered (such as # of unique vegetables, fruits, grains, etc.)</li> <li>• Annual volume of waste sent to a landfill</li> <li>• Annual volume of waste recycled</li> <li>• Annual volume of food waste composted</li> <li>• # of programming events related to zero waste, upcycling, and recycling</li> </ul>

## SECTION V: STRATEGIES & ACTIONS

### Guiding Questions

When working on strategies and actions for this section, we recommend using the following format:

Strategy Name				
Goal 1	Goal 1 Lead	Goal 1 Community Partners	Goal 1 Multibenefits	Goal 1 Funding
Goal 2	Goal 2 Lead	Goal 2 Community Partners	Goal 2 Multibenefits	Goal 2 Funding

- **Lead:** who is the primary person, department, or agency responsible for each goal?
- **Community Partners:** who are the community partners that will be involved in each goal, and in what capacity?
- **Multi-benefits:** what are the **ecological, social equity, climate,** and **greenhouse gas** benefits of each goal?
- **Funding:** what are the funding sources for each goal?

## I. SOCIAL EQUITY CONSIDERATIONS

Evaluating risk and impact by individual hazard may no longer be an effective strategy, and multi-hazard events are becoming more prevalent and powerful due to the effects of climate change. These multi-hazards present unique challenges with intersectional risks, vulnerabilities, and impacts. Additionally, evaluating risks and impacts of disasters with anything less than an international lens is no longer appropriate, as hazard events are becoming increasingly global in nature.

In late 2021 and early 2022, [a series of multiple eruptions from the underwater volcano Hunga Tonga-Hunga Ha’apai set off a chain of multiple hazards](#), including subsequent tsunami waves, an atmospheric shock wave, and sonic booms heard as far away as Alaska. Ash, steam, and gas were expelled, drinking water was contaminated, and multiple lightning strikes. Beyond local damage, the powerful explosion – estimated to be equivalent to around 10 megatons of TNT – “triggered large waves and tsunami advisories tha Australia, New Zealand, Japan, and the west coasts of North and South America. Parts of Japan saw waves as high as nine feet tall, and the west coast of the United States received swells around three and four feet high. In Peru, two people died from the high water, and an oil spill was caused by the waves.”

Implementation of HMPs also improves through a focus on multi-hazards and the global impacts of disaster events. Since departments that address individuals hazards separately do not currently exist, taking a multi-hazard approach may provide the benefit of allowing for multiple departments to find value in and offer support for strategies and actions delineated in this plan.

### Guiding Questions

As a result of the increasing prevalence and intensity of multi-hazard events, reprioritizing and restructuring approaches to strategy and action development within your HMP is essential. In particular, shifting from a hazard-based approach to people- and ecosystem-based approaches will make for more effective and evidence-based practice. Should a “by hazard” structure still appeal to your planning team, acknowledgment of multi-hazards within each of the specific hazard sections may be an intermediary approach. The following questions may support you in either endeavor:

- What are possible multi-hazard impacts that could occur in your area? For each individual hazard, which other hazards are most likely to co-occur or be triggered by that particular event?
- How is your area’s vulnerability to a particular hazard affected by other hazard events? Be sure to consider this from a global perspective.
- What are possible multi-hazard events that may occur globally? How could or will these hazards affect your area, and in what ways? How could or will multi-hazard events occurring in your area affect other areas?
- Who in your area is most vulnerable to hazards? How does this vulnerability change when considering multi-hazards? What additional considerations might you incorporate into your plan to address these vulnerabilities?



- How is the planning team assessing impacts of multi-hazards? What unique ecological, public health, and mental health impacts are resultant from multi-hazards?

## Proposed Goals and Objectives: Infrastructure

\* Equity considerations in teal.

### Goal I-1: Protect and enhance the resiliency and redundancy of electricity system

I-1.1	Work to minimize power outages from the local electric utility during extreme weather events by identifying and protecting critical energy facilities located within the area. <a href="#">Prioritize minimizing power outages for facilities caring for vulnerable and/or marginalized populations, such as hospitals, nursing homes, mental health facilities, libraries, publicly accessible buildings, etc.</a> <a href="#">Prioritize minimizing power outages for areas with populations that may experience disproportionate impact from power outages.</a>
I-1.2	Evaluate the utility distribution system, and identify "underground utility districts."
I-1.3	Support collaboration with the Public Service Commission to implement various smart grid solutions that will provide the area with real-time access to data during events.
I-1.4	Identify, harden, and water seal critical infrastructure relative to electrical, heating, and ventilation hardware within floodplains.
I-1.5	Increase resiliency in our energy generation system by encouraging the development of decentralized power generation and developing fuel flexibility capabilities.
I-1.6	Develop a comprehensive maintenance and training program for employees at facilities with backup generators to ensure proper placement, hook-up, and function during hazard events. <a href="#">Consider ways to ensure additional compensation and/or incentives for employee participation in training programs.</a> <a href="#">Expand accessibility of training to multiple modalities (verbal trainings, written materials, videos, etc.) and to multiple languages.</a> <a href="#">Arrange ASL interpreters and/or translators as necessary.</a>
I-1.7	Install external generator hookups for critical facilities that depend on mobile generators for backup power.
I-1.8	Partner with the Public Service Commission and the local electric utility to evaluate protecting power and utility lines from all hazards.
I-1.9	Determine low-lying substation vulnerability and outline options for adaptation and mitigation.
I-1.10	Evaluate and protect low-lying infrastructure - switching vaults, conduit, and transformers.

### Goal I-2: Increase energy conservation efforts

I-2.1	Increase energy efficiency across all sectors through education, efficiency retrofits, and building management systems. <a href="#">Prioritize energy efficiency rebates, giveaways, and low-cost-to-consumer retrofits for populations that may be least able to meet their energy needs or cover bill costs.</a> <a href="#">Consider that low-income individuals may already be limiting their energy usage due to costs, but may not be yet meeting their energy usage needs.</a>
I-2.2	Encourage critical facilities and institutions to connect to existing cogeneration systems, or develop new cogeneration systems.
I-2.3	Continue the area's electricity demand-response program during peak usage or pre-blackout periods.

