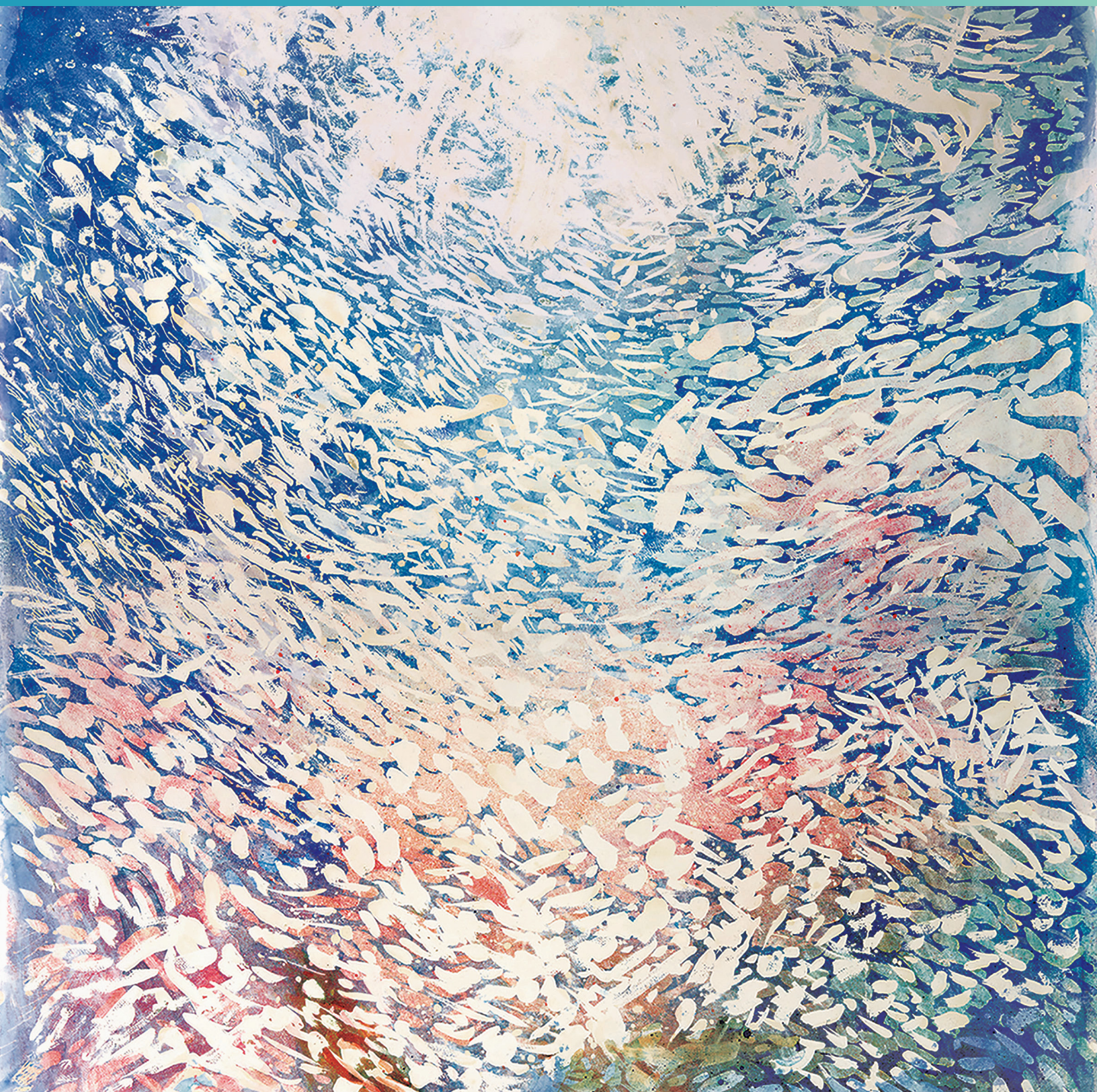
Fifth National Climate Assessment

Focus on COVID-19 and Climate Change



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Authors and Contributors

Federal Coordinating Lead Author

Allison R. Crimmins, US Global Change Research Program

Chapter Lead Author

Kacey C. Ernst, University of Arizona

Technical Contributors

Susan Anenberg, George Washington University

Mary H. Hayden, University of Colorado, Lyda Hill Institute for Human Resilience

Brendalynn O. Hoppe, University of Minnesota Climate Adaptation Partnership

Loretta J. Mickley, Harvard University

Dannele E. Peck, USDA Agricultural Research Service, Northern Plains Climate Hub

Heather J. Tanana, University of Utah, S.J. Quinney College of Law

J. Jason West, University of North Carolina at Chapel Hill

Review Editor

Mark M. Shimamoto, American Geophysical Union

Cover Art

Ellen Blum

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Focus on COVID-19 and Climate Change

Climate change can increase the likelihood of pandemics like COVID-19 and worsen their impacts. Climate-driven changes in ecosystems increase the risk of emerging infectious diseases by altering interactions among humans, pathogens, and animals and changing social and biological susceptibility to infection. Climate change also amplifies the risk of infection among people at the front lines of exposure, especially those with fewer resources. Addressing the challenges of climate change and pandemics requires early collective action and systemic change.

