



Climate and Health Washington 2022

A Special Report on Impacts and Solutions

Washington Physicians for Social Responsibility

Climate and Health/Washington 2022

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**WASHINGTON PHYSICIANS
FOR SOCIAL RESPONSIBILITY**

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Suggested Citation

Ken Lans, Howard Frumkin, and Mark Vossler, *Climate and Health/Washington 2022: A Special Report on Impacts and Solutions*, Washington Physicians for Social Responsibility, <http://wpsr.org/WAclimatehealth2022>

Introduction

The clouds of wildfire smoke that lingered and choked Washingtonians for months during four of the past five summers should be a wakeup call that the impacts of climate change are not some “maybe-in-the-future” or “just-in-other-places” concern. These fires, and their smoke, provided a palpable, much-needed reminder of the intimate connection between the environment—and what we dump into it—and our health. However, wildfire smoke is only one of the many ways climate change is impacting our health here in Washington.

The longer we wait to act, the more fossil fuel we continue to burn, and the more carbon dioxide we pour into the air—the more the earth will warm, the more the climate will be disrupted, and the more dire and widespread the impacts and harms on people will become*. Conversely, rapid action now will deliver considerable health benefits—meaning that climate change is not only a health threat, it is also a health opportunity.

The COVID-19 pandemic has made clear that global threats to health can have catastrophic consequences, that health systems are highly vulnerable, and that when multiple such crises arise simultaneously, they can interact and intensify each other. We must confront the threat of climate change even as we confront the pandemic. Unlike COVID-19, there is no vaccine for the climate crisis, but we can limit the damage to our health and well-being if we act quickly and decisively.

As health professionals, we start from a place of concern for health and wellbeing—and not just for those we treat as individual patients, but also for the broader population and generations to come. In addition, our duty and obligation extends beyond simply diagnosing and treating—after illness and/or damage has occurred—to providing advice and guidance for lessening and even preventing health harms from occurring in the first place.

In this report we provide a high-level overview of the connections between the climate crisis and health in our state. We hope to inform health professionals, policymakers in government and industry, and the public regarding both health threats and health opportunities. We include specific policy recommendations about ways to respond to the challenge of climate change while protecting the health and well-being of all the people of Washington state, today and into the future.

What Everyone Should Know about the Climate Crisis

- 1 There is a scientific consensus about human-caused climate change.** The reality of human-caused climate change is no longer a matter of scientific debate.
- 2 In communities across Washington, climate change is harming our health now.** Doctors, nurses and public health professionals see increasing rates of health problems associated with climate change in their communities.
- 3 Anybody’s health can be harmed by climate change, but some of us face greater risk than others.** Children, pregnant women, the elderly, communities of color and historically marginalized populations, people with chronic illnesses and allergies, and the poor are more likely to be harmed. Any responses to the climate crisis must take into account those who are most vulnerable—both to the impacts of climate change, as well as to the consequences (even if unintended) of our responses.
- 4 Unless we take concerted action, these harms to our health are going to get much worse.** The sooner we act, the more harm we can prevent, and the more we can protect the health of all Washingtonians.
- 5 Tackling climate change provides substantial opportunities to improve health.**
- 6 Key strategies to protect health from climate change impacts include transitioning from fossil fuels to renewable power sources, maximizing energy efficiency, and minimizing waste. Indirect but equally important strategies include reducing poverty and inequality.**

* On February 27, 2022, the Intergovernmental Panel on Climate Change (IPCC) released the second part of its Sixth Assessment Report, *Climate Change 2022: Impacts, Adaptation and Vulnerability*, that paints a deeply troubling picture of how climate impacts, worldwide, are already more widespread, occurring earlier and are far worse than expected. The report finds that every fraction of a degree of additional warming will escalate threats to people, species and ecosystems and that adaptation is crucial to reduce risks and limit irreversible losses and damages as much as possible.



Executive Summary

Climate change harms the health of Washingtonians now and these harms are predicted to intensify in coming years. In this report, we discuss the current and future consequences of climate change on the health of our communities and make specific policy recommendations to **mitigate** (reducing climate change to avoid the unmanageable) and **adapt** (building resilience to manage the unavoidable).

Health Impacts of Climate Change in Washington

Extreme heat: Mean temperatures in Washington during late spring and early summer are rising, punctuated by extreme heat events such as the June 2021 “heat dome.” Such events are predicted to increase in frequency and severity in the future and, as in 2021, will cause increased heat related illness and premature deaths.

Wildfires: Wildfires and the smoke that they produce are becoming increasingly familiar to Washingtonians with periods of hazardous air quality occurring nearly every summer. In areas affected by wildfire smoke, deaths increase, rates of low birth weight and preterm births rise, and more people report to emergency rooms with asthma attacks, heart attacks and strokes.

Sea level rise: Washington, with 3,026 miles of coastline and 68% of its population living in coastal counties, is at risk from sea level rise and more severe storms. Coastal flooding and erosion will result in injuries or death, damage to infrastructure and reduced fishery and shellfish harvests.

Harmful algal blooms: Harmful algal blooms are likely to become more common and more extensive off Washington’s coastline as temperatures rise. Dinoflagellate algae in marine waters produce substances that contaminate fish and shellfish and are toxic to humans.

Infectious disease: Climate change can affect the risk of many infectious diseases—those that spread through vectors such as mosquitoes, those that spread through food and water, and some that spread in other ways. Several kinds of infections are on the rise in Washington, and current trends indicate the need for vigilance in coming years. These infections include vibriosis, cryptococcus and West Nile virus.

Allergies: Warming temperatures and rising CO2 levels have impacts on plants, including those that produce pollen and other allergens. In response to climate change, many weeds and trees produce more pollen, prolong their pollen season, and become more allergenic.

Mental health: Climate change threatens mental health through the loss of familiar and beloved places, the loss of longstanding sources of employment and the post-traumatic effects of climate related disasters. An increasingly recognized phenomenon, especially among young people, is “climate anxiety” or “eco-anxiety”—anxiety about the future of the planet in the face of grim trends and inadequate responses.

Loss of livelihood: Economic insecurity, and loss of livelihood, present serious threats to physical and mental health. People who lose their jobs, or suffer job insecurity, may lose access to health care, and suffer food insecurity, anxiety, stress, and other health problems. Sectors of the Washington economy facing economic damage from climate change include tourism, fisheries, timber, outdoor recreation, and agriculture, and the many other economic activities that support these.

Displacement: Climate change has begun to make some places uninhabitable, a trend that is predicted to accelerate as the impacts of extreme heat, rising sea levels, drought, and severe storms intensify. This will displace some people within our state and from other areas to our state.

Adaptation and Resilience

Since the health impacts of climate change are already being felt in our state, we must not only work to reduce emissions rapidly but also plan for adaptation and resilience in the face of what is happening now. We will need early warning systems for extreme heat events and accessible cooling shelters. Nearly all heat related deaths are preventable. The growing threat of wildfires, floods and landslides will also require early warning systems and land use planning to minimize harm. Health departments need to develop strategies for early detection and treatment of vector borne diseases. Health care facilities need to be adapted to withstand damage and remain open and functional in the setting of natural disasters.

Climate Action Is Health Action

We often think about climate change as a problem distant in both time and place. In fact, climate change is having adverse health impacts on Washingtonians right now. The good news is that policies that reduce CO₂ emissions will deliver immediate health benefits.

Transportation: Policies aimed at increasing low or zero carbon public transportation and active transportation, usually in the form of urban walking and cycling, are important immediate steps to mitigate climate change given the direct co-benefits from reducing pollution and increasing physical activity.

Food and agriculture: Twenty four percent of agricultural greenhouse gas emissions come from livestock and a shift from animal products toward plant-forward diets has significant climate benefits. A diet high in plants and low in animal-based protein is associated with reductions in the risk of diabetes, cardiovascular disease, and some cancers.

Vegetation: Trees and other plants sequester CO₂. Planting more trees, and careful stewardship of existing forests in rural and urban areas, will help reduce CO₂ concentrations. Urban green space also yields a number of health benefits including improved mental health, increased physical activity, stronger social connections, improved air quality, reduced temperatures on hot days, reduced noise, and enhanced safety. Moreover, improved stewardship of forests across the state will decrease the risk of fires and their impacts on rural communities.

Building electrification: Transitioning our buildings from the use of gas for heating and cooking to electric appliances is a cost effective way to reduce greenhouse gas emissions. Building electrification has the additional benefit of reducing indoor air pollutants such as nitrogen oxides and fine particulate matter. As with reducing outdoor air pollution, this reduces the risk of several conditions including asthma, cardiovascular disease and dementia.

Clean electricity: Fortunately our state is ahead of most in decarbonizing the electricity sector with over 50% of our power coming from hydroelectric generation and just over 25% from gas and coal (with this latter number falling). We need to ensure that the additional capacity required for electrifying buildings and transportation comes from renewable sources in order to continue our progress toward clean air for all Washingtonians.

Environmental Justice

While everyone in Washington will suffer consequences of climate change, the burden is not shared equally. Profound health disparities based on race, income and geography already exist in our state and are expected to widen as the atmosphere warms and the health impacts we describe worsen. The impact of climate change on frontline communities does not occur in isolation, but combines with other environmental injustices, economic disparities, and disparities associated with social determinants of health.

Specific Policy Recommendations

At the local level

- 1 Cities and towns should consider climate change in their land use and transportation plans.
- 2 City and county level building codes should encourage all electric residential and commercial buildings.
- 3 Zoning laws should consider elimination of food deserts and increased access to healthy foods with lower associated greenhouse gas emissions.

At the state level

- 1 A statewide mandate should require that all vehicles sold be electric-powered.
- 2 Focus transportation spending on low or zero carbon public transportation and reducing pollution in the most highly impacted communities in our state
- 3 Update state and local building codes in order to phase out gas for cooking and heating and promote all electric residential and commercial buildings.
- 4 Update the Growth Management Act to account for climate change in land use decisions
- 5 While Washington's Clean Energy Transformation Act (CETA) mandates that the state's electricity be 80% carbon free by 2030 and 100% carbon free by 2045, additional policies will be needed to ensure grid stability, reliability and equitable access to clean power.

At the Federal level

- 1 Washington's 2019 Clean Energy Transformation Act should be replicated as a nationwide mandate.
- 2 Congress should pass a clean fuels standard.
- 3 Federal subsidies for fossil fuel production should be eliminated.
- 4 Carbon markets are problematic at a state level and may worsen economic and environmental inequities. A federal carbon tax, however, can be structured in a way that funds tax rebates for low-income households and invests in targeted projects to assist impacted communities.
- 5 Tax rebates for EVs, further increases in vehicle fuel economy standards, investments in low carbon public transportation and upgrades to the electricity grid are all possible at a federal level.
- 6 Agricultural subsidies should be redirected to promote production of foods associated with lower greenhouse gas emissions.

There are a number of steps that the health care sector can take independent of government policies

- 1 The health care sector can reduce the carbon footprint of its operations, with greater efficiency, reduced waste, practices such as telehealth, and exclusive use of green energy.
- 2 The health sector can use its vast purchasing power to demand a reduction in the carbon intensity of products in its supply chain.
- 3 Effective preventive care can help reduce illness, and therefore the volume of care required.



Section 1

Health Consequences of Climate Change in Washington State

Howard Frumkin

Climate change causes a wide range of health impacts, which have been inventoried and described in detail.¹⁻³ While these are often presented as future possibilities, they are in fact manifesting now. Similarly, while health impacts may seem to be problems for people in faraway places, many are emerging across Washington state. In many cases the number of Washingtonians who are being harmed or even who die prematurely can be reliably estimated. This section discusses several categories of climate change-related health impacts that are evident in Washington: extreme heat, wildfires, sea level rise, harmful algal blooms, infectious diseases, allergies, mental health impacts, threats to livelihoods, and dislocation. Importantly, there are other health impacts that are well-established on a national or global scale, but for which we do not have Washington data at present, such as nutritional losses. These health effects deserve careful monitoring in coming years.

Washington – Mean Temperature

May-June 2015 Departure from 1981-2010 Normal

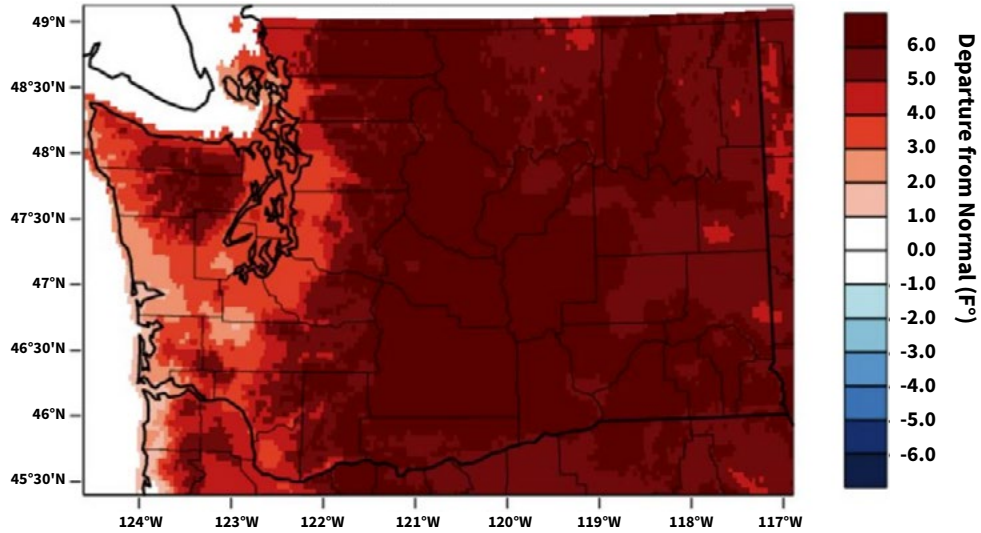


Figure 1: The mean temperature across Washington during May-June, 2015, shown as the departure from normal levels during 1981-2020. Source: WA State Department of Ecology.

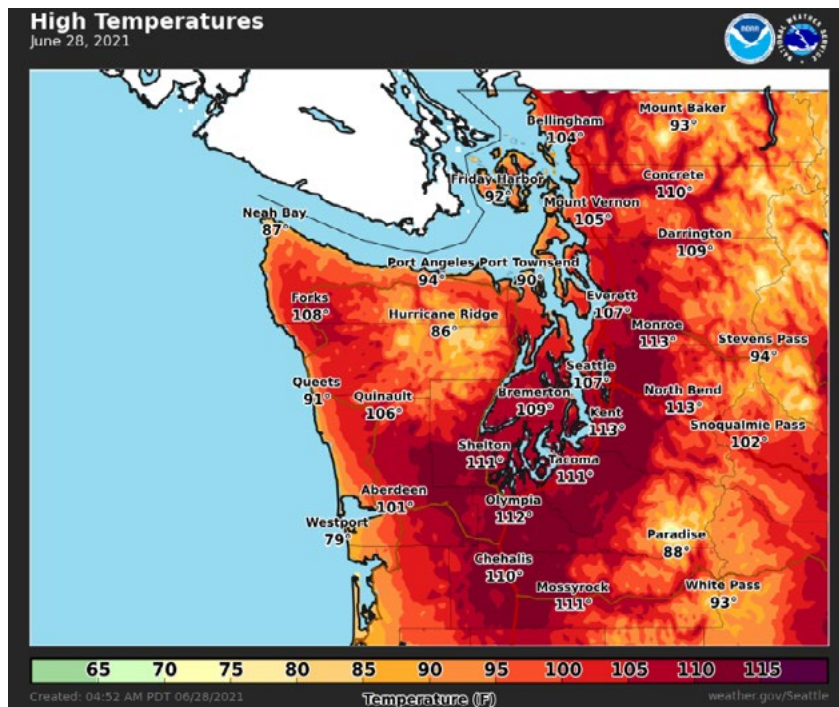


Figure 2: High temperatures in western Washington on June 28, 2021. Source: National Weather Service. Image from Wikimedia.

1.1 Extreme heat

The planet is warming, and Washington state is warming with it. As shown in **Figure 1**, the mean May-June temperature across the state in 2015, to take a recent year, was several degrees above the 30-year norm.