### Goal I-3: Ensure backup power generation for critical facilities and identified key infrastructure during power outages

I-3.1	Investigate off-grid, on-site renewable energy systems, generators, and technologies for critical facilities to ensure redundancy of energy systems.
I-3.2	Seek funding to purchase and install generators for all buildings designated as critical to agency functions.
I-3.3	Develop Combined Heat and Power (CHP) co-generation plants at identified critical facilities.
I-3.4	Evaluate and ensure backup power generation is available to healthcare facilities (nursing homes, critical care facilities, hospitals, mental health facilities, etc.). <a href="#">Consider first those facilities that may serve a disproportionate number of marginalized and/or increased vulnerability individuals.</a> <a href="#">Prioritize facilities with the least ability to pay.</a>

Goal I-4: Protect and manage compressed liquefied natural gas sites and fueling stations before and during hazard events	
I-4.1	Work to ensure existing preparedness plans for liquefied natural gas sites, incorporating their vulnerability to present and predicted flooding, storm surge, and sea level rise.
I-4.2	Adopt building code that requires anchoring of 50 gallon storage tanks or larger.
I-4.3	Support the Public Service Commission's effort to accelerate replacement of aging natural gas infrastructure which will harden the system against flooding.
Goal I-5: Evaluate and improve resiliency of liquid fuels infrastructure	
I-5.1	Design and implement a generator program that assists private gas stations in securing backup generators, especially those stations along major evacuation routes.
I-5.2	Increase and ensure fuel availability during distribution disruptions.
I-5.3	Ensure fuel for generators and delivery priority is given to critical facilities and emergency responders. <a href="#">Consider first those facilities that may serve a disproportionate number of marginalized and/or increased vulnerability individuals.</a>
Goal I-6: Evaluate and improve resiliency of communication systems that are in place for sudden extreme weather events	
I-6.1	Utilize new technologies such as fiber optics, external hook-ups, and mobile generators to improve resiliency. <a href="#">Ensure that communication infrastructure, technological and human, exists for individuals with impaired hearing or speech as well as those who require interpretation or translation services.</a>
I-6.2	Build redundancy into all public and inter-agency warning and communication systems.
I-6.3	Identify best practices for the installation and management of flood proofing of all communications infrastructure at risk of water damage.
I-6.4	Implement additional nurse triage phone lines and community health centers to reduce medical surge on hospitals.
I-6.5	Evaluate and improve early warning systems for hazard events. <a href="#">Ensure that communication infrastructure, technological and human, exists for individuals with impaired hearing or speech as well as those who require interpretation or translation services.</a>
I-6.6	Ensure continued operation of various computer mainframes for email, control systems, and internet service by having stand-by batteries for each with a capacity sufficient for backup generation to operate.
I-6.7	Identify shared communication technology for emergency responders and government agencies to ensure continued and coordinated communication during emergency events.
Goal I-7: Integrate climate change into transportation design, building, and maintenance	
I-7.1	Determine the coastal storm vulnerability and complete an exposure assessment of transportation assets. <a href="#">Consider additional vulnerabilities that may burden transportation infrastructure disproportionately utilized by marginalized and/or heightened vulnerability individuals (e.g. buses and bus routes, bicycle lanes, sidewalks, crosswalks, accessibility ramps, etc.).</a>
I-7.2	Improve stormwater management, operations, and maintenance for stream flooding that erodes away bridge supports.
I-7.3	Incorporate compliance with earthquake standards to withstand a magnitude eight earthquake for all new, improved, and rebuilt bridges.
I-7.4	Design bridge expansion joints for longer periods of high heat and develop a more robust inspection and maintenance process.
I-7.5	Research utilizing existing and new rating systems for all new infrastructure and road projects.
I-7.6	Identify, investigate, and incorporate Best Management Practices as they relate to transportation design, construction, and maintenance. <a href="#">Utilize universal design principles as the standard for determining best practices.</a>
I-7.7	Require that backup solar powered street lights and signals be integrated along evacuation routes and high traffic areas.
Goal I-8: Identify additional alternative routes and modes for effective transport and evacuation efforts during emergency situations	
I-8.1	Evaluate existing systems and develop a comprehensive evacuation plan.
I-8.2	Coordinate evacuation plans with regional partners. <a href="#">Consider unique barriers to evacuation that may exist for members of marginalized or heightened vulnerability groups. Just some examples include: fear of retribution from bosses, loss of employment, or loss of wages; fear of</a>

	leaving culturally or spiritually significant items or places behind; distrust of predominantly white institutions or government agencies; mobility concerns; religious beliefs such as "faith in God's will"; fear of leaving important pets or service animals behind; past trauma exposure associated with leaving the safety of their home or environment; fear of losing access to medicines or services for preexisting health conditions; or receiving culturally insensitive, confusing, or complicated information about the evacuation, which may or may not be in a language of fluency.
I-8.3	Develop and prioritize clearance of specified transportation routes for delivery of emergency response supplies.
I-8.4	Educate the public on the dangers of driving through flooded roads.
I-8.5	Make available a network of dedicated pedestrian and bicycle transportation routes leading into and throughout the area. <a href="#">Ensure these routes are accessible to people who walk, bike, or roll. Ensure safety for those with impaired mobility, sight, and/or hearing.</a>
I-8.6	Identify and collaborate with bicycle groups and repair shops to assist in emergency response and accommodate alternate transportation needs. <a href="#">Coordinate emergency access to wheelchairs, electric bikes, and other modes of transportation for individuals with limited mobility.</a>
<b>Goal I-9: Alter transportation systems in flood-prone areas in order to effectively manage stormwater</b>	
I-9.1	Prioritize infrastructure upgrades for roads identified at risk of flooding through the use of elevation data and Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model results.
I-9.2	Raise streets in identified flood prone areas as they are redeveloped.
I-9.3	Encourage development of Green Streets in flood prone areas and throughout the area.
I-9.4	Encourage use of permeable pavement in non-critical areas – low-use roadways, sidewalks, parking lots and alleys where soils permit proper drainage. <a href="#">Consider the additional benefits of well-drained pedestrian areas such as sidewalks for individuals who use these corridors as primary transportation routes.</a>
I-9.5	Add pumps or other mitigation alternatives to streets as they are redeveloped (if needed).
I-9.6	Assess the need for new culvert capacity and identify where upgrades are needed.
I-9.7	Conduct an in-depth analysis of the impacts of drain fields feeding any harbors.
I-9.8	Expand and reinforce existing stormwater education programs.
I-9.9	Design and implement floodgates and barriers in transportation tunnels.
I-9.10	Encourage the Federal and State Government to design and install floodgates and barriers at vulnerable transportation tunnels.
I-9.11	Upgrade existing floodgate hardware and mechanisms to control rise rate of water into all city tunnels.
<b>Goal I-10: Ensure structural stability of all transportation tunnels to reduce impact from seismic activity</b>	
I-10.1	Repair cracks and leaks in all tunnels to reduce impact of seismic activity.
I-10.2	Follow Federal, State, and Local criteria for the stabilization of Historic transportation tunnels.
I-10.3	Install a seismically resistant fire standpipe, air monitoring, and automatic valve system in all tunnels to provide a fully automated and monitored fire suppression system.
<b>Goal I-11: Ensure structural stability of all transportation tunnels to reduce impact from seismic activity</b>	
I-11.1	Implement a repaving strategy that reduces heat-related damage to asphalt and incorporates maintenance and operations that extend the life of the road surface.
I-11.2	Develop a reconstruction and repair strategy that reduces damage to concrete and incorporates better maintenance and operations.
I-11.3	Develop deicing strategies and materials that are effective in extreme cold temperatures and prolonged events to stabilize roadway and bridge surfaces.
I-11.4	Design pavement sections and materials that withstand longer periods of extreme heat events.
<b>Goal I-12: Enhance the resiliency of any waterfront areas to better adapt to impacts from hazard events and climate change</b>	
I-12.1	Raise bulkhead height along shoreline areas most at risk.