The Impact of Climate on Infectious Diseases

Over half of known human pathogenic diseases are exacerbated by climate change,[1] particularly zoonotic (originating in animals) and vector-borne diseases (KM 15.1; Table 8.1). Zoonotic diseases account for three out of every four newly emerging pathogens, including COVID-19.[2] Changes in climate alter the distribution, diversity, and abundance of vectors and non-human hosts, as well as the host's susceptibility to pathogens and pathogen replication. Climate changes can also speed the transmission of pathogens and promote the establishment of new diseases (KMs 8.2, 15.1). Coupled with global travel networks and dense urbanization, novel pathogens can rapidly spread to areas far from their origins. Our understanding of COVID-19 is evolving, but the pandemic demonstrates the global threat of emerging infectious diseases and has raised awareness of linkages between climate change and zoonotic diseases.[3,4]

Interactions Between COVID-19 and Climate Change Exacerbate Existing Inequities

Climate-related disasters have interacted with COVID-19 throughout the course of the pandemic in multiple ways (Table F3.1). Certain communities—including essential workers, older adults, low-wealth communities, and communities of color—are disproportionately impacted by these compounded exposures (KM 15.2).[5]

Table F3.1. Interactions Between COVID-19 and Climate Change Exacerbate Existing Inequities

The table shows examples of disproportionate impacts related to COVID-19 and climate change.

Climate-Related Exposures	Health Impact	COVID-19 Interactions with Climate Change
Hurricanes	COVID-19 transmission	After Hurricane Laura hit the Gulf Coast in 2020, the average number of COVID-19 hospitalizations increased, compared to before the storm, and was significantly higher in counties most affected by the storm.[6]
Drought	COVID-19 transmission	Many areas, including the Colorado River basin, experienced extreme drought—a climate-related hazard—and historic reductions in water supply during the pandemic. This highlighted the lack of access to clean water for health and hygiene for more than 2 million people living in the US, the majority of whom are people of color (KM 4.2). Tribal lands without reliable access to water had higher COVID-19 incidence.[7]
Wildfires, Hurricanes	COVID-19 transmission	Crowded housing and reduced hygiene increased disease spread during disaster-related evacuations.[5,8] COVID-19 also reduced willingness to evacuate to shelters.[9]
Wildfires	COVID-19 disease severity	Wildfires exacerbate disease risk by worsening air quality (KMs 7.2, 14.2). Breathing in tiny airborne particles magnifies a person's vulnerability to COVID-19.[10,11] Smoke from the massive 2020 fires in the West was linked with increased COVID-19 cases and associated deaths.[12]
Extreme Heat, Drought, Wildfires	Livelihoods	Farmworkers—of whom approximately 70% are born outside the US—are disproportionately vulnerable to climate change impacts that exacerbate COVID-19 risk.[13,14] Extreme heat, drought, and wildfires, combined with the pandemic, negatively affected farmworker health, farm income, and the broader agricultural economy (Figure 11.1).[13,15,16]
Air pollution	COVID-19 disparities in transmission and severity	Exposure to particulate pollution can intensify COVID-19 morbidity and mortality (KM 15.2). Disparities in exposure to particulate pollution may partially explain why Indigenous, Alaska Native, Pacific Islander, Black, and Latinx Americans have experienced higher rates of COVID-19 cases, hospitalization, and death compared to White Americans.[11,17]
Climate Disasters and Long-Term Threat	Mental-health impacts	Climate change and the pandemic may significantly increase the mental health burden in the US,[18] as current inequities in access lead to widening gaps in mental health outcomes.[19,20,21] Uncertainty, frustration, hopelessness, and helplessness, coupled with loss of livelihood, drastic lifestyle changes, and disruption of routines, are linked to COVID-19 and post-COVID conditions, as well as to acute and chronic mental health impacts of climate change (KM 15.1).[22,23]

Lessons from COVID-19 for Managing Climate Change

In 2020, COVID-19 lockdowns reduced transportation and electricity generation, decreasing annual US emissions of greenhouse gases (GHGs) by 11%.[24] At the peak of COVID-19 restrictions (April 2020), emissions decreased by approximately 32%.[25,26] While emissions reductions were not sustained and had little influence on global climate,[27] they revealed the impact climate actions might have on air quality and the carbon cycle.[25,28,29,30] The short-lived decrease in GHG emissions, despite dramatic lifestyle changes, as well as public resistance to restrictions, vaccines, and masks, suggests that voluntary lifestyle changes will not be enough to achieve GHG emissions-reduction targets. Reaching net-zero emissions is achievable and would require implementing known systemic changes (KM 32.2).