The long-term trends suggested in Figure 1 are punctuated by extreme events, as occurred in late June, 2021 (**Figure 2**). During that heat wave, temperatures in many parts of Washington exceeded average temperatures by more than 30°F, and shattered historical records by over 10°F.

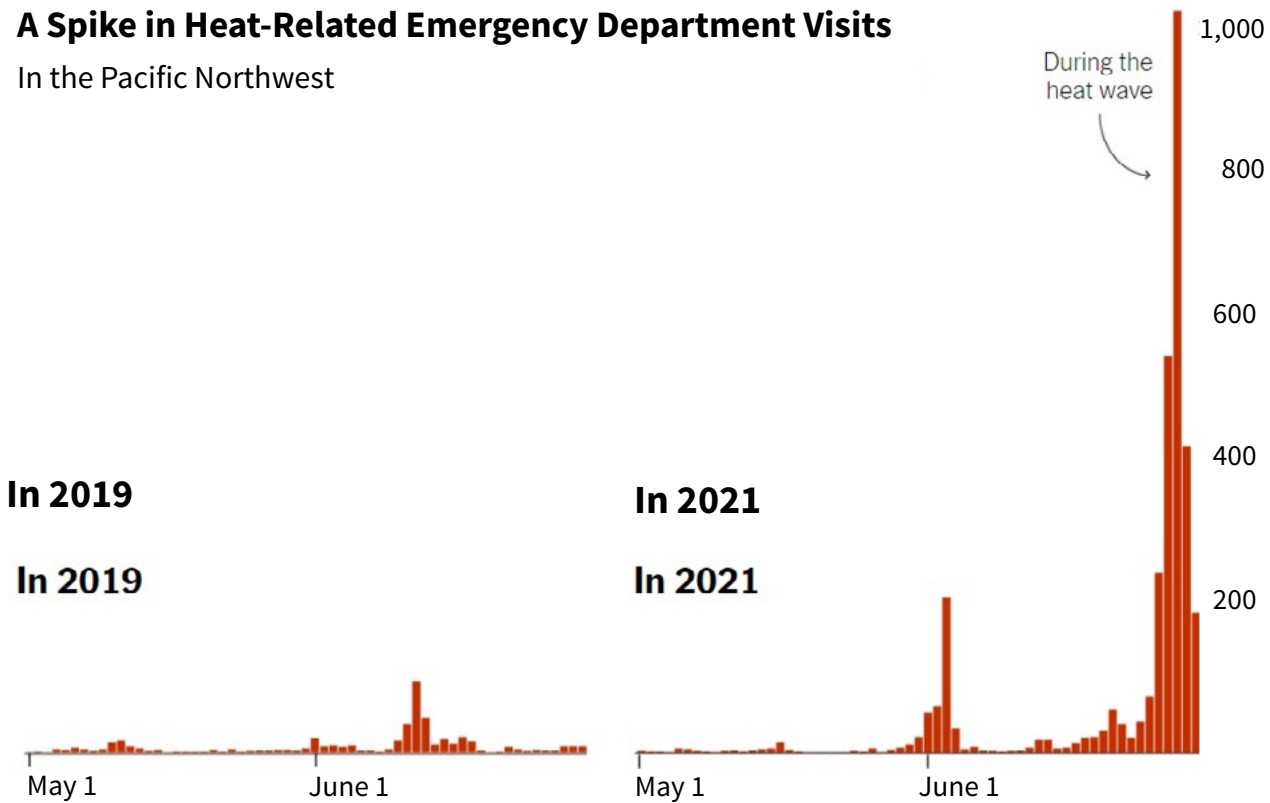
Washington will confront more hot weather in coming years. Climate models predict that by the end of the century, when a child born today will be at retirement age, the mean temperature will be between 3°F and 9°F warmer than in the year 2000.^{4,5} Rising temperatures mean more heat waves, more

very hot days, and longer, hotter summers. At present, while statewide data are not available, fewer than half of homes in greater Seattle have air conditioning, leaving residents vulnerable to very hot weather.

Severe heat is dangerous. The medical effects range from mild problems such as heat rash and heat cramps, to potentially fatal heat stroke. These effects have been demonstrated in Washington state; research shows increased emergency department visits, hospital admissions and deaths in King County during heat waves,⁶⁻⁸ and regionally during the June, 2021 event (**Figure 3**). Initial analyses of the 2021 heat wave suggested hundreds of excess deaths—far more than official statistics indicated.⁹ Projections call for ongoing excess deaths in coming decades.¹⁰ Most excess deaths during heat waves are not attributed to heat on death certificates; they are due to heart and lung disease.

A Spike in Heat-Related Emergency Department Visits

In the Pacific Northwest



Source: Morbidity and Mortality Weekly Report, C.D.C. • Data comes from the U.S. Department of Health and Human Services Region 10, which includes Oregon, Washington, Idaho, and Alaska.

Figure 3: Counts of heat-related emergency department visits across the Pacific Northwest (WA, OR, AK, and ID) during 2021 (right panel) and, for comparison, during 2019 (left panel).

Health Effects of Heat

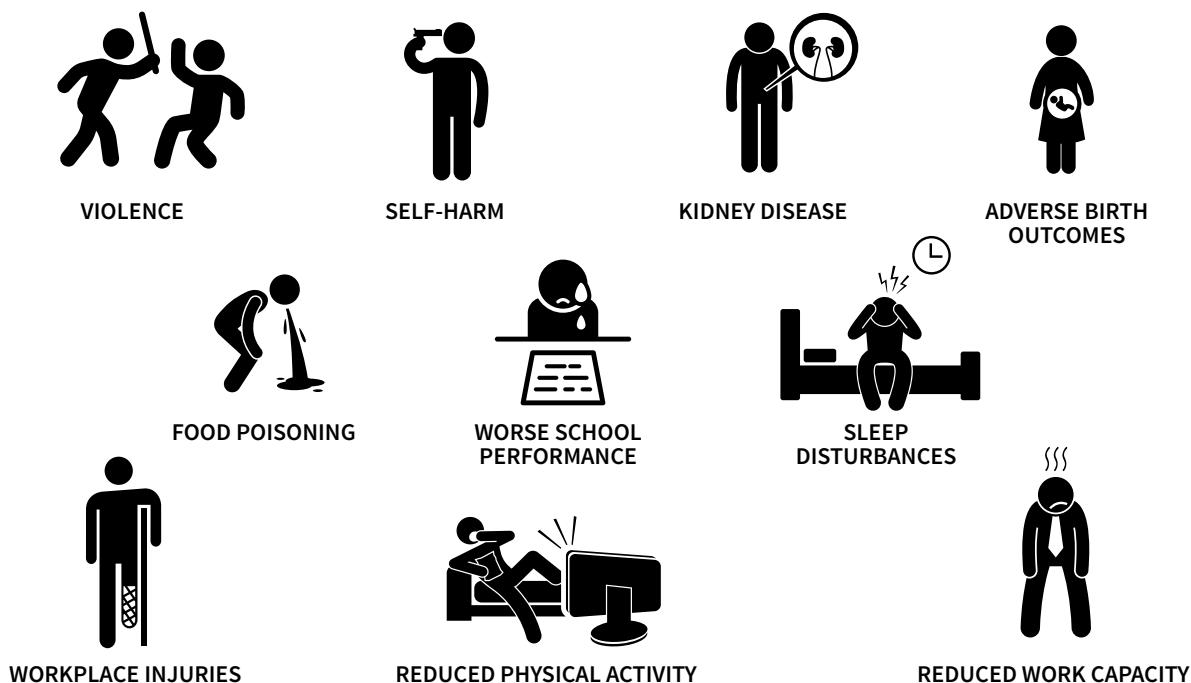


Figure 4: Some effects of heat on human health and well-being.

In addition to fatalities, heat also affects health in many other ways, as shown in **Figure 4**. Heat predisposes to violence and crime; crime rates rise on hotter days. Heat may also predispose people to self-harm; some studies link high temperatures with suicide. Heat increases the risk of kidney disease—a particular threat for outdoor workers who toil in high temperatures without adequate hydration. Adverse pregnancy outcomes—preterm birth and low birth-weight—increase with heat. In hot conditions, it is more difficult to protect food and water from bacterial contamination; the incidence of diarrheal diseases such as shigella and campylobacter rises during hot weather. Heat compromises children’s academic performance. Hot weather compromises sleep quality; sleep deprivation, in turn, is a risk factor for inflammatory, metabolic, neuroendocrine, and cardiovascular conditions. Workplace injuries rise during hot weather. People reduce their physical activity during hot weather, including the cancellation of sports events; less summertime physical activity forfeits an important health-promoting opportunity. Heat also reduces work capacity, affecting outdoor workers such as police officers, farm workers, and construction workers, and workers in non-air-conditioned facilities, to the point that economic output may decline substantially.

Heat also threatens health through indirect pathways. For example, high temperatures can affect medications.¹¹ Some, such as epinephrine, insulin and thyroid hormones, become unstable and lose effectiveness. For medications with a narrow therapeutic index, such as digoxin and lithium, the risk of toxicity rises. Albuterol inhalers, used to treat asthma, can explode with excessive heat. Heat waves also increase power demand to drive air conditioning.¹² This in turn increases the risk of power outages, which threaten health in many ways. For example, people reliant on machines such as nebulizers cannot use them, and loss of air conditioning increases heat exposure, and loss of refrigeration threatens can damage medications.

1.2 Wildfires

Wildfires, the smoke they produce, and the impacts on people and communities, are familiar to Washingtonians. In 2014, the Carlton Complex Fire burned more than a quarter-million acres and destroyed more than 350 homes in the Methow Valley. In 2017 and 2018, smoke from huge wildfires in British Columbia flowed south, blanketing much of the state for weeks. But September, 2020 broke records. Widespread fires erupted not only in Washington, but up and down the

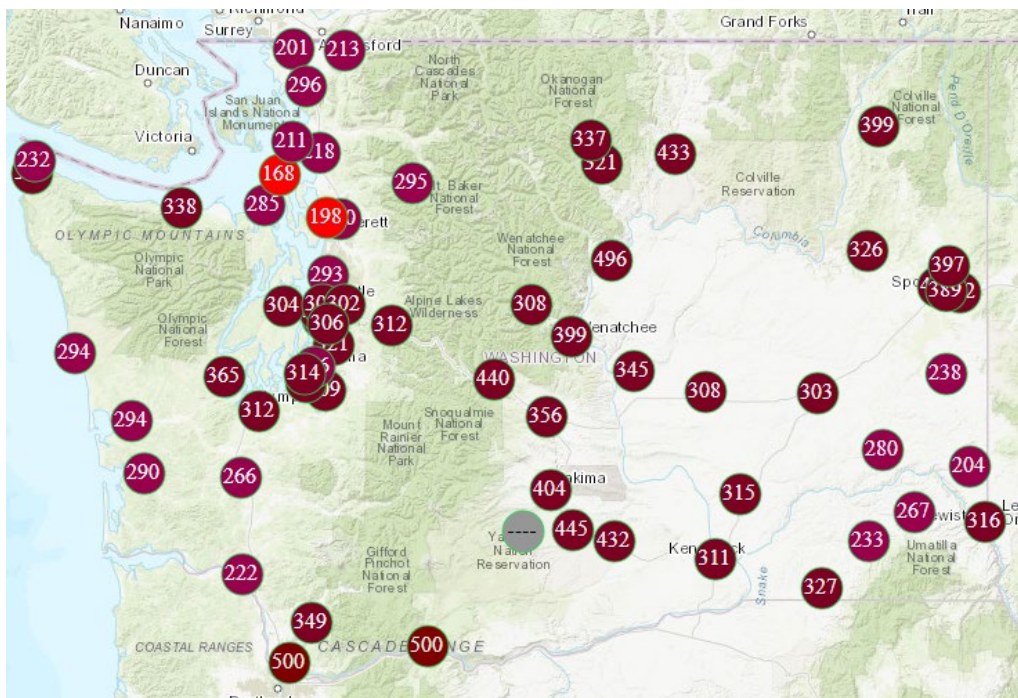


Figure 5: Air quality measurements around Washington in early September 2020, due to wildfire smoke. Good air quality is defined as an Air Quality Index up to 50. A level above 200 is “very unhealthy” and a level above 300 is “hazardous,” qualifying as an emergency. Source: Washington Department of Ecology¹³

west coast. The tiny town of Malden near Pullman was nearly destroyed by a fast-moving blaze, and a 1-year-old child died as his parents fled the Cold Springs Fire near Omak.¹³ Within days, air quality across the state was dreadful—at points, worse than in the world’s most polluted cities (**Figure 5**).

Wildfire flames threaten the people who are directly affected—people caught in the fires, and firefighters who battle them. But the risk extends further. Wildfire smoke can travel hundreds of miles, blanketing entire regions, a risk to everybody who breathes it, especially to people with heart disease, asthma, chronic lung disease, and certain other conditions. In areas affected by wildfire smoke, deaths increase, rates of low birth weight and preterm births rise, and more people report to emergency rooms with asthma attacks.¹⁴⁻¹⁶

Wildfire smoke harms the developing lungs of children.¹⁷ These results have been seen in Washington. A statewide study of the 2012 wildfire season found that each 10 mcg/m³ increase in the smoke level was associated with an 8% increase in the risk of asthma hospitalization (with equivocal results for chronic obstructive lung disease),¹⁸ and a study over the period 2006-2017 found a 9% increase in deaths from respiratory causes on days of wildfire smoke exposure.¹⁹ More recently, a study of the September, 2020 wildfires estimated that smoke exposure over

a two-week period caused dozens of excess deaths across the state (38 using one method of analysis and 92 using another, with 95% confidence intervals extending to as many as 179 excess deaths).²⁰

Warming temperatures and drier summers, and increasing invasions by pests such as pine bark beetles, combine to increase the risk of forest fires.²¹ Other factors, such as land management, fire suppression strategies, and changes in forest type also affect the risk.²² But with continuing longer, warmer, drier summers, the area of severely water-limited forests across the Northwest is projected to increase by almost 50 percent by midcentury, and the typical annual area burned by fire could quadruple by the 2080s.²³

1.3 Air pollution

Air pollution is closely linked to climate change. Most importantly, the leading contributor to climate change—fossil fuel combustion—is also a leading source of air pollution. In addition, climate change worsens air quality, for example when warmer weather drives ozone formation. And the communities that suffer the highest exposure to air pollution are the same communities that are most vulnerable to climate change health impacts.

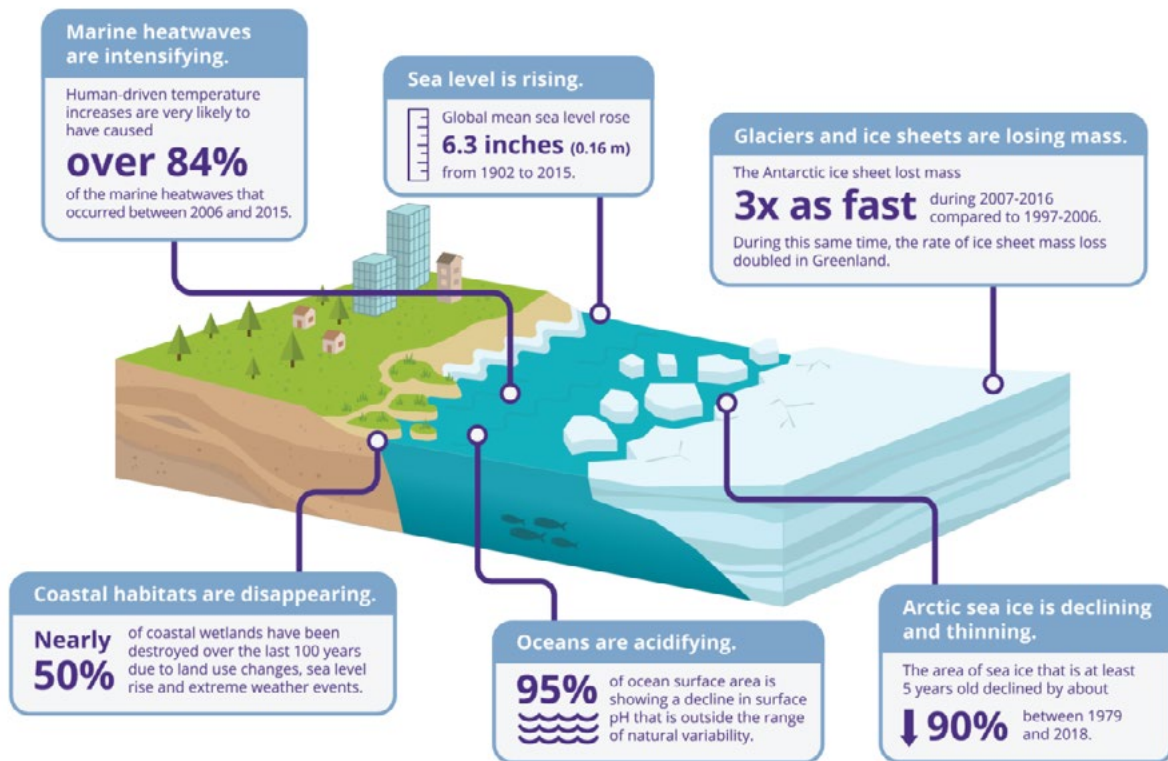


Figure 6: Climate change affects oceans in many ways, and these in turn affect health and well-being. Many of these changes are evident on the Washington coast. Source: IPRC Report on Ocean Cryosphere²⁶

The various air pollutants—especially particulate matter, oxides of nitrogen, and ozone—cause considerable illness and death, mostly from respiratory causes such as asthma and cardiovascular causes such as heart attacks. Air pollution also damages health in many other ways, such as diabetes mellitus; obesity; and reproductive, neurological, and immune system disorders.