I-12.2	Utilize vegetation and stone to stabilize and armor unprotected shorelines.
I-12.3	Encourage the development of integrated flood protection systems that use structural (engineering) and non-structural (wetlands) measures.
I-12.4	Review and enhance coastal area design guidelines to better mitigate the impacts of flooding.
I-12.5	Enhance and strengthen waterfront zoning and permitting.
<b>Goal I-13: Increase the resilience of all wastewater systems and protect them from current and projected extreme weather events</b>	
I-13.1	Ensure all water and wastewater pumping stations have off-grid, on-site energy sources and/or reliable backup power sources by increasing the number of backups and pulling electricity from different grids.
I-13.2	Evaluate the sewer system to identify and develop key areas for prevention of raw sewage overflows.
I-13.3	Develop and adopt an increased level of protection for construction, redevelopment, and design of all water and wastewater facilities that incorporate future climate projections.
I-13.4	Retrofit and harden low-lying pumping stations and treatment plants in flood hazard areas.
I-13.5	Ensure effective operations and security for wastewater treatment plants if facilities are overwhelmed by hazard events.
I-13.6	Establish the capability of wastewater treatment plants to function during large storm events and establish protocols for storms that overwhelm the system.
I-13.7	Increase stormwater recharge areas and quantity management to prevent flooding from overflows.
I-13.8	Conduct an assessment of current water systems to identify age, condition of infrastructure, capacity, weaknesses and areas for priority upgrades.
I-13.9	Conduct and utilize a detailed risk assessment to determine vulnerability of sewage treatment plants to prevent overflows from extreme storm events.
I-13.10	Determine the elevation of sewage treatment buildings, tank construction details, and if the plants are at risk of back flow, for improvements to withstand coastal storm events.
I-13.11	Retrofit wastewater treatment facilities and methane gas storage systems to withstand seismic activity to protect against earthquakes. Design facilities to exceed current building codes.
<b>Goal I-14: Integrate resiliency, redundancy, and structural stability into drinking water systems to ensure safe and reliable water storage and distribution</b>	
I-14.1	Repair leaks and improve connection from all reservoirs and associated rivers.
I-14.2	Provide water conservation education, and continue to protect our watersheds to assist in maintaining water quality. <a href="#">Consider the ways in which local Indigenous groups have already been serving as water protectors, and find ways to honor the spiritual and cultural importances of water in addition to the ecological and utilitarian benefits.</a>
I-14.3	Ensure dam emergency plans account for impacts of climate change.
I-14.4	Identify and document post damage responsibilities in memorandums of understanding as addendums to the Reservoir Watershed Management Agreement.
I-14.5	Review dam capacity, load, and failure points and review them against 1,000 year and 10,000 year precipitation events.
I-14.6	Conduct a study to determine seismic design standards and seismic resiliency of drinking water distribution systems (tunnels, piping, clean water pump stations, dams, shafts, and tanks).
I-14.7	Increase stormwater recharge areas and quantity management in watersheds feeding the reservoirs.
I-14.8	Evaluate the impacts of sediment loading on reservoir capacity.
I-14.9	Manage watershed forests to provide maximum benefits for water quality and to maintain resiliency during extreme weather events.
I-14.10	Adopt new policies on salt application to prevent high salinization on drinking water supplies.
I-14.11	Establish a structured Firing Program to maintain adequate storage and water quality in the source-water reservoirs during drought

	conditions.
I-14.12	Develop and maintain appropriate agreements that will ensure adequate water withdraws from rivers during drought emergencies.
<b>Goal I-15: Conduct an assessment that evaluates and improves all pipes' ability to withstand extreme heat and cold</b>	
I-15.1	Replace old and malfunctioning pipes with new pipes or retrofit existing pipes with new lining.
I-15.2	Evaluate and utilize new technology that allows for greater flexibility in pipes as they are replaced.
<b>Goal I-16: Enhance and expand stormwater infrastructure and systems</b>	
I-16.1	Implement the requirements of any existing permits pertaining to separate stormwater and sewer systems.
I-16.2	Prioritize storm drain upgrades and replacement in areas with recurring flooding. Consider who lives in the areas that have had recurring flooding. Assess the conditions that have led to increased vulnerability and exposure to flooding. Prioritize offering low-to-no-cost upgrades to address this vulnerability.
I-16.3	Install backflow-prevention devices or other appropriate technology along waterfront areas to reduce flood risk.
I-16.4	Preserve and protect natural drainage corridors.
I-16.5	Review and revise storm drain design on a continuous basis, to accommodate projected changes in intense rainfall.
<b>Goal I-17: Modify urban landscaping requirements and increase permeable surfaces to reduce stormwater runoff</b>	
I-17.1	Support existing stormwater requirements and continue to evaluate and improve Best Management Practices.
I-17.2	Encourage urban landscaping requirements and permeable surfaces into community managed open spaces.
I-17.3	Utilize water conservation elements such as green roofs, rain gardens, cisterns, and bioswales on residential, commercial, industrial, and any municipally-owned properties to capture stormwater.
I-17.4	Encourage permeable paving on low-use pathways.
<b>Goal I-18: Evaluate and support DPW's stream maintenance program</b>	
I-18.1	Review and improve status of standing maintenance requirements.
I-18.2	Ensure adequate funding is in place to support stream maintenance.
I-18.3	Identify opportunities where stream restoration efforts will off-set maintenance costs.
I-18.4	Identify interdependencies and benefits of stream maintenance with other transportation programs.
I-18.5	Clear streams on a regular basis, prioritize dredging the stream beds, and increase inspection and cleaning of culverts and storm drains to prevent flooding.
<b>Goal I-19: Support and increase coordination and information sharing across jurisdictions to better enable mitigation of cross-border impacts on the regions watersheds (e.g., understanding flood conditions upstream in the County)</b>	
I-19.1	Partner with local counties to evaluate major tributaries in all watersheds to determine best management practices for capturing run-off and slowly releasing it (stormwater quantity management).
I-19.2	Encourage information sharing within the community to assist in developing best management practice.
<b>Goal I-20: Reevaluate and support a comprehensive debris management plan for hazard events</b>	
I-20.1	Investigate best practices for managing and disposing of downed trees, yard waste, building debris, as well as additional household garbage.
I-20.2	Expand and integrate existing programs to reduce or intercept debris before it gets into the streams and/or harbors.
I-20.3	Develop and promote solid waste management actions for citizens to implement before a hazard event.
<b>Goal I-21: Encourage the integration of climate change and natural hazards into private and State planning documents, systems, operations, and maintenance</b>	