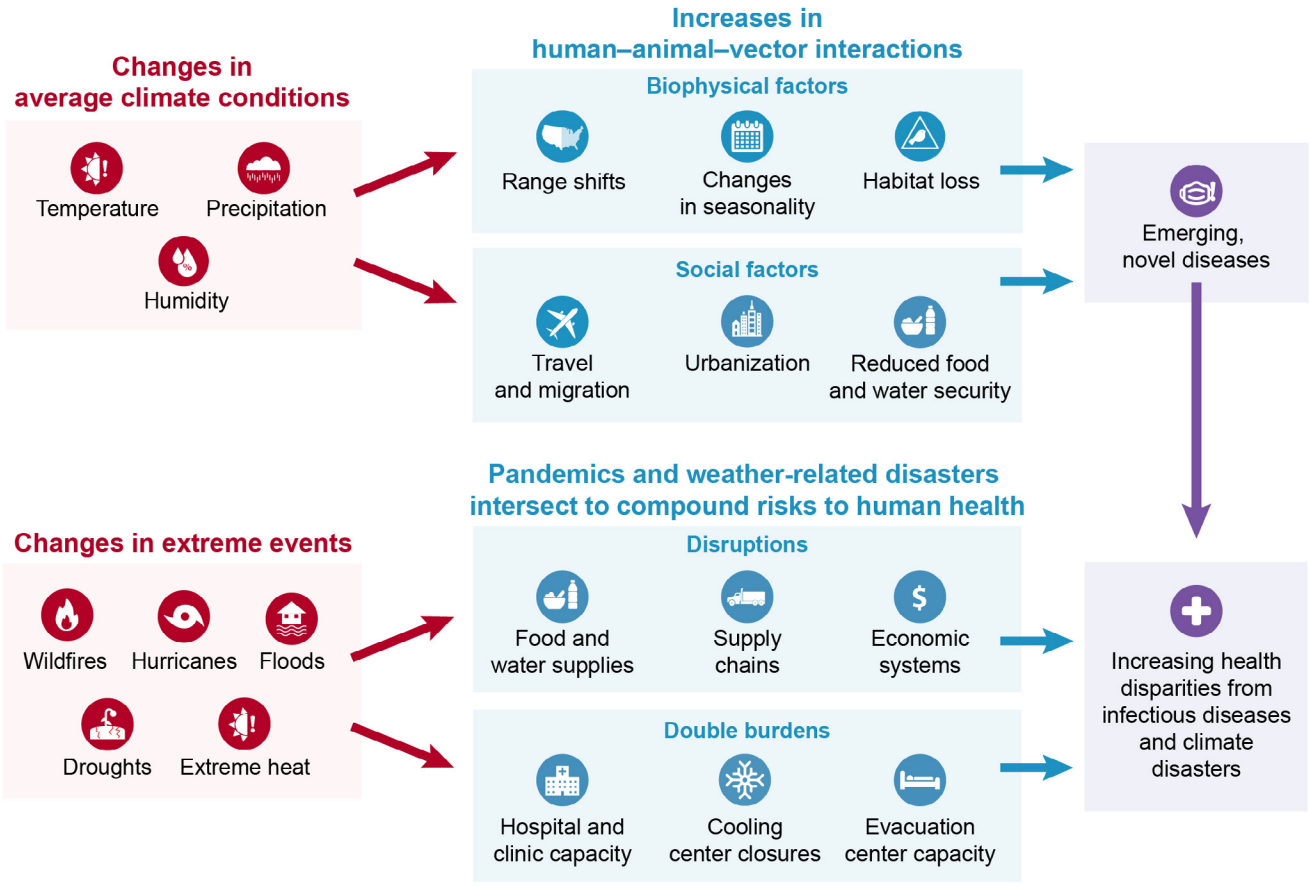
Early projections of COVID-19 costs to the US from lost economic output (i.e., income) and reduced health (i.e., premature death and long-term impairment) were calculated to be $17.9 trillion (in 2022 dollars)[31]—an underestimate given continued transmission and the high prevalence of post-COVID conditions.[32] Climate change also involves significant and inequitable direct and indirect costs, which increase with delayed response (KM 19.1). Developing solutions would help avoid significant economic costs of future pandemics and climate change.