Fortunately, Washington state has generally good air quality, thanks in large part to our state’s reliance on non-polluting sources of electricity. As discussed above, wildfires are a major exception. Other exceptions, where air quality can be poor, include near busy roadways or at other places where traffic concentrates (such as idling vehicles on waiting lines), near point sources such as certain industrial facilities, and in parts of the state where people heat with wood stoves.

The gasoline and diesel that power most vehicles contribute to climate change and to air pollution. Measurements in Seattle point to motor vehicle exhaust as a leading contributor to that city’s particulate air pollution.²⁴ During the COVID pandemic, when stay-at-home orders greatly reduced traffic in Seattle, levels of particulates and oxides of nitrogen in the city’s air fell substantially.²⁵ Vehicular traffic is

also a major contributor to ozone air pollution in the state. Accordingly, transportation policies that aim to mitigate climate change—switching to walking, cycling and transit, and switching to cleaner vehicles including electric vehicles—deliver both climate benefits and air quality benefits—two pathways to health benefits.

1.4 Sea level rise

Climate change affects the planet’s oceans in complex ways (see **Figure 6**), and Washington, with 3,026 miles of coastline, is at the forefront of experiencing those impacts. The coastal waters off Washington are warmer and more acidic than they were a generation ago. During 2014-2016, a “blob” of unusually warm water off the coast raised sea surface temperatures 3.6°F (2°C) above average, causing seabird and marine mammal die-offs.²⁶

Globally, the average sea level has increased by about 6-8 inches over the last century; this amount varies considerably from place to place due to local coastal conditions. This is a complex phenomenon to track and predict. Parts of Washington’s coastline (such as the northwest tip of the Olympic peninsula) are being uplifted by seismic activity, which reduces

the apparent sea level rise, while other places (such as parts of central Puget Sound) are subsiding, which amplifies sea level rise.²⁷ Much will depend on how quickly the world reaches net zero carbon emissions, and on the rate of ice melt in Greenland and Antarctica (another process whose timing is difficult to predict).

The stakes are high; 68% of Washington's population lives in coastal counties.²⁷ Sea level rise has been projected for 171 locations along the length of Washington's coast.²⁷ For example, Tacoma is expected to see a 0.6-1.2 feet sea level rise by 2050, and 1.5-3.3 rise by 2100. (The wide range reflects different assumptions about greenhouse gas emissions in coming decades, and the inherent uncertainty of forecasting.) For Aberdeen, the predictions are 0.2-0.7 feet by 2050, and 0.6-2.4 feet by 2100, and for Port Angeles, 0.3-0.8 feet by 2050 and 0.8-2.5 feet by 2100. Some forecasts are higher, projecting as much as several feet of rise by 2100.²⁷

Sea level rise, even at levels that sound relatively modest, can have significant consequences for people. In combination with more severe storms (another feature of climate change), higher sea levels mean higher storm surges, more coastal flooding, and more erosion. Because winter and spring streamflows are projected to increase (from earlier snow melt), and

more severe rainfalls are expected, the sea level rise will intensify coastal river flooding at some times of the year.²⁶ Coastal bluffs in some areas of Puget sound are especially susceptible to erosion; for example, in San Juan County, they could recede by 75-100 feet by 2100.⁴ In addition, Washington state is in an active tectonic zone, and land levels could drop significantly with a major earthquake—an effect that rising sea levels would amplify.

These processes will harm Washingtonians in several ways. First, people can be injured or killed during severe coastal storms and floods. Second, sea level rise is expected to damage or inundate coastal wetland, tidal flats, and beaches, damage coastal infrastructure, inundate commercial and industrial areas, and reduce fishery and shellfish harvests, with impacts on livelihoods.²⁷ Third, the loss of culturally important coastal sites, and damage to fisheries, threaten the well-being of Tribes and others who live near or recreate along the coasts.

1.5 Harmful algal blooms

Harmful algal blooms are a symptom of altered coastal systems, and they are becoming more frequent and extensive in many parts of the world,^{28,29} including in the waters off Washington (**Figure 7**).



Figure 7: An algal bloom at Saltwater State Park in Des Moines, June 2018. Source: WA Department of Ecology.

Table 1: Examples of diseases caused by harmful algal blooms

Human health impact	Primary toxin
Amnesic Shellfish Poisoning	Domoic acid
Neurotoxic Shellfish Poisoning	Brevetoxin
Paralytic Shellfish Poisoning	Saxitoxins
Diarrhetic Shellfish Poisoning	Okadaic acid
Ciguatera Fish Poisoning	Ciguatoxin/Maititoxin

Even small increases in ocean temperature, in the range of 2–3°F, may propel the growth of common dinoflagellate organisms in marine waters. Some of these organisms produce substances that are toxic to humans. People are exposed primarily by eating contaminated fish and shellfish, but in some circumstances people can inhale the toxins. Pets can also be poisoned. The different toxins cause various shellfish and fish poisoning syndromes, which feature a range of gastrointestinal, neurological and cardiovascular symptoms, and in severe cases can be fatal (Table 1). Fortunately, these diseases are rare in Washington, due in part to careful monitoring and warning systems in place.

In the summer of 2015, the largest harmful algal bloom ever observed off the West Coast stretched from California to Alaska. The cause was a marine diatom called *Pseudo-nitzschia*, which produces domoic acid, a toxin that accumulates in shellfish, crabs, and some fish, and causes Amnesic Shellfish Poisoning. Other species that flourished that year included the causes of Paralytic and Diarrhetic Shellfish Poisoning. Shellfish harvesting in much of the Northwest had

to be closed that year, with severe economic consequences.

Harmful algal blooms are likely to become more common, and more extensive, off Washington’s coast. A recent study³⁰ showed that climate change has increased the frequency of marine heat waves more than 20-fold, and that, with 3°C warming, events that occurred only once every hundreds to thousands of years in preindustrial times could occur on an annual to decadal basis. For example, scientists at the Northwest Fisheries Science Center and the University of Washington, have studied a dinoflagellate called *Alexandrium*, which causes Paralytic Shellfish Poisoning, and have concluded that climate change will drive longer periods of harmful algal blooms, and increased bloom growth.³¹⁻³³ These will reduce recreational opportunities, compromise cultural practices, and threaten health, and will also cause indirect harm through economic impacts (discussed below).

1.6 Infections

Climate change can affect the risk of many infectious diseases—those that spread through vectors such as mosquitoes, those that spread through food and water, even some that spread in other ways. Fortunately, Washington has not seen major increases in some of the nation’s best-recognized climate-sensitive infections, such as Lyme disease. However, several kinds of infections are on the rise in Washington, and current trends indicate the need for vigilance in coming years.

Vibriosis cases, Washington state

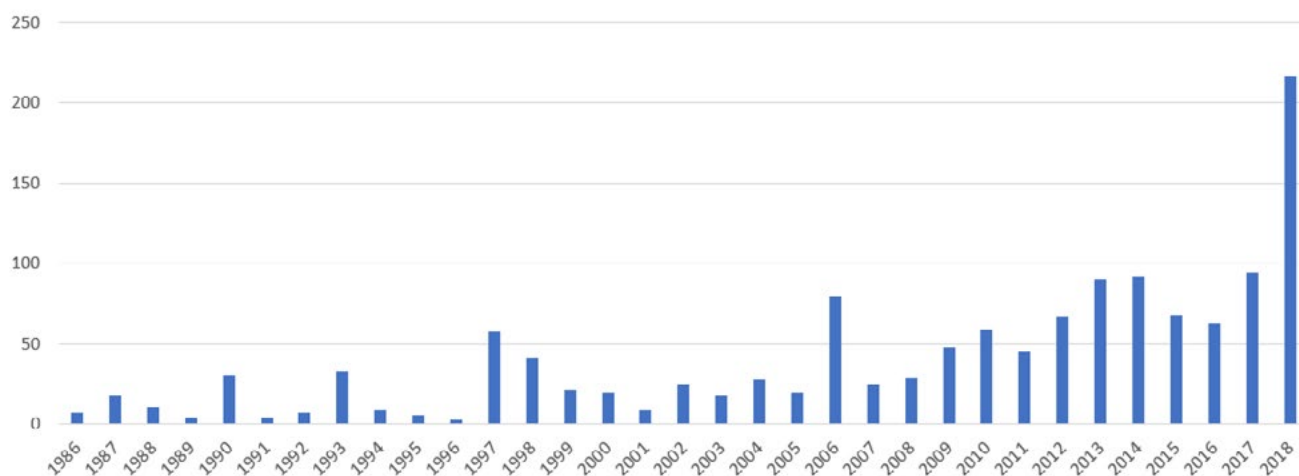


Figure 8: Infections with vibrio bacteria, Washington state, 1986-2018. Source: Microbial Ecology³⁷

Public health authorities track infectious diseases through reporting by health care providers and clinical laboratories. Because this reporting is incomplete, available data on infectious disease rates are often underestimated. However, trends over time can provide important information.

Vibriosis is the name given to several diseases caused by a genus of bacteria, *Vibrio*. The best known of the *Vibrio* species is *V. cholerae*, the cause of cholera—a disease not seen in Washington state. But other species can also cause disease, including *V. parahaemolyticus*, the most common type found in Washington waters, and *V. vulnificus*. People develop vibriosis after consuming raw or undercooked seafood (such as raw oysters). The disease causes intestinal symptoms, with nausea, vomiting, cramps, and diarrhea. Most people recover in a few days, but severe cases need to be hospitalized. *Vibrio* can also cause skin infections, especially if an open wound is exposed to contaminated sea water.

Vibrio thrives in warmer water, so infections generally occur from May through October. Not surprisingly, climate change is expanding the range of *Vibrio*, in both time and space.^{34,35} The factors that influence *Vibrio* growth in Pacific Northwest waters are not fully understood,³⁴ but just a few degrees of warming can significantly increase the levels of *Vibrio* in oysters.³⁶ There is some evidence that human infection rates are rising in the state (**Figure 8**).

Cryptococcus gattii causes a very different kind of infection. This fungus has long been recognized in tropical climates from Latin America to south Asia, where it is found in environmental media such as soil and tree bark. People can become infected when they inhale the tiny spores; the infection attacks the brain, nervous system, and lungs, and can be fatal. In 1999, an outbreak of *C. gattii* was detected on Vancouver Island, B.C. Within just a few years, the first case had appeared in Washington state, in a man living on Orcas Island.³⁸ The disease has continued to percolate throughout the Pacific Northwest since then,^{39,40} with several cases reported each year in Washington.⁴¹ The emergence of this tropical disease in the Pacific Northwest has not yet been fully explained, but the warming climate—especially milder winters—has been hypothesized to play a role.^{42,43}

West Nile virus, the leading cause of mosquito-borne disease in the United States, is also a growing problem in Washington state. While most people who are infected do not develop symptoms, about 1 in 5 devel-



Figure 9: Culex mosquito, the West Nile virus vector.
Source: CDC (<https://www.cdc.gov/westnile/index.html>)

ops a fever and other symptoms such as headache, achiness, joint pains, vomiting, diarrhea, and rash, and a small number go on to develop severe nervous system involvement that can be fatal. This disease is carried by two mosquito species: *Culex pipiens* and *Culex tarsalis* (**Figure 9**). Because these mosquitos, like all insects, are affected by temperature and other environmental conditions, West Nile virus is considered a climate-sensitive disease.⁴⁴⁻⁴⁷ Indeed, surveillance by the Washington State Department of Health routinely detects infected mosquitos throughout the state (<https://www.doh.wa.gov/DataandStatisticalReports/DiseasesandChronicConditions/WestNileVirus/WestNileVirusActivityfor20022016>). The annual tally of human cases in Washington remained in the single digits, and almost all occurred in returning travelers, until 2009, when 38 cases occurred, all but two confirmed to have been contracted in-state. Since then the case count has fluctuated, several times reaching the double digits, and almost all contracted in-state (**Figure 10**).³⁸ This is almost certainly an undercount.

Overall, climate change affects a wide range of infectious diseases, which threaten Washingtonians through a wide range of pathways and mechanisms. As discussed below, much of the defense relies on a strong public health infrastructure—surveillance, epidemiology, public education, and safeguards such as good food sanitation and limits on shellfish capture at dangerous times.

1.7 Allergies

Warming temperatures and rising CO₂ levels have impacts on plants, including those that produce pollen and other allergens. In response to climate change, many weeds and trees produce more pollen, prolong their pollen season, and become more allergenic.⁴⁸⁻⁵⁰ These trends may worsen allergy symptoms for people with allergies. In addition, climate change

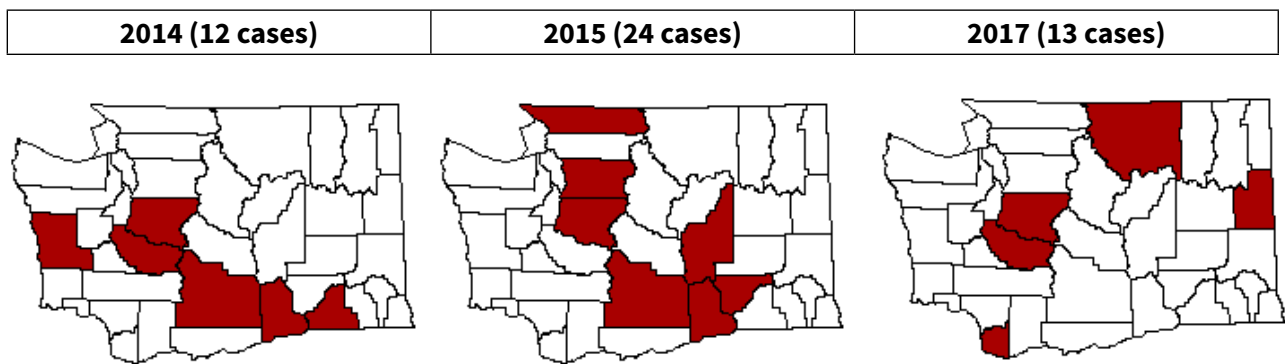


Figure 10: Distribution of West Nile Virus cases in Washington, by county, in three recent years
 Source: Washington State Department of Health ³⁶

is changing the state’s ecology. Over recent decades, sections of central and eastern Washington have been shifting from USDA Plant Hardiness Zones 5 and 6 to 6 and 7 respectively.⁴⁹ This change in climate, together with changes in water availability, bark beetle and other pest activity, and CO₂ levels, will likely alter the species composition of the state’s trees and plants (**Figure 11**).²³ However, long-term data on pollen composition are not available, and it is difficult to predict how these changes will affect the risk of allergy.