I-21.1	Incorporate consideration of hazards and climate adaptation efforts into all plans, systems, operations, and maintenance.
I-21.2	Ensure Red Line planning incorporates adaptation strategies.
I-21.3	Ensure hazard scenarios, utilized in vulnerability assessments, are at a minimum 25% greater in intensity and impact than historical record events to date.
I-21.4	Develop guidelines for hospital, health care facilities and other institutional entities (e.g. Universities). <a href="#">Ensure that communication infrastructure, technological and human, exists for individuals with impaired hearing or speech as well as those who require interpretation or translation services. Expand accessibility of training to multiple modalities (verbal trainings, written materials, videos, etc.) and to multiple languages. Arrange ASL interpreters and/or translators as necessary.</a>
I-21.5	Partner with regional air quality institutions to integrate air quality measures and messaging into any existing climate change policy efforts.
<b>Goal I-22: Develop policies which require capital improvement projects to incorporate hazard mitigation principles</b>	
I-22.1	Discourage new public projects in hazard-prone areas such as floodplains or the coastal high hazard areas.
I-22.2	Utilize hazard mitigation design requirements that exceed minimum standards for critical facilities.
I-22.3	Use comprehensive infrastructure assessments to identify infrastructure in need of replacement and prioritize funding for those projects.

## Proposed Goals and Objectives: Buildings

### Goal B-1: Develop and implement hazard protections for critical facilities including hospitals, fire stations, police stations, hazardous material storage sites, etc.

B-1.1	Conduct educational outreach for all municipal, residential, commercial, and industrial buildings about proper storage and disposal of hazardous materials and heating oil.
B-1.2	Require hazardous materials stored in all municipal, residential, commercial, and industrial buildings within floodplains to be elevated a minimum of three feet above the freeboard.
B-1.3	Require new critical facilities to be designed with redundant operating systems.
B-1.4	Require pre-wiring for generators at all facilities designated critical to agency operations and hazard response.
B-1.5	Develop stricter flood regulations for critical facilities.
B-1.6	Develop partnership with private fueling stations to provide backup generators in exchange for a commitment to fueling emergency response vehicles during a hazard event.
B-1.7	Ensure storage of and access to fuel for generators in critical facilities.

### Goal B-2: Enhance building codes that regulate building within a floodplain or near the waterfront

B-2.1	Design new projects to be resilient to a mid-century sea level rise projection and adaptable to longer-term impacts.
B-2.2	Incorporate climate change and coastal hazard considerations into building codes by increasing freeboard requirements to two feet as buildings are redeveloped and renovated.
B-2.3	Continue to regulate existing tidal floodplain delineations per any previously adopted regulations.
B-2.4	Incorporate outfall elevation regulations.
B-2.5	Develop Construction Best Practices for development within floodplains.
B-2.6	Train all code enforcement and building inspectors about flood proofing techniques and the local floodplain ordinance.
B-2.7	Encourage green roof installations to include vegetative and reflective technologies for all new commercial, industrial, multifamily, and municipal development.

Goal B-3: Strengthen City zoning, floodplain and construction codes to integrate anticipated changes in climate	
B-3.1	Review zoning codes and strengthen language (where necessary) in order to better protect citizens and increase resiliency in buildings.
B-3.2	Review and amend existing building and floodplain regulations to require more flood resistant new and existing structures when located in the floodplain.
B-3.3	Utilize open space category in zoning code to protect sensitive areas (e.g. stormwater sites, steep slopes, floodways, etc.).
B-3.4	Review and increase Flood Protection Elevation (Base Flood Elevation + Freeboard) standards to the highest available State, Federal, or local elevation level.
B-3.5	Evaluate and update stormwater management regulations to avoid increases in downstream flooding.
B-3.6	Adopt design requirements that include wet and dry flood proofing techniques.
B-3.7	Review and consider adoption of the International Green Construction code.
Goal B-4: Update a list of flood prone and repetitive loss buildings to consider for acquisition	
B-4.1	Continue to acquire property (including repetitive loss properties) in the special flood hazard areas where feasible and appropriate.
B-4.2	Prioritize Hazard Mitigation Assistance funding for mitigation of repetitive loss properties and severe repetitive loss properties.
B-4.3	Develop a creative financing program for flood resiliency in industrial buildings.
Goal B-5: Improve wind resiliency of new and existing structures	
B-5.1	Review local building codes to determine if revisions are needed to improve the structures ability to withstand greater wind velocities and storm impacts.
B-5.2	Retrofit emergency shelter windows to withstand winds associated with coastal storm events.
Goal B-6: Evaluate various seismic design enhancements using prototypical building types	
B-6.1	Determine engineering effectiveness and cost-benefit of various earthquake mitigation measures using computer modeling.
Goal B-7: Retrofit existing buildings in the designated Flood Area to increase resiliency	
B-7.1	Target and encourage flood resiliency retrofits for buildings in the designated Flood Area.
B-7.2	Prioritize retrofitting and increasing resiliency of Public Housing units in the designated Flood Area and other high risk areas.
B-7.3	Educate building owners within the floodplain to ensure that all electrical, mechanical, and key building systems are above the base flood elevation and meet existing codes.
Goal B-8: Improve resource conservation practices in all City owned buildings	
B-8.1	Install energy-efficient and low-water-use equipment during renovations in all municipal buildings.
B-8.2	Support energy efficiency and weatherization as part of schools planning efforts.
B-8.3	Update green building standards by offering multiple compliance paths for new and substantially renovated construction.
Goal B-9: Conduct educational outreach to increase resource conservation practices in private buildings	
B-9.1	Conduct educational outreach and provide information about savings related to reduced water use.
B-9.2	Educate and provide resources and information about utility rebate programs.
B-9.3	Provide energy efficiency education to include information on conserving electrical power. Emphasize reductions during summer peak demand hours.
Goal 10: Use HAZUS-MH computer modeling to determine losses generated by coastal storms	
B-10.1	Utilize engineering studies and cost-benefit analyses to identify additional mitigation needs and actions.

B-10.2	Evaluate various building design enhancements to reduce losses generated by earthquakes, floods, and storm surge.
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## Proposed Goals and Objectives: Natural Systems

### Goal NS-1: Utilize green corridors and parks to help protect surrounding communities from the impacts of hazard events

NS-1.1 Evaluate green corridors and parks for possible improvements for floodplain management.

NS-1.2 Increase the resiliency of park facilities and buildings.