COVID-19 and climate change have common underlying challenges and solutions.[33,34] Shared solutions include the following:

- Improved science communication that builds trust and minimizes disinformation impacts
- Collective action among nations to minimize threats
- Bottom-up and top-down programming to build community resilience
- Solutions to address stark socioeconomic, racial, and gender disparities that increase the vulnerability of those who are facing discrimination or have fewer resources
- Investments in public health and medical infrastructure that can respond to acute increases in medical burden
- Continued advancement in technology to prevent and respond to crises
- Responsive and agile systems that detect and respond to early warning signals before the worst impacts are realized

Quick action has major benefits. For COVID-19, deaths lag hospitalizations, hospitalizations lag infections, and infections lag exposures, providing time to prepare if adequate surveillance and public health systems are in place. Similarly, today's GHG emissions will affect the climate for decades to come, and delayed action has significant consequences (KM 19.1).[31] Early, preventive actions will slow or avoid the impacts of both pandemics and climate change, particularly the impacts felt by future generations. For climate change, preventive actions include achieving net-zero emissions (KM 32.1) and increasing adaptive capacity (KM 31.3). For pandemics, actions include addressing current health inequities, modernizing surveillance systems, enhancing targeted communication, mobilizing community-based prevention programs, and rapidly developing technical solutions such as vaccines. We can use the lessons learned from the COVID-19 pandemic to build resilience and to better mitigate, respond to, and recover from both the next novel pathogen and climate change.

Climate Change and Pandemic Risks



Climate change exacerbates infectious disease risk and increases health disparities.

Figure F3.1. (**top**) Climate change is projected to alter the geographic range and seasonality of disease vectors and animal hosts due to habitat loss and changes in habitat suitability. Concurrent climate-driven changes to human social systems—such as migration and travel, growing urban centers, and food and water insecurity—increase the potential for novel pathogens to spread quickly. (**bottom**) More frequent or severe extreme weather events can simultaneously interrupt supply chains, causing further economic disruption. Extreme weather events during a pandemic can reduce healthcare capacity, increase crowding in evacuation centers, and increase exposure to extreme conditions, such as exposure to extreme heat if cooling centers are closed—all of which act together to increase health disparities. Figure credit: University of Arizona and USGCRP. See figure metadata for additional contributors.

Traceable Accounts

Description of Evidence Base and Research Gaps

The author team reviewed the current science related to COVID-19 and climate change, focusing particularly on the more measurable impacts of climate change–related disasters and their compounding impacts during the COVID-19 pandemic. There is a growing body of literature that examines the compounding health effects of COVID-19 and climate change–driven disasters and extremes.[5] Primary research articles examine the links between air pollution, wildfires, and COVID-19 susceptibility, and several case studies examine hospital capacity in areas experiencing both COVID-19 and natural disasters. These include articles that demonstrate how extreme heat during the pandemic overlapped with COVID-19 to impact vulnerable populations;[35] the COVID-19 pandemic's influence on willingness to evacuate during hurricanes;[9] the potential impact of hurricane evacuation on COVID-19 transmission;[36] and the role of wildfires on susceptibility to severe COVID-19 disease. Additional parallels between climate change and the COVID-19 pandemic have been drawn extensively within the academic literature.[5] Most of these articles are reviews of the science of these two challenges that seek to identify how they interrelate. Many of the articles raise similar themes, indicating some degree of consensus among the experts who have examined these two issues.

There remain significant gaps in understanding the role that climate change has played and will play regarding COVID-19 transmission. For example, it is unclear if, and to what extent, climate change was a driver of the emergence of the novel SARS-CoV-2 virus.[37] There is no scientific consensus and low certainty of this relationship. Questions remain about the cited increase in bat species in the region, as well as about the methods for calculating vegetation change. This illustrates the challenges in directly linking the emergence of a novel pathogen with climate change, as pathogen emergence is a downstream consequence of both first-order (i.e., geophysical changes in the climate) and second-order (shifts in forests, grasslands, and oceans) impacts of increasing GHGs. There is evidence that supports higher transmission of COVID-19 in drier and colder months, but longer time trends need to be established before there can be reliable projections of how climate change will impact transmission patterns.

For disease systems with a longer history, the role of climate change in increasing the geographic range and incidence of disease is much clearer. Zoonotic and vector-borne disease systems are particularly subject to climate change impacts. Range expansion of disease vectors is already occurring.[38,39] Changing ranges will also alter interactions among species, leading to projected increases in cross-species transmission.[40] Human movement from climate change–related disasters and loss of livelihoods are also anticipated to move pathogens around the globe[41] and expose larger numbers of individuals when these pathogens are introduced into increasingly large urban populations.[42]

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