Another concern for allergy sufferers is bee and other insect stings. While some species, such as bumblebees and honeybees, are declining in much of the world for a variety of reasons, others may expand their range as the climate warms.⁵⁰⁻⁵³ For example, Alaska’s first deaths from insect-induced anaphylaxis (yellow-jacket stings) occurred in 2006; allergists subsequently documented a statewide trend in allergic reactions to stings and attributed it to milder winters with increased survival of over-wintering queens.⁵⁴ Washington may encounter such changes as well.

As allergies become increasingly common in the U.S. population,⁵⁵ the potential for climate change to aggravate allergies remains a serious concern.

1.8 Mental health

Climate change may affect mental health in a variety of ways,⁵⁶ all directly relevant to Washington state. First, disasters leave their victims with long-lasting mental health burdens.⁵⁷ This has been well documented for the kinds of disasters to which Washington is increasingly subject, including floods,⁵⁸ droughts,⁵⁹ severe storms,⁶⁰ and heat waves.⁶¹ People affected by a disaster are more likely to suffer from sleep disturbances, anxiety, depression, and post-traumatic stress; substance abuse, domestic violence, and self-

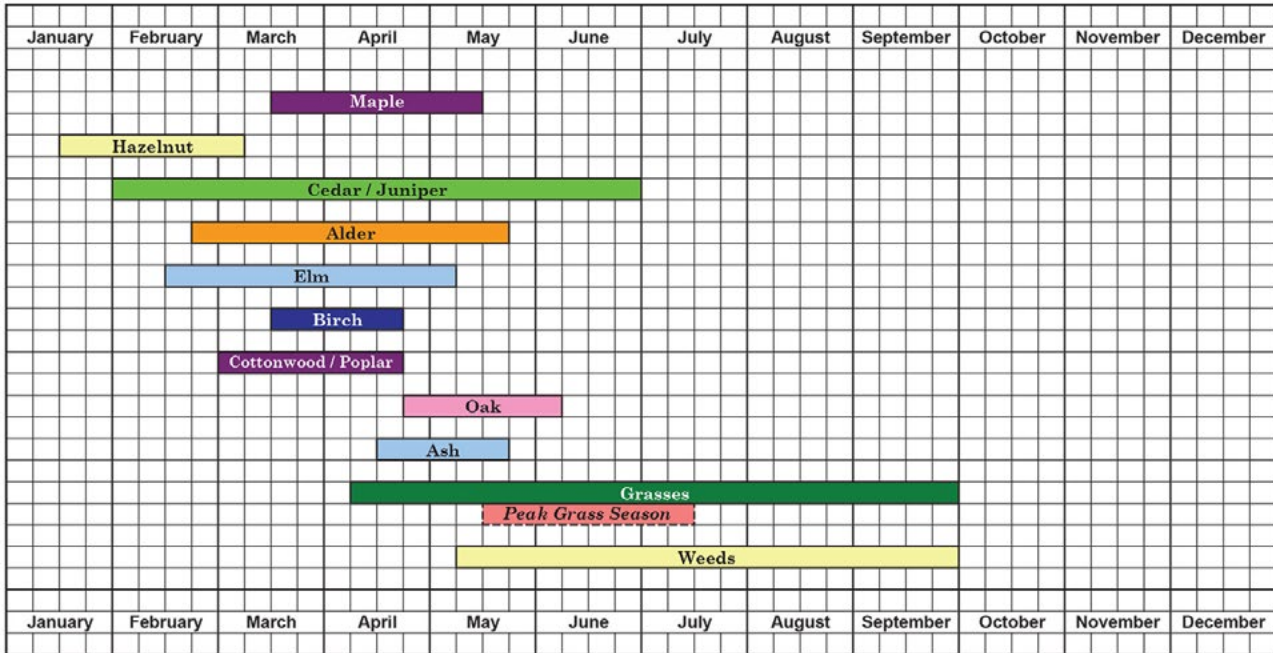
harm all rise.⁵⁷ Although some people recover with time, many suffer for years after a disaster. Post-disaster mental health problems are especially likely among people directly impacted by a disaster (such as getting flooded out of their homes), people with weak social ties, people who were displaced, people who lost loved ones and/or property, and people who are financially insecure.

Second, climate change may threaten mental health through the loss of familiar and beloved places, culturally significant features, or longstanding sources of employment. Several terms have been introduced to explain this sense of loss: “global mourning,” “ecological grief”⁶², and “solastalgia,” which is defined as “the pain experienced when there is recognition that the place where one resides and that one loves is under immediate assault.”⁶³ This response may be especially likely when it touches people’s “sense of place”—their place-attachment and place-based identity.⁶⁴ Many Washingtonians feel a deep connection to the state’s natural beauty, and for the Tribes, place attachment has deep historical and cultural roots.

Third, an increasingly recognized phenomenon, especially among young people, is “climate anxiety” or “eco-anxiety”—anxiety about the future of the planet in the face of grim trends and inadequate responses.^{65,66} This anxiety has become more evident in recent years, in young people’s demonstrations on climate change in social media postings,⁶⁷ and has been widely noted in popular press stories.⁶⁸⁻⁷¹

Finally, as climate change increasingly stresses the health care system, primary health care providers and mental health professionals may find it increasingly difficult to deliver mental health care. In all these ways, climate change threatens the mental health of Washingtonians.

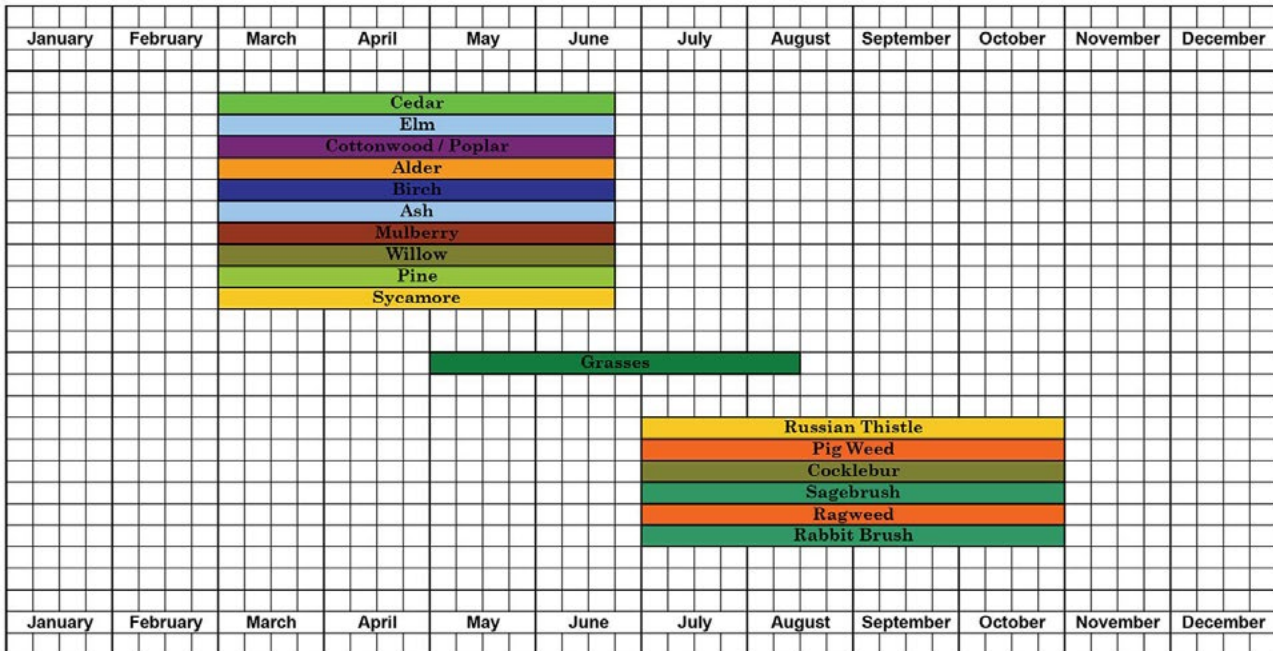
Seattle Area Pollen Seasons



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Northwest Asthma & Allergy Center

Eastern Washington Area Pollen Seasons



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Northwest Asthma & Allergy Center

Figure 11: Principal sources of tree pollen, by month, in the Seattle area and eastern Washington. Source: Northwest Allergy & Asthma.



1.9 Loss of livelihood

Economic impacts are often considered as distinct from health impacts. But economic insecurity, and loss of livelihood, are serious threats to physical and mental health,⁷²⁻⁷⁵ as the COVID-19 pandemic has made clear. People who lose their jobs, or suffer job insecurity, may lose access to health care, suffer food insecurity, anxiety, stress, and other health problems. Therefore, the economic disruption that comes with climate change must be considered a health threat as well.

A full analysis of the potential economic impacts of climate change on Washington's economy is beyond the scope of this report. However, examples are plentiful. The economy of the Long Beach peninsula depends heavily on shellfish, tourism, and service industries. When a harmful algal bloom occurred in 2017, both shellfishing and tourism plummeted, and the local food bank saw an almost 25% increase in the number of families needing assistance.⁷⁶ During the low-snow winter of 2014-2015, the Stevens Pass Mountain Resort opened for only 87 days, down from an average of 150, with commensurate losses in employment,⁷⁷ and water shortages the following spring and summer cost the state's farmers an

estimated \$633 million and \$773 million in crop losses.⁷⁸

Sectors of the Washington economy facing economic damage from climate change include tourism, fisheries, timber, outdoor recreation, and agriculture, and the many other economic activities that support these. Climate change thus poses extensive indirect threats to the health and well-being of Washingtonians.





1.10 Displacement

Climate change has begun to make some places uninhabitable, a trend that is predicted to accelerate as the impacts of extreme heat, rising sea levels, drought, and severe storms intensify. This will displace some people—a wrenching experience at best, and a disaster when unplanned and under-resourced, and when displaced people are unwelcome in receiving areas.^{79,80}

In Washington, the major driver of relocation will be rising sea levels. Already, the Quinault Nation has initiated a move from its traditional coastal land in Taholah, Grays Harbor County, to higher ground.⁸¹ Similarly, the Quileute Tribe, through its *Move to Higher Ground* (<https://mthg.org>), is raising funds to relocate inland from its low-lying coastal site in La Push, Clallam County.

The health impacts of displacement include grief and depression; stress and anxiety; interruption of medical care; disruption of community; and loss of livelihoods.^{82,83} As traditional lands have a special place in tribal culture, the trauma of displacement may be especially acute for the tribes.⁸⁴ But tens of thousands of Washingtonians living in coastal areas are at risk of displacement—a number that will rise as the 21st century progresses.²⁷





Section 2

Adaptation and resilience

Many effects of climate change, from rising sea levels to changing weather, are now unavoidable. Mitigating climate change by reducing emissions will reduce the ultimate magnitude of these effects. But adapting to changes occurring now, and projected to worsen, is also necessary. We can significantly reduce the current and projected health impacts of climate change through proactive and effective strengthening of public health and health care. This requires providing sufficient human and financial resources for managing climate change in health departments and civil organizations. These investments need to prioritize reducing current inequities that increase vulnerability to climate change. Failure to do so would elevate risks to the health and well-being of a great many Washingtonians.



Some adaptive measures are specific to particular hazards, such as heat waves or floods; these are discussed below. Other adaptive measures take an “all hazards” approach applicable across a range of disasters, from earthquakes to pandemics. Examples include strengthening community links, since the initial response to most disasters occurs at the neighborhood level; educating the public about disaster preparedness such as maintaining disaster kits at home and having communications plans in place; strengthening public health and emergency preparedness agencies; and creating redundant communications and transportation assets. This approach is highly efficient.

Adaptation to heat: Nearly all heat-related deaths are preventable. It is well understood how our bodies respond to high temperatures, the groups that are particularly vulnerable, and actions to protect these individuals. It has also been known for more than a decade that heatwaves are increasing in frequency, intensity, and duration. Yet, Washington state was not adequately prepared for the heat dome that occurred at the end of June 2021. The approximately 100 excess deaths need not have occurred. Lives can be saved by

heat action plans, including heatwave early warning and response systems and longer-term planning for a warmer future. Early warning systems communicate not only the risks of higher temperatures, but also the many effective interventions that people can use to protect themselves during heatwaves, such as going to a cooling shelter, using an electric fan, putting ice towels around the neck, and drinking cold water. Early warning systems facilitate interventions across multiple agencies and organizations to protect particularly vulnerable individuals, such as older adults, individuals with chronic medical conditions, children, outdoor workers, and individuals living in redlined and other marginalized communities. Longer-term planning includes building level and urban level strategies such as increasing natural ventilation, improved construction materials, and increasing greenspace. Preparedness also includes planning for power outages that can accompany heat waves.

Adaptation to disasters: The growing threat of wildfires, floods, and landslides means an all-hazards approach is more effective than individual systems. The initial response to a disaster is generally hyper-local, with neighbors helping neighbors; stronger



rbifmr / Shutterstock.com



Margarita Young / Shutterstock.com

community bonds facilitate this response. When neighbors know and look out for each other, not only is their disaster response enhanced^{85,86} but health and well-being improve.⁸⁷ Coordinated, multipurpose early warning systems are also needed. For example, the simultaneous occurrence of heatwaves and wildfires creates significant health risks for people who are more exposed and/or more vulnerable. Prevention strategies need to address conflicting messages, such as closing windows and doors to reduce exposure to wildfire smoke and opening windows and doors in the evening to reduce indoor temperatures.

Adaptation to increased infectious disease risk:

The threat of vector-borne diseases changing their geographic range and seasonality of transmission requires strengthening vector monitoring and surveillance for diseases of concern, such as West Nile virus and, eventually, dengue fever. Early warning systems based on environmental information can predict when conditions are conducive for a disease outbreak, providing time for health departments and civil organizations to implement control programs, including public education.

Adapting health care facilities: Health care facilities need to anticipate and prepare for a range of disasters. This includes drilling and exercising, building relationships with disaster management agencies and other partners, and provisions for maintaining function despite electrical outages. In some parts of the state, hospitals and other health facilities may need to be modified to build resilience, particularly those located in regions susceptible to flooding, storm surge, or sea level rise.



**CLIMATE
JUSTICE**

Section 3

Environmental Justice in Washington State

Deric Gruen, *Front and Centered*

People living in Washington state experience environmental risks and their related health effects in measurably different ways, depending on the neighborhoods in which they live. People in communities that have lower incomes, less access to education and health care and poorer overall health also shoulder a disproportionate share of the burden of environmental pollution. This is because their neighborhoods are more often located near pollution sources such as vehicle traffic or hazardous waste facilities as a result of historic and continued institutional racism through policies such as redlining—denying to people of color access to live or own homes in certain neighborhoods. In short, where you live, your income, your race or your language ability may put you at greater risk for exposure to the harmful health effects of environmental pollution (**Figure 12**). High risk areas are described as frontline or overburdened communities. This is illustrated in the *Washington Environmental Health Disparities Map* (<https://frontandcentered.org/ej-map/>) housed at the Washington State Department of Health Tracking Network ⁸⁶ produced through the leadership of frontline communities, environmental health experts, and state agencies that uses the formula below to identify census tracts at greatest health risk.