### Goal NS-2: Increase and enhance the resilience and health of (urban) forests

NS-2.1 Anticipate the impacts of future changes in temperature and weather on (urban) forests by developing a comprehensive list of plant and tree species known to have a broad range of environmental tolerances.

NS-2.2 Establish and routinely update a comprehensive tree inventory to anticipate insect and forest structural impacts of climate change.

NS-2.3 Establish a comprehensive maintenance program that includes pruning for sound structure and the removal of hazardous limbs and trees. First focus on areas where vulnerable infrastructure is nearby such as energy supply and roads.

NS-2.4 Continually adjust and modify planting details and specifications to assure the health and longevity of trees.

NS-2.5 Increase the (urban) tree canopy and target areas with urban heat island impacts.

### Goal NS-3: Create an interconnected network of green spaces to support biodiversity and watershed based water quality management

NS-3.1 Increase green spaces in areas where there is available vacant land in order to reduce the heat island effect. [Prioritize green space placement in areas where there are the least amounts of green space currently. Address systemic barriers to access to green space.](#) Ensure meaningful community participation to assess multibenefit needs of green space (e.g. recreational space, food production space, addressing air and/or water pollution, providing shade, etc).

NS-3.2 Convert vacant land and row houses into meaningful and connected open space.

NS-3.3 Complete a habitat analysis and plan for the area.

NS-3.4 Create a strategic plan that identifies areas of focus for tree planting, stormwater management, and forest preservation.

NS-3.5 Certify areas as Community Wildlife Habitats through the National Wildlife Foundation.

### Goal NS-4: Expand, protect, and restore riparian areas in the city

NS-4.1 Conduct regular maintenance of stream restoration projects and stormwater quality facilities.

NS-4.2 Evaluate current regulations regarding stream buffers and floodplains and modify them (if appropriate) to assure they adequately protect perennial stream corridors.

### Goal NS-5: Preserve and create new coastal buffer efforts and support creating more wetlands and soft shoreline along coastal areas

NS-5.1 Integrate natural buffer requirements, such as wetlands and soft shorelines, into new development or redevelopment.

NS-5.2 Complete stream restoration projects in stream valleys that lead into coastal wetlands so as to increase habitat and reduce sedimentation.

NS-5.3 Identify and evaluate areas in the Critical Area buffer to prioritize ecological buffer restoration efforts.

### Goal NS-6: Require drought management plans to account for changes in climate

NS-6.1 Map drought risks and water availability via climate change scenarios.

NS-6.2 Update drought management plans to recognize changing conditions.

Goal NS-7: Integrate climate change and natural hazards planning into small watershed action plans	
NS-7.1	Review existing watershed management plans and identify future actions to address climate impacts.
Goal NS-8: Conduct detailed ongoing analysis of climate information, trends in storm events, and hydrology to support policy changes responding to climate change	
NS-8.1	Expand the use of climate information (e.g. seasonal forecasts) in water resources planning and management.
NS-8.2	Research and actively monitor trends in storm events, stream flow, and other conditions affecting hydrology and water.
NS-8.3	Update flood maps to reflect changing risk associated with climate change.
NS-8.4	Continuously improve and enhance flood vulnerability data.

## Proposed Goals and Objectives: Public Services

Goal PS-1: Strengthen emergency preparedness coordination between local government, NGOs, and private entities	
PS-1.1	Identify and develop a common database that all municipal government agencies and departments should utilize for hazard information, preparedness, and response.
PS-1.2	Increase the resiliency of park facilities and buildings.
PS-1.3	Ensure consistency and integration with existing and future response plans within and between agencies.
PS-1.4	Continue to identify and improve coordination with Key Partners including private sector, State partners, Federal partners, community, universities and industry leaders through Local Emergency Planning Committee.
PS-1.5	Coordinate outreach efforts of various municipal Offices to leverage messages related to all-hazards emergency preparedness.
PS-1.6	Develop strong working relationships with local experts to provide technical assistance to refine and improve city government emergency preparation. Consider other valuable forms of expertise beyond technical assistance: expertises related to public communication, group process, and accessibility may be useful. Recognize the expertise of community members with various lived experiences and identities – including local Indigenous, BIPOC, disabled, queer, poor, or houseless folks – whose perspectives and participation would in and of themselves be invaluable assets.
PS-1.7	Review and improve specific response plans contained in the EOP and related ESFs that relate to extreme weather events (snow, heat, flood, wind, electrical outages, and other hazard events).
PS-1.8	Ensure equipment purchases and communication systems are compatible across agencies and jurisdictions.
PS-1.9	Encourage all animal rescue and care shelters to further develop their internal plans for animal's health and safety during and after a hazard event.
PS-1.10	Ensure all animal rescue and care shelters located within the floodplain are provided the support to apply for and obtain funds to relocate.
PS-1.11	Develop and implement a case study of hospital-based practices that foster community resilience to climate change. Ensure that hospital-based practices involve meaningful equity components and delineate targeted supports for marginalized populations who may be made differentially vulnerable due to health conditions caused or exacerbated by the effects of systemic forces such as racism, ableism, transphobia, poverty, etc.
Goal PS-2: Develop a Hazard Awareness Program	
PS-2.1	Create a standardized early warning system for members of the public.
PS-2.2	Evaluate and improve community health center strategies for communicating with patients during an emergency.
PS-2.3	Educate citizens about the existing early warning systems and actions they should take when alarms sound.
PS-2.4	Prepare and integrate occupational health and safety messages and instructions for first responders.

PS-2.5	Hold climate specific seminars for hospital emergency and sustainability managers.
<b>Goal PS-3: Designate community leaders and organizations that can assist and provide support during hazard events</b>	
PS-3.1	Prior to a hazard event, identify lead contacts serving vulnerable populations and coordinate actions to maximize safety and information sharing. <a href="#">Wherever possible, ensure that lead contacts are trusted members of these communities who share components of identity or lived experiences. For example, a trusted sponsor for NA, a Drug and Alcohol Counselor, or an advocate for houseless individuals may be an effective lead contact for transient individuals who use substances. Similarly, an Indigenous leader in the community would likely be the most appropriate lead contact for members of their own Nation, but not necessarily for all Indigenous people in the area.</a>
PS-3.2	Develop a community group coordination plan and implementation guide.
PS-3.3	Identify and evaluate plans already in place and work to improve utilization of community based leaders to assist in preparedness and response.
<b>Goal PS-4: Integrate climate change and natural hazards planning into all municipal and community plans</b>	
PS-4.1	Develop guidelines to include proactive resilience planning into plan development process.
PS-4.2	Incorporate language that strengthens the ability of municipal government officials to enforce rules and restrictions that support public health, safety, and welfare related to hazard events and conditions.
PS-4.3	Partner with the State Department of Mental Health, local mental health agencies, and other pertinent entities to develop institutional checklists and materials for health care specific resilience plans.
<b>Goal PS-5: Better equip emergency workers for natural hazards</b>	
PS-5.1	Research and identify personal protective equipment (PPE) needs based on specific hazards. <a href="#">Consider adaptive and/or extra-precaution options for individuals with cognitive or developmental challenges, individuals experiencing psychosis or mental health crises, people with physical disabilities or pre-existing health conditions such as a compromised immune system.</a>
<b>Goal PS-6: Anticipate and address potential disease outbreaks caused by extreme weather events and changing climatic conditions</b>	
PS-6.1	Support studies of heat and flood related vector borne diseases in the region based on changing temperature and moisture.
PS-6.2	Evaluate existing programs that detect disease outbreaks to determine their flexibility to respond to new conditions.
<b>Goal PS-7: Protect residents from the effects of hazard events and plan for more frequent hazard instances</b>	
PS-7.1	Re-evaluate and update existing heat alerts, advisories, and updates to healthcare and emergency service providers.
PS-7.2	Ensure that residents and visitors have access and transportation to cooling centers during extreme heat events.
PS-7.3	Evaluate code red plans to ensure all agencies adequately protect their own workers. <a href="#">Fair and just compensation (including hazard pay), benefits coverage, time off, union protections, job and benefits security, and access to mental health supports must all be addressed.</a>
PS-7.4	Consider extending hours for public wading pools during extreme heat events.
PS-7.5	Include information about Code Red in the event permitting process, and incorporate language that allows for event cancellation.
PS-7.6	Work with Regional, State, and Local partners to improve air quality and reduce respiratory illnesses. <a href="#">Prioritize reducing the prevalence and intensity of respiratory illnesses such as asthma that occur with <u>heightened prevalence and morbidity in marginalized populations</u>.</a>
PS-7.7	Create and implement programs to manage combined health impacts of heat and air pollution.
<b>Goal PS-8: Conduct climate, resiliency, and emergency planning education and outreach</b>	
PS-8.1	Incorporate environmental health and climate change into curriculum at schools, universities, and health care facilities. <a href="#">Ensure that curriculum addresses how the natural environment and human environment intersect, including how racism has caused and exacerbated health complications for BIPOC individuals across generations and how the intersecting forces of racism and classism have predicted who has been affected first and worst by climate change.</a>
PS-8.2	Educate communities on how city agencies respond to hazard events, their role in an event, and how agencies work together.
PS-8.3	Educate and train community groups to participate in responding to hazards. <a href="#">Prioritize trainings for community groups that are comprised of and/or support marginalized community members.</a>



PS-8.4	Generate a comprehensive community-specific all hazards outreach campaign.
PS-8.5	Develop and communicate a simplified process for residents to follow after a hazard event. <a href="#">Ensure that the process is available in as many languages spoken in the area as possible, is available in several different formats (visual, auditory, written, etc.), and that translation and interpretation services are available.</a>
PS-8.6	Create a curriculum for hospitals to teach communities about climate change as part of hospital community benefits programs. <a href="#">Ensure that curriculum addresses how the natural environment and human environment intersect, including how racism has caused and exacerbated health complications for BIPOC individuals across generations and how the intersecting forces of racism and classism have predicted who has been affected first and worst by climate change.</a>
PS-8.7	Utilize existing preparedness messaging to include information on universal precautions to insect-borne and other infectious diseases.
<b>Goal PS-9: Improve awareness and education about the importance of flood insurance and preparation for citizens</b>	
PS-9.1	Create an educational program centered on flood hazards, coastal construction practices, and evacuation procedures.
PS-9.2	Encourage owners of properties to purchase flood insurance and improve policyholder awareness at time of sale or renewal.
PS-9.3	Inform property owners who have paid off their mortgage that flood insurance is still necessary.
PS-9.4	Identify programs and grants that assist citizens in purchasing flood insurance and making flood proofing changes.
PS-9.5	Develop an annual newsletter to inform and remind owners of property in the floodplain about flood insurance and flood proofing activities they should undertake.
PS-9.6	Provide information on how to file for reimbursement for impacts of hazards.
PS-9.7	Require a flood disclosure form, and educational information as part of lease agreements for commercial and residential properties.
PS-9.8	Develop floodplain awareness information for rental tenants and ensure distribution as tenants change.
<b>Goal PS-10: Increase food security within the area</b>	
PS-10.1	Develop a food security plan for the area. <a href="#">Ensure that the plan addresses differential access to food (both quantity and quality) based on race, class, gender, disability status, and other markers of identity. Consider ways to eradicate <a href="#">food deserts</a> and address systemic lack of access to healthful and/or culturally relevant foods. Consider ways to increase the <a href="#">food sovereignty</a> of community members.</a>
PS-10.2	Increase land under cultivation for commercial urban agriculture.
PS-10.3	Link regional/local food producers to local distributors.
PS-10.4	Incorporate existing food policy initiatives into planning efforts.
PS-10.5	Double the size and number of food producing community gardens by 20XX.

## Mitigation Plan Goals **[insert Year–Year timeframe of Plan]**

### Proposed Goals and Objectives

#### Goal 1: Protect Public Health and Safety and Reduce the Loss of Life from Hazard Events

1.1	Prioritize reduction of health and safety impacts on residents that have been made more vulnerable to impacts of natural hazards and climate change.
1.2	Enhance community adaptive capacity by providing resources to neighborhood resilience centers and supporting proactive community preparedness events.
1.3	Improve and promote early warning communication systems as well as communications during and after a disruption that incorporate multiple languages and multiple ability levels including hearing and visually impaired.