Threat x Vulnerability = Risk

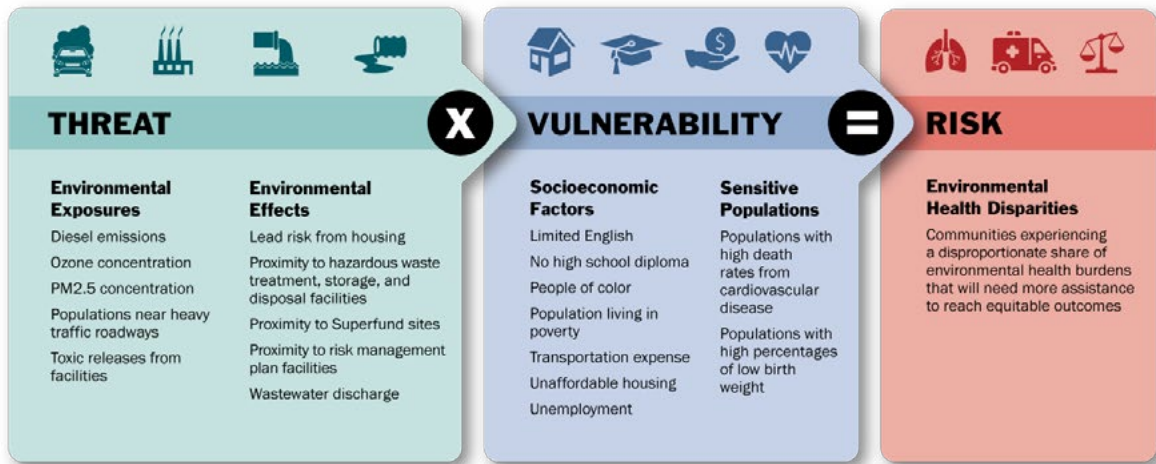


Figure 12: Identifying communities at greatest risk. Source: Washington Department of Health.

Environmental justice is about remedying disparities both in environmental health outcomes and in decision-making processes from which people of color and indigenous people have been historically excluded. This includes acknowledging that frontline communities are best positioned to identify threats and solutions using tools like citizen science and policy and processes to advance self-determination. The Washington State Healthy Environment For All Act, which passed in 2021, defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, rules, and policies. Environmental justice includes addressing disproportionate environmental and health impacts in all laws, rules, and policies with environmental impacts by prioritizing vulnerable populations and overburdened communities, the equitable distribution of resources and benefits, and eliminating harm.”

Climate Justice in Washington State

Activities that create greenhouse gases, such as burning fossil fuels, and climate impacts, are more specific features of environmental justice. While everyone in Washington will be affected by climate change, race, income, and language influence how much risk Washington state residents and workers face from wildfires, floods, extreme heat, and other climate-related hazards. Communities of color, indigenous people, and people with lower incomes, are all at greater risk

because of greater exposure to hazards at home and at work, and face greater barriers and often less power to respond. The impact of climate change on frontline communities does not occur in isolation, but combines with other environmental injustices, health disparities, disparities associated with social determinants of health, and life stage risk factors. Those are key findings of a collaborative report by Front and Centered, a statewide coalition of frontline communities of color, and the University of Washington, with the support of the Seattle Foundation in the Unfair Share report.⁸⁹

The concept of climate justice grew out of an understanding that the nations likely to be first and worst impacted by climate impacts were those that contributed the least cumulative emissions, an injustice that demanded support for mitigation and adaptation as well as compensation by wealthy nations. The same is true within countries, as in Washington State where income and often race are the greatest factors in both contribution to emissions and ability to adapt. However, justice is just starting to be understood as a fundamental element of climate action.

Equity and Energy

Fossil fuel power plants in Washington tended to be built in what were primarily rural areas that have recently become more populated. People living in close proximity to these power plants tend to be individuals who have lower incomes, often living in poor quality housing and may also be disproportionately people of color.

The Environmental Health Disparities Map provided by the Washington State Department of Health, reveals how factors such as unemployment, limited English, and transportation expenses lead to environmental health disparities. Energy assistance programs for communities with lower incomes through weatherization and bill assistance can reduce energy burden—but do not tackle the health effects from proximity to fossil fuel power plants. More holistic changes need to be made to provide the benefits of clean and renewable energy resources directly to communities suffering from health disparities.

Just Transition

Strategies to advance climate and environmental justice have historically had strong roots in research, litigation, community organizing, and public policy. The movement has expanded from place-based struggles to changing the rules at the state and federal level. Small gains have been made. President Biden issued a 2021 executive order that climate investments be prioritized in EJ communities, drawing from a 2018 ballot measure in Washington, and laws in New York and California. At the state level, Washington passed the 2019 State Clean Energy Transformation Act, which mandates that electric utilities both phase out fossil fuels and ensure equitable distribution of energy benefits to highly impacted communities. But

gaps remain in shared understanding and commitment. The 2021 Climate Commitment Act cap and trade program has the words “environmental justice” throughout, but some environmental justice advocates opposed the core mechanism of permitting polluters to buy/sell/ trade emissions credits rather than require emissions reductions.

Having seen false promises that prioritize polluter flexibility over direct reductions come and go, and while environmental racism persists, frontline communities have begun to rally around the idea of a “Just Transition” (Figure 13). A term often referencing justice for workers in industries transitioning off fossil fuels, frontline communities have extended the idea to EJ communities as well as workers. The Just Transition Framework has drawn attention to the larger social and economic transition required to reach zero emissions and adapt to climate impacts. The core challenge is that the transition extends beyond technology to resource use, work, worldview, and governance. It puts emphasis on direct measures to stop fossil fuel extraction and emissions at the source, and create regenerative economic and living systems by building power in frontline communities, divesting from extractive and exploitative enterprises, and reinvesting in models that put life and public health over accumulation of private profits.

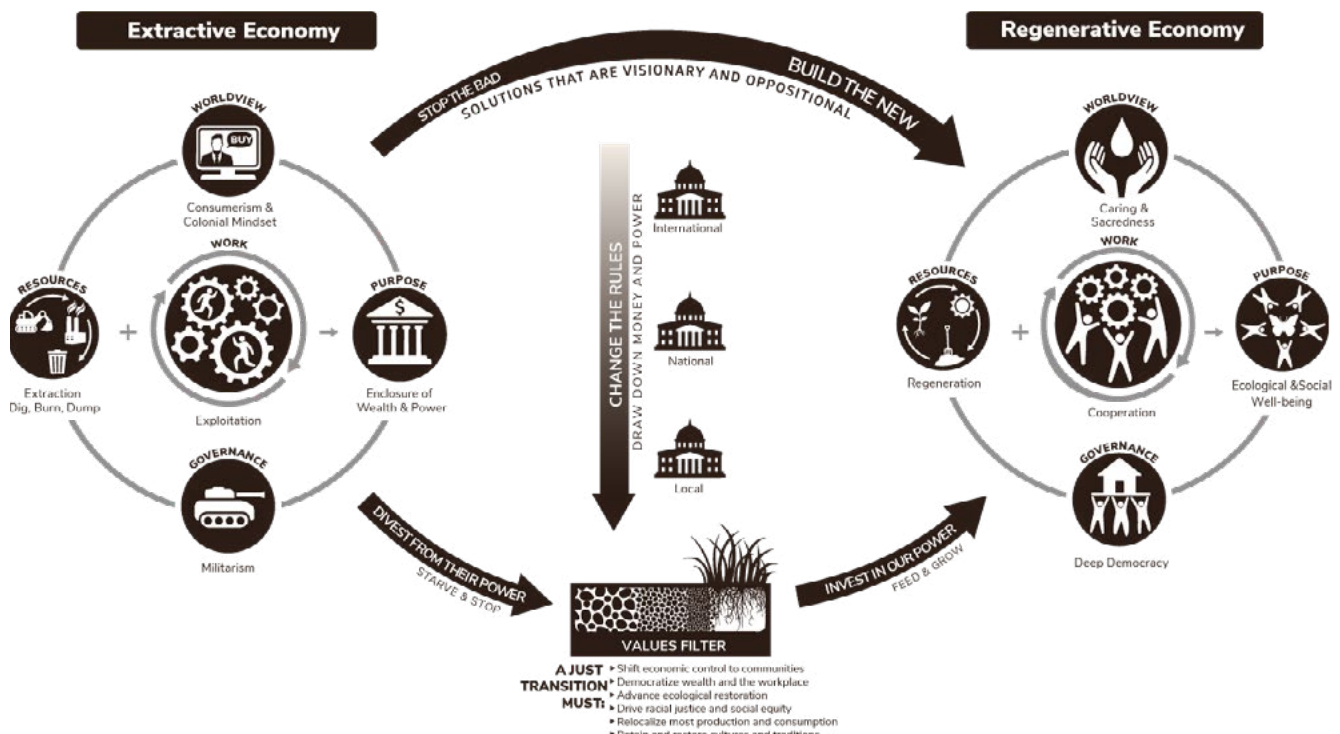


Figure 13: The Just Transition framework. Source: Climate Justice Alliance.



Section 4:

Climate Action is Health Action

Section 2 discussed the need to adapt to unavoidable climate change, to protect the health and safety of Washingtonians. It is also essential to avoid as much climate change as possible, by reducing greenhouse gas emissions and drawing down atmospheric greenhouse gases. Fortunately, many strategies to mitigate climate change are well known, and are technically and economically feasible. And there is more good news: Many of these actions not only fight climate change, they also benefit human health and well-being—a conclusion supported by robust evidence.⁹⁰⁻⁹⁴

Fighting climate change is not a story of deprivation and sacrifice; it is a story of opportunity and of safer, healthier, and more secure lives. In this section we review the major ways in which climate action delivers health benefits. We begin by reviewing the leading opportunities for GHG emissions reductions in Washington, then describe several pathways from these reductions to better health and well-being for Washingtonians. In Section 5 we link these pathways to specific policies that both fight climate change and promote health and well-being.

4.1 Sources of greenhouse gases in Washington state

The major sources of greenhouse gas emissions are shown in **Figure 14**. Understanding these sources helps identify the leading opportunities to improve health while reducing emissions.

Transportation is the leading source of GHG emissions in Washington. Within this sector, about two-thirds of emissions come from on-road gasoline and diesel vehicles, almost a quarter from aviation, and the balance from marine and rail sources.

Residential, commercial and industrial GHG emissions derive from burning fuels for space heating and process heating. Within this sector, 54% of emissions come from industry, 25% from residential properties, and 21% from commercial settings.

Electricity generation in Washington depends heavily on hydroelectric resources, so the contribution of this sector to our state's GHG emissions, at 16%, is lower than in most other states. This contribution to GHGs will decrease in coming years thanks to the 2019 Clean Energy Transformation Act, which requires all electricity supplied to Washington consumers to be renewable or non-emitting by 2045.

More than half of the overall electricity consumption (54%) in Washington is generated by hydropower. The second and third leading sources of electricity are gas (11.6%) and coal (10.4%), with nuclear (5%), wind (4.4%), and solar (0.29%) produced at a much smaller scale. Due to Washington's energy disclosure laws, 14% of energy generated is "unspecified," meaning that the supply comes from the wholesale power market and cannot be identified.⁹⁵

Agriculture includes activities such as raising livestock (because of enteric fermentation in ruminant animals' digestive systems), manure management, and fertilizer use, which result in methane and nitrous oxide emissions. These accounted for 7% of Washington's total in 2018. Certain **industrial** processes, such as aluminum and cement manufacturing, release GHG. These emissions accounted for 6% of Washington's total in 2018. **Waste management** GHG emissions, amounting to 2.4% of Washington's total in 2018, derive from landfills and wastewater treatment facilities. Finally, the **fossil fuel industry**, accounting for one percent of Washington GHG emissions in 2018, includes fugitive methane emissions due to leakage

Washington state GHG emissions, 2018

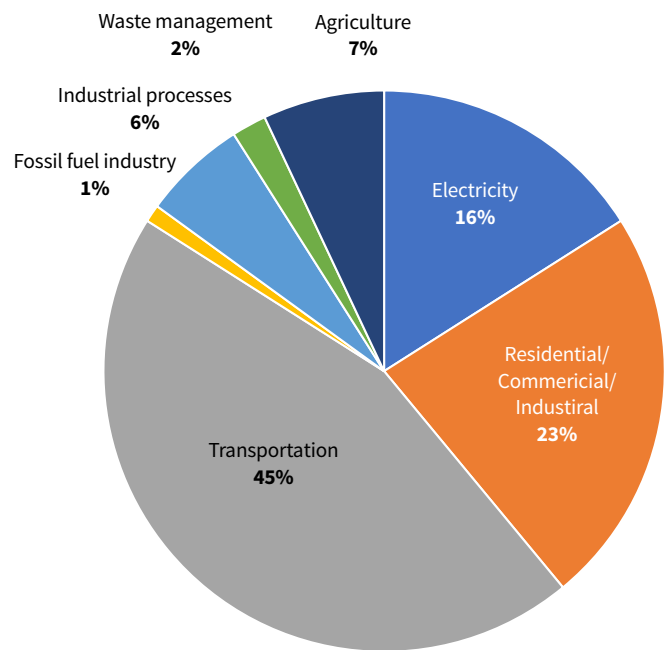


Figure 14: Washington state greenhouse gas emissions, 2018. Emissions in 2018 totaled 99.57 MMT CO₂e. Source: Washington Department of Ecology. *Washington State Greenhouse Gas Emissions Inventory: 1990-2018*.

and venting from natural gas pipelines and petroleum systems.

4.2 Health benefits of climate action in Washington state

Clean air

Reducing the combustion of fossil fuels offers immediate and substantial health benefits. The products of combustion—principally particulate matter, oxides of nitrogen, and (indirectly) ozone—are well-established contributors to illness, including respiratory disease, cardiac disease, stroke, diabetes, cancer, neurologic conditions, depression, and adverse birth outcomes, and to early death.⁹⁶ In Washington, as shown in Figure 14, there are many opportunities to reduce people's exposure to combustion products of fossil fuels. With progress underway in the electricity sector—and with Washingtonians likely already enjoying health benefits from shuttering our coal-fired

**Washington Department of Health:
Environmental Health Disparities
Map 103**

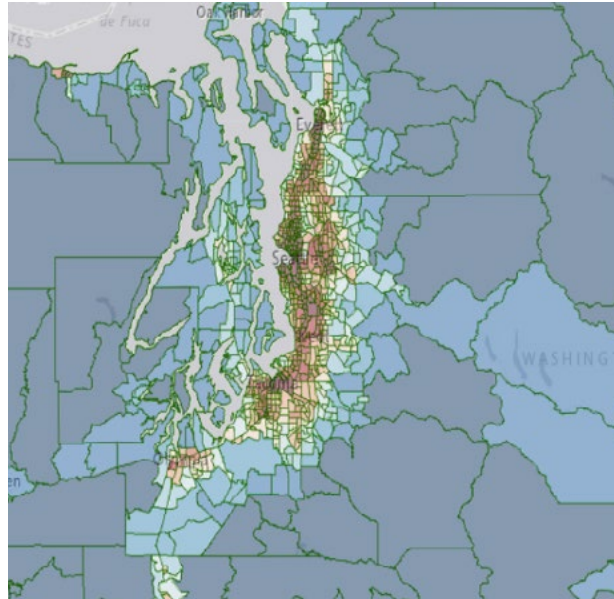


Figure 15a: Relative levels of PM 2.5 pollution in the Seattle-Tacoma I5 highway corridor¹⁰³

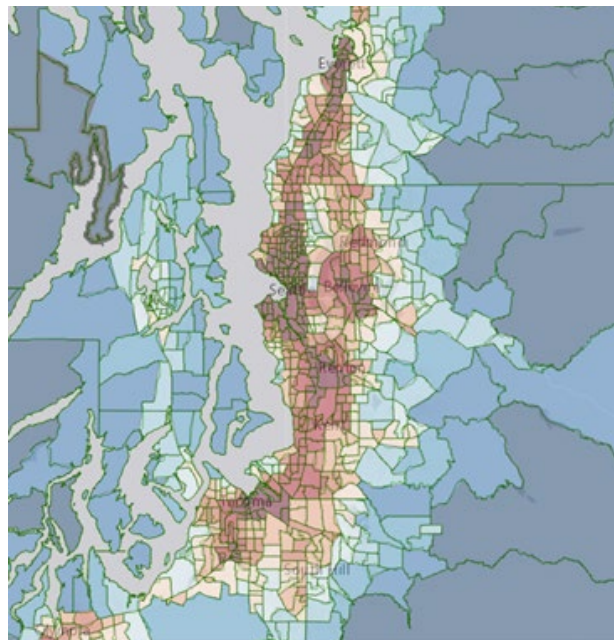


Figure 15b: Relative levels of NOx pollution in the Seattle-Tacoma I5 highway corridor.

power plants.⁹⁷ Other key areas of opportunity to reduce air pollution include transportation, buildings, and industry.