1.4	Collaborate with and support organizations and agencies that provide community engagement and outreach services to BIPOC and low-income populations.
1.5	Improve public awareness of hazards, risk, and climate change through easy-to-understand and easy-to-access resources, materials, and data that connects directly to support services and networks that aid in preparedness, disruption and recovery.
1.6	Provide timely notification and direction to the public of imminent and potential hazards, including installing rain gauges, soil saturation sensors and stream monitoring systems for early warning identification of pending flooding situations and debris flows. Continue public education programs to improve residents' ability to make informed decisions based on their hazard risks.
<b>Goal 2: Minimize threat and impact to human life, property, and infrastructure</b>	
2.1	Restrict development and citing of structures in high risk areas and ensure all redevelopment and recovery activities comply with existing health and building codes.
2.2	Acquire property and pursue relocation of structures in hazard prone and high-risk areas while providing transition and trauma services to people impacted.
2.3	Strengthen the enforcement of state and local building and health codes and support other structural interventions that will reduce risk and improve quality of life. Ensure enforcement is paired with affordable or free services for low to moderate income homeowners and renters.
2.4	Prioritize risk-reduction retrofits at affordable housing locations and modular home parks where residents are unlikely to have the resources.
2.5	Improve or create redundancies for critical service networks such as water, power, sewer, transportation, communications, digital and data as well as critical facilities such as hospitals, police and fire, community gathering spaces and utilities.
2.6	Promote appropriate mitigation of all public and privately –owned property within the county including but not limited to, residential units, commercial structures, educational institutions, healthcare facilities, and infrastructures systems.
<b>Goal 3: Consider climate change, trend lines and future predictions when designing and developing public spaces, buildings and infrastructure</b>	
3.1	Incorporate climate projections and climate science into design guidelines, engineering criteria, and government decision-making.
3.2	Ensure known and likely climate considerations are integrated into citing decisions for new facilities, utility systems or housing considerations.
3.3	Integrate best available climate science and risk information into building codes and land use planning.
3.4	Promote climate resilience and post-disaster mitigation as part of repair and recovery.
<b>Goal 4: Strengthen intergovernmental coordination, communication, and capabilities in regard to mitigating hazard impacts</b>	
4.1	Incorporate <a href="#">targeted universalism</a> and climate change into capital improvement project prioritization.
4.2	Promote planning and implementation efforts that foster cooperation and coordination among jurisdictions, agencies, and organizations involved in hazard mitigation.
4.3	Combine mitigation education efforts with existing governmental and nongovernmental outreach programs including education of public officials, developers, realtors, contractors, building owners and the general public about hazard risks and building requirements.
4.4	Encourage federal/state/local government partners to provide more funding opportunities for proactive climate action and hazard mitigation investments in BIPOC and low-income communities.
4.5	Partner with private sector, including small businesses, to promote structural and non-structural hazard mitigation as part of standard business practices and develop regional partnerships to leverage and share resources.
<b>Goal 5: Create and support healthy and equitable neighborhoods</b>	

5.1	Develop strategies to reduce public health risk to natural hazards and incorporate mental health into all pre, during and post-hazard support services.
5.2	Increase social resilience by incorporating indigenous knowledge, incorporating future climate-related hazards, and promoting community-developed and community-supported mitigation strategies.
5.3	Prioritize implementation of proactive mitigation strategies in socially (e.g., age, poverty, race, disability) and physically (floodplain, wildfire) vulnerable neighborhoods.
5.4	Promote and prioritize community-identified and community-supported hazard mitigation and climate action especially in areas with strong community partners.
5.5	Create incentives for mid- to high-income people to mitigate hazards on their own property through education, cooperative land acquisitions, elevation and relocation programs, Community Wildfire Protection Plans, TDRs and TDCs, and other means as they become available or are created. For low-income community members, provide fiscal support through grants rather than relying on incentive programs.
<b>Goal 6: Incorporate protection and conservation of natural resources and ecological services into mitigation strategies and actions</b>	
6.1	Prioritize actions that restore natural function of environmental processes.
6.2	Develop hazard mitigation and climate change adaptation policies that prevent long-term negative effects on the environment.
6.3	Incorporate the value of environmental/ecological services into prioritization of mitigation actions.

# SECTION VI: IMPLEMENTATION & EVALUATION

## I. SOCIAL EQUITY CONSIDERATIONS

### Targeted Universalism

Policy responses are often erroneously divided into either universal or targeted solutions. Each approach has benefits and drawbacks: universal approaches may be seen as legitimate due to their attempt to support many groups, but may also be seen as costly and overly ambitious; targeted solutions may be praised for their efficiency and scale, but challenged when some groups feel left out. A [targeted universalism](#) approach, however, sets universal goals yet assigns targeted processes to achieve these goals “based upon how different groups are situated within structures, culture, and across geographies to obtain the universal goal.”

Utilizing targeted universalism as an approach can mean that government programs meet less resistance from critique that they serve special interests, especially since its aim is to move all groups, including those already rich or powerful, toward the universal policy goal. Simultaneously, however, targeted universalism ensures that wealth and power divides narrow and close rather than continuing to grow.

TABLE 1

Types of Universal Programs

Type of Policy	Components	Examples
Truly universal	They apply to everyone within a national jurisdiction. No cost or fee. No age or income baseline or minimum. No activity required.	Universal basic income
Broadly universal	A universal policy with some minimal exceptions, based upon activity.	Universal suffrage
Conditionally universal	A policy that applies conditionally, but not based on inherent characteristics.	Social Security's unemployment insurance and old age benefits; minimum wage: requires working

Credit: Haas Institute for a Fair and Inclusive Society at UC Berkeley. Examples of universal programs, delineated by type.

### A Note On Reparations

Plan implementation offers a unique and meaningful opportunity for engaging in reparations work. [Reparations](#) refers to a system of redress, often financial or land-based, intended to repay those who have suffered most directly from egregious and inhumane injustices such as slavery, genocide, or state-sanctioned violence. As scholars at Brookings Institute illustrate, reparations are not a foreign concept to the United States. Several past examples of reparations include: (1) the receipt of land and billions of dollars by Native Americans for being forcibly exiled from their native lands and subjected to genocidal practices; (2) \$1.5 billion was paid to Japanese Americans interned during World War II; and (3) various financial reparations for the Holocaust provided to Jews via the Marshall Plan. [Despite the average white family today having roughly 10 times the amount of wealth as](#)

[the average Black family](#), and the average white college graduate having over seven times more wealth than Black college graduates, a pervasive and toxic narrative that the growing racial wealth gap is due to issues of merit and hard work persists. Reparations, however, provide a meaningful and effective way of addressing the racial wealth gap. However, Black Americans have not received reparations for state-sanctioned racial discrimination, despite slavery affording some white families the ability to accrue tremendous wealth. Native Alaskans and Native Hawaiians also represent groups that have not yet received reparations for unjust occupations, seizures, and treatment. In 1973, the [Aboriginal Lands of Hawaiian Ancestry \(ALOHA\)](#) demanded reparations from the U.S., citing the overthrow of the Native Hawaiian government in 1893. These demands remain unanswered today. Importantly, racial discrimination and disenfranchisement cannot be seen as fixtures of the past. The case for reparations continues to be justified and amplified by ongoing harms such as racialized wage gaps, voter suppression, mass incarceration and criminalization, police violence, and more.

## II. ECOLOGICAL CONSIDERATIONS

Ecosystem services have been defined as “benefits that humans recognise as obtained from ecosystems that support, directly or indirectly, their survival and quality of life” ([Harrington et al., 2010, p. 2781](#)). This definition is further endorsed by [Earth Economics](#), which states that “any product of an ecosystem function that benefits humans is an ecosystem good or service.” [Earth Economics](#) delineates that goods are tangible and can usually only be used or owned by one person (such as drinking water, timber, fish, crops, and wildlife) while services are intangible (e.g. flood protection, water filtration, recreational value, aesthetic value, etc.) and often cannot be traded in markets or privately owned by one person, making them more difficult to value. Ecosystem services can also be understood as [provisioning services](#) (e.g. fruits, vegetables, trees, fish, livestock, oils, natural gas, plants used for materials or medicine, etc.), [regulating services](#) (e.g. air and water filtration, decomposition, pollination, carbon storage, erosion control, climate regulation, etc.), [cultural services](#) (e.g. recreation, inspiration for art, music, and architecture, etc.), and [supporting services](#) (e.g. photosynthesis, nutrient cycling, the creation of soils, the water cycle, etc.).

Other benefits of ecosystem services include the known benefits of the natural environment on mental health and psychological wellbeing. [Evidence links nature experience with:](#) (1) increased positive affect, (2) increased happiness and subjective well-being, (3) positive social interactions, cohesion, and engagement, (4) a sense of meaning and purpose in life, (5) improved manageability of life tasks, (6) decreases in mental distress, such as negative affect, (7) positive effects on various aspects of cognitive function, (8) positive effects on memory and attention, (9) greater impulse inhibition, (10) increases in children’s school performance, and (11) increases in imagination and creativity.

When ecosystems are disrupted or destroyed, ecosystem services are lost; they are often replaced with built environments that are more costly to maintain and do not perform as well. Built environments and products, from buildings to cars, depreciate over time. Ecosystem services, however, have cascading benefits. Not only does the preservation of natural capital save money, but these ecosystem services appreciate in value and can provide multigenerational benefits.

The destruction of ecosystems and the disruption of services they provide can have deleterious socio-cultural impacts in addition to ecological impacts. [One study found Pacific salmon to be a cultural and ecological keystone species](#) “irreplaceable and core to the identities and ways of life of indigenous communities throughout the Pacific Northwest.” Many ecosystem service benefits – whether provisioning, regulating, cultural, or supporting – may as yet be unnamed or not fully understood. Thus, applying the [precautionary principle](#) to preserve and protect ecosystems and the known and unknown services they provide is a sound planning approach. Additionally, many are turning to nature-based solutions that, through the provision of ecosystem services, [can yield multiple and compounding benefits that address key social, ecological, and climate problems simultaneously](#).

## Guiding Questions

[Earth Economics' EVToolkit](#) may be a useful resource for helping to understand and quantify ecosystem services in your area. Helpful framing questions include:

- What *provisioning* ecosystem services are at work in the area covered by your HMP? How do similar ecosystem services outside of the area covered by your plan impact your community's ability to meet its needs? Specifically, consider food production, natural gas extraction, plant cultivation for materials and medicines, etc.
- What *regulating* ecosystem services are at work in the area covered by your HMP? How do similar ecosystem services outside of the area covered by your plan impact your community's ability to meet its needs? Specifically, consider air and water filtration, decomposition, pollination, carbon storage, erosion control, climate regulation, etc.
- What *cultural* ecosystem services are at work in the area covered by your HMP? How do these benefits vary based on the different cultures represented in your area? What kind of scoring system might be useful for ensuring a cultural group's subjective evaluation of this service is accounted for?
- What *supporting* ecosystem services are at work in the area covered by your HMP? How do similar ecosystem services outside of the area covered by your plan impact your community's ability to meet its needs? Specifically, consider nutrient cycling, the creation of soils, the water cycle, etc.

## Metrics of Evaluation:

- **Climate Exposure:** the degree to which a person, community, or system is exposed to or may experience extreme weather events or future changes in climate or climate-related impacts
- **Sensitivity:** the degree to which individuals, groups of individuals, assets, and resources are susceptible to these changing conditions based on their inherent qualities or existing pressure from non-climate stressors.
- **Adaptive Capacity:** the ability of people, assets, or resources to withstand or respond to climate changes in a way that retains the current structure. This includes both inherent adaptive capacity as well as the system's capacity to manage or adapt to these extreme weather events or changing conditions.
- **Recognition equity:** identifying and acknowledging injustices affecting specific populations
- **Procedural equity:** addressing power structures and access to participation in decision-making. A key to this is ensuring equitable, inclusive, and meaningful engagement and asking how our engagement shifts power, builds trust, and ensures accountability, both structurally and intergenerationally.
- **Distributional equity:** addressing the distribution of burdens and benefits across different populations.

## Climate Equity Indicators:

### Indicators (from [2021 Cincinnati Climate Equity Indicators Report](#))

People	Health	Ecosystems and Infrastructure	Built Environment Hazards	Socio-Economic Indicators	Neighborhood Planning
<ul style="list-style-type: none"> <li>• Population</li> <li>• Age</li> <li>• Race and Ethnicity</li> <li>• English Language Ability</li> </ul>	<ul style="list-style-type: none"> <li>• Life Expectancy</li> <li>• Health Insurance Coverage</li> <li>• Disability</li> <li>• Disease Prevalence               <ul style="list-style-type: none"> <li>◦ Asthma</li> <li>◦ Cancer</li> <li>◦ Diabetes</li> <li>◦ High Blood</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Tree Canopy Coverage</li> <li>• Greenness of Land Surface</li> <li>• Impervious Surface</li> <li>• Land in Parks and Greenspace</li> <li>• Heat Island Exposure</li> </ul>	<ul style="list-style-type: none"> <li>• Traffic Exposure</li> <li>• Lead Exposure</li> <li>• Cancer Risk from Air Pollution</li> <li>• Respiratory Disease Risk from Air Pollution</li> <li>• PM 2.5 Levels</li> <li>• Ozone Levels</li> <li>• Diesel Particulate</li> </ul>	<ul style="list-style-type: none"> <li>• Persons Living in Poverty</li> <li>• SNAP Recipient Households</li> <li>• Educational Attainment</li> <li>• Renter Occupied Households</li> <li>• Rent Burdens</li> <li>• Homeowner</li> </ul>	<ul style="list-style-type: none"> <li>• Community Councils</li> <li>• Community Development Corporations</li> <li>• Community Plans</li> </ul>



	<div>Pressure<ul style="list-style-type: none"><li>○ Heart Disease</li><li>○ Kidney Disease</li><li>○ Obesity</li></ul></div>	<div><ul style="list-style-type: none"><li>● Walkability</li><li>● Transit</li><li>● Accessibility</li><li>● Food Access</li><li>● Daytime Population Flux</li><li>● Commuter Patterns</li></ul></div>	<div>Levels<ul style="list-style-type: none"><li>● Water Pollution Source Proximity</li><li>● Superfund Site Proximity</li><li>● Potentially Toxic Industrial Activity Proximity</li><li>● Hazardous Waste Treatment and Disposal Facility Proximity</li></ul></div>	<div>Mortgage Burdens<ul style="list-style-type: none"><li>● Energy Burdens</li><li>● Vehicle Access</li></ul></div>	
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