Many **transportation policies** address climate change and also benefit health. One example is reducing travel demand through community design that places destinations near where people live and work. Another is “mode shift”—shifting from motor vehicles to “active transportation” (walking and cycling) and to mass transit. Still another is reducing vehicle emissions, through greater vehicle efficiency and/or a shift to electric vehicles. These strategies reduce both GHG emissions and air pollution. Research in the North-

eastern states⁹⁸, the Midwest⁹⁹, and California^{100,101} has confirmed that low-carbon transportation policies reduce disease and premature death from air pollution. Nationwide, cleaner vehicles in recent years have prevented tens of thousands of premature deaths each year, with estimated health care cost savings of over \$250 billion/year.¹⁰² Of note, these benefits are of particular value to communities located near busy traffic corridors such as I-5, where air quality is heavily affected by vehicle exhaust (Figure 15). In Washington, as across the country, poor communities and communities of color are disproportionately likely to live in such places.

Building strategies that address climate change also improve health, by providing clean indoor air. Heating and cooking with gas increase the level of pollutants inside homes.^{104,105} Those who are most exposed in kitchens—often women and small children—sustain the highest exposures. Children living in homes with gas stoves have a 42% higher risk of suffering asthma symptoms, and a 24% higher lifetime risk of being diagnosed with asthma, compared to those who don't.¹⁰⁶ Switching from gas to electric cooking reduces pollutant levels and reduces these risks. Moreover, energy-efficient buildings that maintain good air quality—as exemplified by Seattle's *Bullitt Center* (<https://bullittcenter.org>)—improve health, comfort, and performance in school and on the job, as well as reducing energy demands and operating costs.¹⁰⁷

Improving air quality is a compelling health strategy because it particularly benefits some of the most vulnerable Washingtonians. Children, the elderly, and people with respiratory diseases such as asthma are especially vulnerable to air pollution. Poor people and people of color are disproportionately exposed to air pollution from roadways and industries.^{108,109} Conversely, when low-income housing is built according to “green” principles, residents enjoy substantial health benefits.¹¹⁰ Reducing fossil fuel combustion, and cleaning up indoor and outdoor air, both address the climate crisis and protect people at greatest risk.

Physical activity

Transportation policies that address climate change include promoting walking and cycling. In an increasingly sedentary society, building routine physical activity into our lives is a powerful strategy for health. Physical activity is more effective than our best medications; it reduces cardiovascular risk factors such as high blood pressure and overweight, it reduces the risk of heart attack and stroke, it reduces diabetes risk, it reduces the risk of some cancers, it improves mental health, and it reduces the risk of osteoporosis, to name just some of the benefits.¹¹¹

Walking and cycling deliver many of these health benefits, while also reducing the carbon footprint of travel. Commuting by foot or bicycle has been found to reduce the risk of cardiovascular disease, cancer and overall mortality.¹¹² US cities with the highest levels of active transport have 20% lower prevalence of obesity and 23% lower prevalence of diabetes than those with the lowest levels of active transport.^{113,114} These reductions in illness and mortality also generate significant cost savings.¹¹⁵ For children, walking and cycling to school offers immediate health

benefits, such as obesity and diabetes prevention, improves academic performance, and helps instill lifelong habits of physical activity.¹¹⁶

Transit use is also an effective strategy to promote physical activity. Transit commuters typically walk from home to the bus or rail stop to start their journey, then to their workplace once they disembark, often getting their recommended daily physical activity in the process.^{117,118} Children do the same if they ride transit to school, with similar benefits.¹¹⁹

Neighborhood design, and land use policies, can also promote physical activity. Mixed-use development that places retail, schools, workplaces, recreational facilities, places of worship, and medical offices near where people live make it possible to walk or cycle to these destinations. In contrast, urban sprawl—the on-going expansion of cities and towns into rural areas, converting farmland, forests and wildlife habitat into development for suburbs or exurbs—can contribute to increased carbon emissions and poor health outcomes in a number of ways.

- Farmlands and forests are critical carbon sinks.
- Conserving rural lands improves access for local food.
- Far-flung suburbs mean long commutes, which means greater carbon emissions.

Similarly, good infrastructure is key; sidewalks and bike paths allow people to move about safely and efficiently, promoting their health without contributing greenhouse gases.

Contact with nature

Another example of co-benefits is contact with nature. Nature-based solutions to climate change use green infrastructure—vegetation, soil, and/or constructed landscape features such as bioswales and retention ponds—to build resilience and achieve both mitigation and adaptation (**Figure 16**). For example, a wetland might help with stormwater management, preventing inundation of storm sewers and preventing combined sewage outflows during heavy rainfall. Similarly, tree canopy in towns and cities helps reduce the temperature during heat waves; green neighborhoods can be more than ten degrees cooler than neighborhoods with little or no vegetation. And forests, in both urban and rural areas, sequester large amounts of carbon, making them a powerful tool in fighting climate change. These ecosystem services benefit health and well-being in many ways.

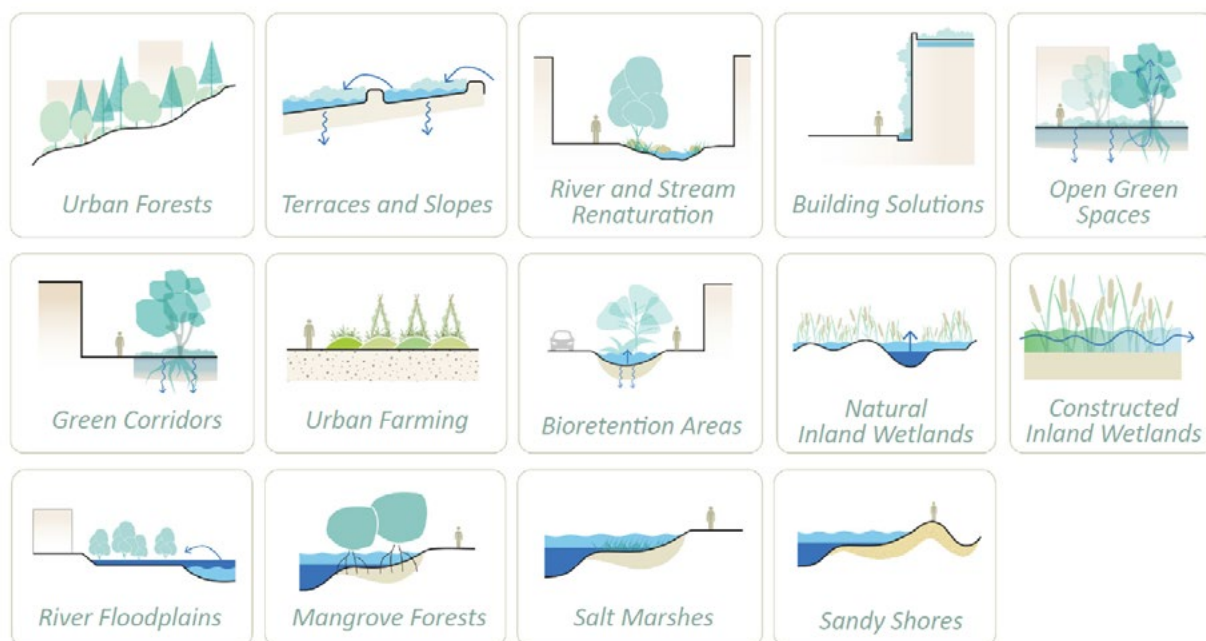


Figure 16: Nature-based solutions for climate change mitigation and adaptation. Source: World Bank. 2021. A catalogue of nature-based solutions for urban resilience. Washington DC: World Bank.

But nature contact also offers direct health benefits. People thrive when they live in green neighborhoods, or when they have access to parks and greenspace. Contact with nature improves mental health, reduces stress, promotes physical activity, and increases positive social interactions. There are additional health benefits, some of them perhaps surprising—improved birth outcomes, better sleep, stronger immune function, lower levels of aggressive behavior.¹²⁰⁻¹²³ Importantly, nature contact may have an “equigenic” effect, reducing the health disparities between privileged and less privileged populations.¹²⁴ This means that nature contact promotes not only health, but also health equity.

Nature-based solutions through green infrastructure therefore offer not only a set of climate strategies, but extensive health benefits as well.

A healthy and sustainable food system

Our food system offers many opportunities both to fight climate change and to improve health.¹²⁵ First, farming practices are often not optimized to reduce GHG emissions and to sequester carbon in soil; potential strategies include grassland protection,

appropriate use of cover crops, biochar, alley cropping, cropland nutrient management, and improved manure management.¹²⁶ Second, beef and dairy products are major components of the American diet, and major products of the agricultural sector; Washington has a substantial livestock industry, with well over a million cattle in the state.^{127,128} Cattle production contributes to climate change, and meat-heavy diets contribute to the risk of cardiovascular disease, some cancers, and metabolic syndrome.¹²⁹⁻¹³² The average GHG impact of 50 grams of protein from beef is approximately 17.7 kg CO₂, compared to approximately 2.9 kg CO₂ and approximately 0.4 kg CO₂ from beans.¹³³ Reducing beef and dairy production and consumption, and shifting diets toward more vegetables, fruits, whole grains, legumes, and nuts, would offer benefits both for sustainability and for health. Third, there is considerable waste in the food system, from the point of production to the point of consumption;^{134,135} reducing waste would reduce the carbon footprint of the food system, and by making more food available and affordable, would boost the nutrition of food-insecure Washingtonians (who comprised one in four households in the state during the COVID pandemic, up from one in six beforehand).¹³⁶



BUILDING A CLEANER

COMMUNITIES OF COLOR FOR 1631

ASIAN PACIFIC ISLANDERS FOR 1631

MOM'S CLEAN AIR

OUR KIDS HEALTH MATTERS

YES ON 1631

YES ON 1631

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Section 5

Solutions to Treat, Prevent and Protect

As we face the defining crisis of our generation we must prioritize the most effective solutions, those that can be implemented most rapidly and that have the most wide ranging impact. The single most important thing that health professionals can do about the climate crisis is to talk about it. Talk with fellow professionals. Talk with patients. Talk with elected and appointed decision makers. Make everyone aware of the health impacts of our continued use of fossil fuels resulting in the pollution of the air and warming atmosphere and oceans.

5.1 - Overview of Solutions

There is a debate between proponents of system change and proponents of individual lifestyle change. Those who favor system change argue that lifestyle change (alone) is insufficient to address the climate crisis. Moreover, according to this view, excessive focus on how individuals eat, travel, and consume could let major carbon emitters off the hook, and “nudge out” needed support for system change. Those who focus on lifestyle, on the other hand, argue that behavior change (especially among high-consuming people in wealthy countries) is indispensable to addressing the climate crisis. This is an instance of “both and,” not “either or.” Both behavioral choices and system change are necessary in combating climate change. In fact, the two sets of strategies are closely related: the right policy changes facilitate climate-friendly behavior change, and personal behavior change can propel activism on a wider scale.

We need a transportation system that is clean, accessible and equitable. This will clearly require a reduction in vehicle miles driven with an emphasis on electrified public transportation and active transportation in our urban and suburban communities. Vehicle electrification and accessible charging will be required. Long distance shipping of goods and transportation of people will also need to rapidly become electrified. These solutions will require public investment at a federal, state and local level.

Energy efficiency and electrification of buildings presents an important opportunity for rapid, cost effective reductions in fossil fuel consumption and CO₂ emissions while simultaneously improving indoor air quality and our health. All-electric homes, when newly constructed, save the consumer money. Retrofits, however, may require tax rebates and other incentives to be affordable for many households. Building efficiency and electrification will require changes in building codes as well as public investments in infrastructure and assistance to low income communities.

Land use decisions have a profound impact on air quality and climate change. Suburban sprawl contributes to climate change by removing forests and agricultural land that serve as carbon sinks while also increasing commute times primarily by single passenger internal combustion engine powered vehicles. Washington’s growing population must be housed in denser, more walkable communities with access to public transportation and green spaces. Our carbon sequestering forests must be protected.

As we electrify buildings and transportation we need to also ensure that the increased demand for electricity generation is met with zero carbon sources.

5.2 - Sector specific policy solutions

5.2.1 - Transportation

Policies targeting emissions from the transportation sector, the largest source of GHG emissions in Washington state, can make major progress towards improving the health of our communities and preserving our climate.

At the local level

New policies will be necessary to ensure that walking and biking for commuting, shopping and recreation are safe and accessible for all. We need to make increasing and maintaining bike lanes, crosswalks, sidewalks, and traffic calming measures a priority in city and county level transportation policy. Public transportation must be more accessible to all. Ensuring easy walkability to transit stops and increased frequency of busses and trains need to be part of county and city level infrastructure planning.

At the State Level

Electric Vehicles and Clean Fuels

The Washington State Legislature passed clean fuel standards during the 2021 session. Currently undergoing rulemaking, this legislation will require the fuels we use in our vehicles to become increasingly less carbon intensive by specific thresholds working towards zero emission vehicles by 2045. As the carbon intensity of our fuels decreases, so do the co-pollutants, particularly PM_{2.5} and volatile organic compounds. This legislation will also increase the sales of electric vehicles in the state, promoting market growth towards a cleaner fuel economy. Key action now lies with the Department of Ecology as it hammers out the details through a rulemaking process that will continue through 2022.

Further policies are needed to promote transport electrification including a statutory requirement that all vehicles sold in the state be fully electric. The WA Department of Ecology has announced their adoption of the Zero Emission Vehicle (ZEV) Program and Advanced Clean Trucks (ACT) Rule moving the state toward a more just and equitable transporta-

tion future that prioritizes cleaner air and a healthier climate. The ZEV Program directs light duty vehicle manufacturers to increasingly sell zero emission vehicles in Washington and starting in 2024, will result in zero emission vehicles making up 8 percent of all light duty vehicle sales. The ACT Rule requires truck makers to sell an increasing number of clean, zero-emission medium- and heavy-duty vehicles in Washington. Additional incentives for purchase of EVs, especially incentives that make such vehicles affordable for low-income households will be necessary.

Transportation Spending

As the Clean Fuel Standards generate revenue for the state, spending in the transportation budget will need to be updated regularly. We need to ensure that revenue earmarked for transportation policies in the budget is used in accordance with the legislative intent of the policies generating the revenue. Namely, we need to prioritize projects in our most vulnerable populations along highway corridors who experience the most exposure to transportation emissions that will build community resilience and adaptation, increase access to healthcare services, and mitigate adverse health outcomes. Transportation spending in the state budget should ideally complement city and county level efforts to improve ease of active transportation and access to public transportation.

Public transportation, especially rail and bus systems, need to be rapidly transitioned to 100% electric as rapidly as possible across our state. Electrification of trains on existing rail lines should be prioritized over plans for building new high-speed rail connecting the entire Pacific Northwest.

At the Federal Level

Transportation Investments

The federal government can have tremendous impact on the transportation sector through subsidizing public transportation projects, tax breaks for electric vehicles and increasingly strict fuel efficiency standards. State governments, including Washington's, are limited in their ability to generate revenue and prohibited from long term deficit spending. The Federal government, being much less limited by these constraints, must step up and fund what the states cannot. Larger projects such as high-speed interstate electric rail will require Federal funding.

Ending Fossil Fuel Subsidies and Pricing Carbon

Current Federal policy depresses the costs of fossil fuels to far below the societal cost of burning them. Ending fossil fuel subsidies is an important first step in correcting this. A Federal Clean Fuel Standard patterned after the WA state law would also help drive the transportation sector toward cleaner choices. In the near term a federal carbon price would mainly impact the electricity generation sector with only secondary effects on transportation.¹³⁷ However if the carbon price rises steadily over time low and zero emissions vehicles and public transportation will become more attractive to the consumer.

5.2.2 - Buildings

Thanks to Washington state's abundance of clean, low cost electricity, swapping out gas appliances for electric ones is a huge climate win, reducing the average household's carbon emissions by 50%,¹³⁸ the equivalent of completely giving up your car. According to Washington's Deep Decarbonization Pathway Study¹³⁹ the lowest cost pathway for achieving our state's commitment to 80% carbon reductions economy-wide by 2050 relies on electrifying our buildings, reducing the residential sector's use of gas by 85%. Getting to these reduction goals requires that new buildings rely on electric appliances rather than gas, and that money be appropriated to retrofit existing buildings.

At the Local Level

City and County Councils in Seattle, Olympia, Tacoma, Bellingham, Unincorporated King County, Shoreline, and Everett have passed, through resolution or ordinance, initiatives to require the use of electric space and water heaters in new large multifamily and commercial buildings instead of their gas counterparts. Action is limited, however, by the regulatory authority of these decision making bodies. At present, municipalities and county governments in Washington may not exceed the state-wide code standards for residential buildings, but do have the authority to update requirements for new commercial and multifamily construction. King County, Seattle, Shoreline, and Bellingham passed ordinances requiring electric space and water heating in new construction. All other Washington municipalities should move to decarbonization of buildings, within the limits of their legal authority.

At the State Level

Legislation promoting building electrification failed to pass during the 2021 session and only small steps forward and building efficiency and state building electrification were achieved in the 2022 session. We need to press on with several important policies. The legislature needs to require the State Building Codes Council to achieve net zero commercial and residential building energy codes and authorizes local governments to adopt a “reach code” that allows them to set stricter reduction standards than the state requirements. We need to require utilities to develop clean heat transition plans for meeting a share of the State’s greenhouse gas targets by 2024. We need to authorize public utilities to use rate payer funds to incentivize customers to switch from gas to electric sources of energy.

The **State Building Codes Council** is a governor-appointed body of stakeholders from across the state tasked with updating commercial and residential building and energy codes on a regular three-year cycle. We anticipate updates in both the commercial and residential codes in the coming years. We need a state wide requirement for all new construction to rely on electric space and water heating appliances - essentially enacting what a few local governments have been able to achieve statewide.

At the Federal Level

Building codes and mandates fall under the jurisdiction of state and local government. However the Federal government can provide tax breaks and subsidies for heating, cooling, and cooking with efficient electric appliances. These incentives can apply to both new construction and to retrofits.

5.2.3 - Land use and growth

Land use decisions, which refer to where and how we develop land, can have a significant impact in mitigating the health impacts from climate change.

At the local level

Washington’s cities and towns can implement a range of policies to address the climate crisis and simultaneously promote their residents’ health and well-being. One set of options pertains to the built environment. Local jurisdictions can permit accessory dwelling units (ADUs), duplexes, triplexes, and

Cleaning up the Health Care Sector

Health care is on the frontline of the climate crisis, dealing with the health impacts of extreme weather events and wildfires, and changes in disease prevalence. Yet at the same time, health care’s carbon footprint is significant, and a hospital cannot simultaneously contribute to climate change and meet its mission to “do no harm.”

In a 2019 report,¹⁴² *Health Care Without Harm* (<https://noharm.org>) estimated that the global health care sector was responsible for 4.4 percent of global net emissions. If the health care sector were a country, it would rank fifth in the world for greenhouse gas emissions. The United States is the world’s second largest GHG emitter, but the first in terms of health care sector GHG emissions, accounting for 27% of the global health care footprint.

In the US, the health care sector is responsible for 8.5% of national emissions. Hospitals operate 24/7 and contribute more than one-third of those emissions.

Hospitals are the second most energy intensive facilities in the country and, on average, use 2.5 times more energy per square foot than other commercial buildings.

Hospitals are ranked as the third most water-intensive public buildings (after senior care facilities and hotels), using an average of 570 gallons per staffed bed per day. Water is also a major contributor to greenhouse gas emissions because of the energy needed to distribute it, treat it and heat it.

Hospitals serve a lot of food to staff, patients and visitors. Hospitals can reduce the greenhouse gas emissions of their food services by shifting from meat to plant-based diets, sourcing food from sustainable producers, and reducing food waste.

US hospitals generate 29 pounds of waste per inpatient day, and the manufacturing process and transportation of the products purchased by U.S. hospitals also creates 32 pounds of waste for every pound of product manufactured.

Robyn Rothman, *Health Care Without Harm*

A Role to Play in Resilience and Readiness

Hospitals must be able to care for people during and after extreme weather events. Vulnerable populations will be disproportionately impacted by severe weather and depend on hospitals in their communities as a safe haven. Hospitals also have a role to play in taking care of people before disasters to address the social and environmental determinants of health that put people at risk.

Health systems must ensure their facilities and operations are prepared for climate impacts. With climate change, extreme weather events are becoming more frequent and more intense. Our design thresholds for temperatures, wind velocities, and flooding are being exceeded and the weather is lasting longer so health care facilities must be able to function longer without resupply.

Health systems need to partner with local and regional governments and other community stakeholders to ensure community infrastructure and systems are ready. Health systems have to leverage their political and economic influence to address the social and environmental determinants of health. Climate change is a force multiplier for all of the social and environmental factors that contribute to disease and health inequities.

At the State Level

Health care, despite lagging behind other sectors in addressing its climate impact, is in a unique position to lead. As the only industry with a healing mission, health care can leverage its purchasing power (18% of the U.S. GDP) to support a transition to a clean energy, circular economy, while nurses and doctors use their trusted voices to help policymakers and the public understand that the climate crisis is a health crisis.

Health systems, including those in Washington state, have been stepping up to address the climate crisis, with an understanding of the intersection of climate, health, and equity. Almost 50 health care facilities in Washington are members of Practice

Greenhealth, a sustainability membership association for health care that provides environmental solutions to hospitals and health systems across the United States.

In December 2019, in collaboration with Health Care Without Harm, seven Washington health systems launched the Washington Health Care Climate Alliance (WA Alliance), a coalition committed to protecting the public from the health impacts of climate change, becoming anchors for resilient communities, and contributing to meeting the state's climate goals. Together, the WA Alliance represents 40 hospitals and more than 100 health care facilities in Washington with over 100,000 employees and \$21 billion annual operating revenue.¹⁴³

All WA Alliance members have committed to setting a GHG reduction goal for their own operations through the Health Care Climate Challenge, an initiative that has mobilized 300 participants, representing the interests of more than 22,000 hospitals and health centers in 37 countries to protect public health from climate change by implementing a three-pillar strategy to reduce their carbon footprint, prepare for the impacts of extreme weather and the shifting burden of disease, and educate staff, policymakers, and the public about climate and health.

WA Alliance members include some of the most ambitious health care climate leaders in the country. On Earth Day 2020, in the midst of the early COVID-19 pandemic, Providence Health System announced a goal to be carbon negative by 2030. Virginia Mason and Seattle Children's Hospitals announced carbon neutrality goals later that year. In June, Providence and CommonSpirit Health (now owner of Virginia Mason Franciscan Health) joined ten other health systems in the Impact Purchasing Commitment to build healthy, equitable, and climate-resilient local economies. The commitment directs health care purchasing toward low-carbon, non-toxic products and services that grow economic opportunities for people of color- and women-owned businesses by at least \$1 billion over five years. ■

rowhouses. This increase in the housing supply, and the densification of neighborhoods, addresses the need for (often affordable) housing, and facilitates walking, cycling, and transit use. Other aspects of “smart growth” include good connectivity of street networks, good walking and cycling infrastructure, vibrant activity centers, and mixed-use zoning so people can get to work, school, shopping, and other destinations without driving.

At the State Level

Thirty years ago, activists across Washington organized to pass a pioneering state law, the Growth Management Act (GMA), to respond to the threats of sprawl. Passed in 1990, the GMA requires cities and counties in Washington to develop comprehensive plans to manage their population growth. These plans identify and protect wildlife habitats, resource lands like farms and forests, and waterways, and identify and outline how urban growth areas (UGAs), where people live, can be developed.

Plans for UGAs contain many elements—capital facilities like schools, libraries, and fire stations, utilities like electric and water, parks and recreation—but the nexus between planning for housing and transportation is one of the most critical for fighting climate change and promoting healthy communities.

Updates to the GMA are required to specifically address climate change through land use measures. Such measures include requiring Washington’s eight largest counties to reduce greenhouse gas emissions from vehicle miles traveled, by adopting land use policies that promote transit, bike, and pedestrian oriented communities; and ensure all Washington cities and counties are planning for climate hazards such as sea level rise, wildfires, drought and flooding.

While an update to the GMA did not pass in 2021, the legislature did pass a budget proviso funding the state Department of Commerce to lay the groundwork to add a climate element to the GMA. Another attempt to update the GMA to include climate considerations was made in 2022 and once again failed to pass. Given the scope and duration of the impact of land use decisions on emissions passing this on the next attempt is a top priority.

5.2.4 - Electric power generation

It is essential to fully decarbonize the electricity supply in Washington since decarbonization of all

other sectors will require abundant and affordable zero carbon power.

At the State Level

Washington has a number of policies aimed at transitioning our power generation to cleaner and new renewable resources. In 2006, voters passed a ballot measure, the Energy Independence Act (I-937), it was the first policy requiring large electric utilities to use new renewable resources and expand energy conservation programs. In 2019, the state adopted the Clean Energy Transformation Act (CETA) which requires all electric utilities to reach 80% clean (+ carbon neutral) by 2030 and 100% carbon free power supply by 2045. Utilities must publish, every four years, a clean energy implementation plan with specific targets for new renewable energy and energy efficiency and demonstrate how the utility will reach the goals. These four plans must also include community benefit indicators and specific strategies for reducing energy burden and delivering clean energy benefits to communities facing health disparities.

Community benefits are expected to include expanded energy efficiency programs, more comprehensive weatherization and appliance replacement, rooftop and community solar and wind projects, battery storage, and community energy projects like microgrids that improve resilience. Clean electricity policies are important foundations for the energy system as energy used by transportation and buildings is gradually switched to electricity.

As power generation becomes cleaner and more transportation and buildings are electrified, it will be vital for Washington to ensure that customer resources (e.g. energy efficiency, rooftop and community solar and wind projects, battery storage, and microgrids) are robustly developed on par with larger renewable energy projects.

Wind, solar and hydropower are variable energy resources that depend on the ability of the power grid to store their power when it is not needed and to dispatch the power when demand is high. State based incentives that encourage investment by utilities, residential and commercial customers, and local governments will be important for effectively securing the environmental and health benefits of clean and renewable power supply.

New electricity loads from transportation and buildings will increase the need for new power supplies. A vital tool for minimizing this new load is to ensure that the buildings and vehicles are as efficient

as possible and that their demand is effectively managed so that it does not stress the power grid. State specific requirements will be needed to ensure that buildings, vehicles, chargers, and appliances are all capable of having their usage managed. In addition, utilities will need to establish and implement programs that utilize the managed load to most efficiently operate and manage the power grid.

At the Federal Level

Washington is one of the states in the vanguard of the clean energy transition. However, if only a few states reach 100% carbon free power by 2045 and other states lag behind, Washingtonians will still suffer the impacts of climate change that we outline in this report. Furthermore, cleaning up other sectors is in large part dependent on the increased use of clean electricity. We hope that other states and the Federal government will follow our lead in promoting health and well-being via reduction in fossil fuel use.

Infrastructure Investments: While state level statutes and regulations can promote the rapid decarbonization of power generation funding for the necessary grid upgrades and distributed generation will depend in large part on federal support. Just as with other sectors this can take the form of direct investments in infrastructure and/or takes breaks and subsidies to power companies, businesses and homeowners. The bipartisan infrastructure package that passed in 2021 contains some significant steps in the right direction.

National Clean Electricity Standard: Washington's Clean Energy Transformation Act serves as a useful template for other states and the Federal government to follow. It would be perfectly feasible to enact similar legislation state by state but it would be preferred for the Federal government to make it standard. We recognize that there are a significant number of Americans whose livelihood depends on fossil fuel generated electricity. We, therefore, call for a just transition in which federal assistance and investments are made in impacted communities and households.

Carbon Pricing: While a price on carbon might seem to apply to all sectors, at the pricing levels currently under consideration and that seem politically feasible, the dominant emissions reductions will be from electricity generation.^{137,140} The Washington Legislature passed the Climate Commitment Act in 2021

which puts a cap on emissions, auctions emissions allowances, and proposes to invest a portion of the proceeds in climate resiliency programs. This law has been controversial among climate and environmental justice activist groups. Primary concerns include redundancy with regulatory policies especially the CETA which will result in underpricing of allowances at auction and continued pollution in vulnerable communities.¹⁴⁰ State tax rebates in Washington are limited in scope by the state constitution depriving us of at least one mechanism by which to limit the economic disparities that can be associated with carbon pricing.

A Federal carbon price could be less complex and offer significant opportunities to invest in impacted communities and compensate low income households for the increased energy costs and reduce overall economic inequity.¹⁴¹ Furthermore the Internal Revenue Service is capable of handling tax rebates, dividends, or credits. The first step toward correctly pricing carbon would be to remove the massive subsidies that fossil fuel companies currently enjoy. The second step would be to charge a Federal fee or tax on emissions that actually reflects the societal costs of emissions and provides a strong incentive to reduce them.

5.2.5 – Food and Agriculture

While changes in methods of food production and soil management, often termed regenerative agriculture, offer much promise for reduction of green house gas emissions and for sequestration of carbon, this important area is beyond the scope of this report and beyond the expertise of the authors. Since foods that have the lowest associated emissions are for the most part also the healthiest for human consumption, we focus on what to eat rather than on how to grow it.

At the Local Level

Many of the communities that are most highly impacted by air pollution and climate change are also food deserts with limited access to nutritious foods. This deficit can be partially corrected by changes in local zoning laws that encourage access to grocery stores. Other local policies, such as economic incentives and other support for grocery stores in low-income neighborhoods, can help. Finally, local governments can work to educate their residents about the benefits of plant forward low carbon diets.

Organized Medicine and Climate Advocacy

Organized Medicine Getting Actively Involved

During a Washington State Medical Association board meeting in 2019, members were considering the organization's strategic plan and goals for the years ahead. Thoughtful discussion led to one of our leaders posing the question: As the state's largest physician association, representing more than 11,000 physicians, physician assistants, resident physicians, and medical students across the state, do we have a role to play in addressing climate change? The answer, as set forth in policy initiated by WSMA leadership and adopted by the WSMA House of Delegates later that year, was a resounding "yes."

The organization's physician members witness firsthand the link between the health of our air, water, and environment and the health of our patients and communities. While it's now clear that Washingtonians are already and increasingly experiencing the health impacts of climate change, it's also clear that without urgent and effective action, those impacts will continue to worsen.

With responsibility for the health and wellbeing of patients and communities, physicians' concern about the impact of climate change fuels a desire to speak up, get involved, and help identify issues (diagnosis) and enact solutions (prevention and treatment). The policy adopted by WSMA delegates in 2019 articulates those concerns and provides a springboard for action for the medical association and Washington's physician community, stating:

- 1 Climate change is a critical public health issue.
- 2 Potential effects of climate change on human health include higher rates of respiratory and heat-related illness, increased prevalence of vector-borne and waterborne diseases, food and water insecurity, and malnutrition. Persons who are elderly, sick, or poor are especially vulnerable to these potential consequences.
- 3 We support educating the medical community on the potential adverse public health effects of global climate change and incorporating the

health implications of climate change into the spectrum of medical education, including topics such as population displacement, heat waves and drought, flooding, infectious and vector-borne diseases, and potable water supplies.

- 4 We recognize the importance of physician involvement in policymaking at the state, national, and global level and support efforts to search for novel, comprehensive, and economically sensitive approaches to mitigating climate change to protect the health of the public; and we recognize that whatever the etiology of global climate change, policymakers should work to reduce human contributions to such changes.
- 5 We encourage physicians to adopt programs for environmental sustainability in their practices, share these concepts with their patients and their communities, and to serve as role models for promoting environmental sustainability.
- 6 We encourage physicians to work with local and state health departments to strengthen the public health infrastructure to ensure that the global health effects of climate change can be anticipated and responded to more efficiently.
- 7 We support epidemiological, translational, clinical, and basic science research necessary for evidence-based global climate change policy decisions related to health care and treatment.

The WSMA in the past few years also approved additional policy in support of a low-carbon fuel standard (2019), recognizing the importance of clean energy (2018) and at its recent September 2021 meeting the House of Delegates passed separate resolutions 1) "Promoting Building Electrification to Improve Human Health" and recognizing that gas (methane) for cooking represents a health hazard and that gas for water and home heating represent long-term public health risks due to climate impacts and in support of access to active transportation.¹⁴⁴

The Washington Academy of Family Physicians has also taken a lead in speaking out and passing resolutions recognizing the health impacts of climate change and advocating for appropriate responses. Many national bodies of other health specialty organizations have also been advocating for climate action and we would encourage our fellow health professionals here to push their respective Washington state bodies to do so as well.¹⁴⁵ ■

At the State Level

Land use decisions should consider the impacts on agriculture and promote both regenerative agriculture and the production of low carbon intensity foods. Our state government could also work on public education regarding the benefits of plant forward diets.

At the Federal Level

The agricultural sector receives significant Federal subsidies. These subsidies should be redirected to promote production of healthier foods that are associated with lower emissions.

5.3 Moving to Action: What Each of Us Can Do.

While tackling the climate crisis may seem daunting, there is still time to take meaningful action. Each reduction in emissions, no matter how small, reduces harm and saves lives. The more of us who get involved and act, and the sooner we do it, the better chance we'll have to minimize impacts and best protect everyone's health and well-being.

As discussed above, both behavioral changes and system changes are needed in the fight against climate change. The needed system-level changes can only be taken at the state, national and international level—which is why the previous section detailed some of the key policies and actions we're urging our Washington legislators and government officials to expeditiously pass and put in place.

For each group of people below, we've included the recommendation to contact elected and other leaders—and to vote!

The actions listed below start with those that everyone should be taking:

5.3.1 All of Us

Change only happens when individuals make their voices heard and take action. Here's a list of the most important and effective (and in many cases, easiest) things we can each do. Links to information that can help you get started are included.

- 1 Speak up! To friends, family, neighbors, co-workers and elected officials. Make your voice heard by those in power.** Talk about climate change with the people in your life. Spread the word that climate action promotes human health. Make sure your representatives are making good decisions. By voicing your concerns—via social media or, better yet, directly to your elected officials—you send a message that you care about the warming world. Encourage Congress (contact at 202-224-3131) and the *Washington state legislature* (<https://leg.wa.gov/lic/pages/hotline.aspx>) to enact new laws that limit carbon emissions and require polluters to pay for the emissions they produce. Elected officials often won't do anything difficult unless they know that their constituents care.
- 2 Vote.** Support and vote for candidates who are ready to help lead us into a cleaner, greener, more sustainable and more just and equitable future.
- 3 Use energy wisely:** Conserve and Weatherize.
- 4 Drive less, walk, bike, bus, or carpool to work/school.** Get a fuel-efficient vehicle for when you must drive.
- 5 Actually eat the food you buy—and make more of it plant forward and less of it meat and dairy.** (Reason and details under “Health Benefits of Acting Now.”)
- 6 Write letters to the editor.** These are most likely to be published when written in response to a piece that's already been published by a given media outlet. Good guidelines (<https://www.nrdc.org/stories/how-write-successful-letter-editor>).
- 7 Speak with your pocketbook by consuming responsibly.** Put your purchasing power to good use (after cutting out unnecessary purchases) and send the market a signal by choosing products and brands that align with your green aspirations.
- 8 Make sustainable and responsible investments.** Find out where your money goes. As an investor, you can no longer ignore climate change. Let industry know you care about climate change by meeting with your bank or investment adviser to make sure your investments do not include fossil fuels. And make sure your workplace, pension fund, university or bank doesn't invest in fossil fuels either. If they do, join or start a divestment campaign.

- 9 Join and/or support local climate advocacy groups.** Join local climate actions. It helps you get and stay in the loop while magnifying and spreading your voice. Taking action to fight the climate crisis is the best way to lower your anxiety and improve your mental health.

5.3.2 Health Professionals

- 1 First and foremost, physicians and other clinicians must provide care to patients who are experiencing climate-related health effects.** This may include conversations with patients about the relevance of climate change to their medical condition. We can also advise our patients about the health-benefits of meat and dairy reduced diets and more walking and cycling.
- 2 Become a climate change champion at work** by becoming part of efforts to reduce the carbon and environmental footprint of your hospital, health facility, and/or practice. (See the section on “Cleaning up our own medical house.”)
- 3 Use your trusted voice to bring up and discuss these issues with the public and policymakers to assure they understand that the climate crisis is a health crisis,** that urgent action is needed, and that they need to support policies that reduce greenhouse gas emissions as well as adaptation strategies that improve preparedness for anticipated climate-associated effects.¹⁴⁶
- 4 Speak about the health impacts of climate change at public hearings; and provide expert testimony.**
- 5 Educate and work with your local public health department**—be part of adaptation and preparedness efforts that address impacts of climate change that are no longer preventable.
- 6 Encourage medical education at all levels to incorporate climate change-related coursework into health curricula**—and step in to help organize and teach.
- 7 Push your specialty medical and health associations to educate, advocate, and lead.** Organized medicine needs to keep speaking up and getting even more involved. Most major medical and health associations in the United States have declared climate change a public health emergency, including the American Medical Association, American Academy of Pediatrics, and American Heart Association, and Washington state associations are doing so as well.

- 8 Be directly involved in adaptation and resilience efforts.** Examples include crafting early warning systems for heat and extreme weather events, advising hospitals and health systems on preparedness, and collaborating with research institutions to enhance surveillance and community resilience in the face of inevitable climate-related disasters.
- 9 Collect data and create reports** that keep other stakeholders aware of how well we’re doing, collectively, to prevent and respond effectively to the health harms of climate change.
- 10 Foster discussions** with the public, policymakers and with a range of local and state government agencies on climate-related health issues, **and advocate** for policies that will protect the health of people across the state—especially Washington’s most vulnerable residents.
- 11 Work in close collaboration with professionals in other areas of local and state government** (including transportation, agriculture, natural resources, zoning, etc.) because their policies and programs can have direct influences on climate change and human health.

5.3.3 Business Leaders

Beyond the moral imperative that addressing climate change is the right thing to do, climate change presents a range of very real and growing risks for businesses across industries, from disrupted supply chains and higher insurance costs to labor challenges. In addition, important business stakeholders are increasingly prioritizing climate change—and pressing companies to do the same. In response, companies can (and many have started to) take actions to reduce their own emissions and those of their suppliers and customers, become more resilient to inevitable climate impacts, and influence broader policies.

- 1 Internally,** seek a deeper understanding of the risks and opportunities of a changing climate, and take steps to reduce your carbon footprints (the emissions from producing your products) and your handprints (emissions from the sales and use of your products). Reduce consumption and waste, optimize employee’s transportation, raise awareness among your employees and promote sustainability friendly ways of working.
- 2 Externally,** engage suppliers, customers, key stakeholders and policymakers, and publicly report emissions and energy-usage data,

climate-related risks and management strategies.

- 3 Demonstrate your commitment to climate action** by partnering with other companies and stakeholders on solutions and by publicly supporting policies, regulations, and code revisions that help tackle the climate crisis.
- 4 Identify, plan, and resource for avoiding climate risk.** A critical aspect of advance planning is to protect future investments. Any significant investment in new infrastructure should include a thorough climate vulnerability assessment of the proposed location. Risks specific to construction, transportation, outdoor work and other operations should be identified and addressed.
- 5 Invest in energy efficiency and renewable energy** to save costs, contribute to risk reduction and yield reputational dividends. Investments in products and technologies can provide near-term savings and, in the long term, enable climate adaptation and mitigation. The business case can therefore be immediate while the financial upside and the benefits of environmental stability will grow due to climate risk.
- 6 Promote and support market and regulatory mechanisms** that help mitigate climate change or adequately prepare us for the consequences. By pushing politicians and public actors to act on global warming, businesses and business leaders can have a huge influence.

5.3.4 Government Leaders

While businesses can make many decisions on their own that will substantially reduce their own emissions and carbon footprint (a mere 100 corporations are responsible for 70% of heat-trapping emissions), it is only governments and government leaders who have the power to enact the large-scale and wide-ranging policies, rules, regulation, and code changes that can ease, allow, and (as necessary in some cases) force the scope and kind of changes and actions that are needed to stimulate and accelerate the transition away from our harmful reliance on fossil fuels toward systems and sources of power and energy that are more sustainable, that help lift up rather than hold back historically impacted and vulnerable populations and communities, and that are less harmful to the planet and to human health.

To accomplish that, the list of what government officials can do is very simple:

- 1 Listen to and act for the benefit of all your constituents,** which, first and foremost, means providing for the common good; promoting justice, equity, and fairness; and acting to protect the health, safety, and well-being of all Washingtonians—now and into the future.
- 2 Enact policies that reduce emissions and promote environmental justice.** We urge our government leaders to act at a local, state, and federal level and implement the policies that we highlight in this report.



Conclusion

In this report we have detailed the pressing medical case for acute concern about climate change and laid out the health imperatives for urgent and decisive action. As stated in the most recent IPCC report, there is no longer any scientific doubt that we humans are responsible for the continuing changes in our climate. This report should make clear that those changes are already causing harms to our health—harms that will increase the longer we wait to act.

We've also tried to make clear that we still have time for meaningful actions that can head off the worst impacts of climate change and, further, that we have the means to beneficially tackle the crisis .

We challenge our leaders and government officials, at the local, state, and federal level, to step up and act quickly and responsibly. They must start by mitigating future impacts through actions, policies, codes, rules and regulations that begin dramatically reducing emissions to limit (and eventually eliminate fossil fuel-related) greenhouse gas releases—which means (but is not limited to) fully embracing clean energy, walkable communities, public transportation, and green building design. Leaders in local and state government should also begin focusing on adaptations and preparedness, providing the support needed to build resilience against the damaging climate change impacts that are already baked in.

It's time for all of us—as individuals, organizations, companies, governments—to lean in and tackle this crisis while we still have the opportunity to make so much of a difference for everyone's health and wellbeing.

7. Resources and Readings

Major Reports on Climate Change and Climate and Health

IPCC: Sixth Assessment Report of the Intergovernmental Panel on Climate Change:

The Intergovernmental Panel on Climate Change; <https://www.ipcc.ch/report/ar6/wg1/> is made up of the world's leading climate scientists, charged with publishing regular comprehensive updates of global knowledge on the climate crisis, intended to inform government policymaking. Each "assessment report" takes about five to seven years to complete, involving hundreds of scientists reviewing the work of thousands more experts. The current report—being published in four parts, from August 2021 to October 2022—is the sixth since the body was set up in 1988.

Part 1

AR6 Climate Change 2021: The Physical Science Basis. <https://www.ipcc.ch/report/ar6/wg1/>

Full report: IPCC, 2021: Climate Change 2021: The Physical Science Basis: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report_smaller.pdf

Summary for Policymakers: IPCC, 2021: Summary for Policymakers. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf

Part 2

Climate Change 2022: Impacts, Adaptation and Vulnerability. <https://www.ipcc.ch/report/ar6/wg2/>

Full Report: IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_FinalDraft_FullReport.pdf

Summary for Policymakers: IPCC, 2022: Summary for Policymakers. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf

Part 3

Climate Change 2022: Mitigation of Climate Change, <https://www.ipcc.ch/report/ar6/wg3/>

Full report: IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Full-Report.pdf

Summary for Policymakers: IPCC, 2022: Summary for Policymakers. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Summary-ForPolicymakers.pdf

The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future:

Last year's 6th annual report covers 44 health indicators, including climate change impacts, exposures, and vulnerabilities; adaptation, planning, and resilience for health; mitigation actions and health co-benefits; economics and finance; and public and political engagement. The report is also available as a U.S. brief (13 pages), as a summary for medical professionals (3 pages), and as various regional reports. Full Report: <https://www.thelancet.com/countdown-health-climate>. Special reports: <https://www.lancetcountdownus.org/additional-resources/>.

WHO: Special Report on Climate Change and Health, The Health Argument for Climate Action:

In the lead up to last year's COP26 meeting in Glasgow, Scotland, the World Health Organization (WHO) released a COP26 special report, urging COP negotiators to center health and equity in their summit discussions and commit to a sustainable recovery from the COVID-19 pandemic. The solutions-oriented report lays out 10 recommendations (below) for maximizing the health benefits of tackling climate change... and avoiding the worst health impacts. You can find a report summary here. Full report: <https://apps.who.int/iris/rest/bitstreams/1378263/retrieve>; Summary: <https://www.who.int/news/item/11-10-2021-who-s-10-calls-for-climate-action-to-assure-sustained-recovery-from-covid-19>

U.S. Government Web Sites

EPA: U.S. Environmental Protection Agency. <https://www.epa.gov/climate-change>

NASA: Global Climate Change: Vital Signs of the Planet, <https://climate.nasa.gov/>

Books

earth.org has a useful list of "Eight Best Books on Climate Change and Sustainability in 2022." <https://earth.org/8-must-read-books-on-climate-change-and-sustainability/>

Planetary Health: Protecting Nature to Protect Ourselves, Samuel Myers and Howard Frumkin. <https://islandpress.org/books/planetary-health>

Resources for Medical Students

Medical Students for a Sustainable Future, Guide to Climate and Health Curriculum Reform in Medical Schools: Created to help medical students across the country advocate for and design climate curricula for their schools. <http://ms4sf.org/>

Planetary Health Report Card, 2020-2021: Medical students internationally can use the Report Card to grade and compare their home institutions on an annual basis. <https://phjrc.files.wordpress.com/2021/04/2021-phrc-summary-report-final-1.pdf>

Selected Organizations

Washington Physicians for Social Responsibility: (WPSR), the publisher of this report, is a statewide, healthcare professional-led, advocacy organization working to create a healthy, just, peaceful and sustainable world. They address the gravest current threats to human health and survival: nuclear weapons, economic inequity, and the climate crisis. <https://www.wpsr.org/>

Washington Environmental Council: A statewide nonprofit, WEC works and brings people together to solve Washington's most critical environmental issues—protecting the environment of Washington and playing a continuing, major leadership role with its efforts around climate and clean energy. <https://wecprotects.org/our-work/areas-of-work/climate-clean-energy/>

Climate Solutions: An effective, policy-oriented, nonprofit, working in Washington and Oregon. “To drive public policy change faster and to foster more private innovation, we primarily work to pass and implement policies at the state level and in major jurisdictions using the tools of advocacy, research, communications and organizing outreach.” They send out a useful, bi-weekly **update** with a climate news roundup and opportunities to take climate action. <https://www.climatesolutions.org/>

Center for Health and the Global Environment: CHanGE “exists to highlight the connections between climate change and human health,” and is based in the UW School of Public Health bridging the Departments of Global Health and Environmental and Occupational Health Sciences. It's also a member of the College of the Environment's interdisciplinary coalition, EarthLab. You can **subscribe** to their monthly newsletter to stay up-to-date on news, events and

opportunities. <https://deohs.washington.edu/change/>

Medical Society Consortium on Climate and Health: To raise awareness of the impact of climate change has on patient health, over 20 medical organizations and associations (representing more than 600,000 health care professionals) have formed the Consortium. They produce reports, organize educational events, and put out a monthly newsletter with the very useful health & climate news, updates and advocacy opportunities. <https://medsocietiesforclimatehealth.org/>

Citizens' Climate Lobby: CCL is a nonprofit, nonpartisan, grassroots advocacy climate change organization focused on national policies to address the climate crisis. Its mission is to educate and enable ordinary citizens to effectively influence Congress to act on climate. It has organized chapters in every US Congressional district and its work is heavily driven by volunteer activists. <https://citizensclimatelobby.org>

Climate Reality Project: Through grassroots leadership trainings, global media events, digital communications and issue campaigns, The Climate Reality Project, founded by former Vice President Al Gore in 2005, works to spread the truth and raise awareness about the climate crisis. Climate Reality recruits, trains, and mobilizes people to become powerful activists, providing the skills, campaigns, and resources to push for aggressive climate action and high-level policies that accelerate a just transition to a cleaner and greener world. You can join a local chapter, (<https://www.climateactproject.org/chapters>), there are four in Washington: King County, Snohomish County, Tacoma, and Bellingham, get trained as a climate leader and speaker with the Climate Reality Leadership Corp (trainings still lead by Gore), or get updates on policy and actions.

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Front cover illustration: Stateline windfarm
outside Walla Walla. Photo by Ken Lans



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