

Tackling climate change could be the greatest global health opportunity of the 21st century

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Key findings

- **Climate change, alongside the collapse of biodiversity, are the biggest global health threats of the 21st century.** Direct climate change impacts are expected to cause [~250,000](#) additional deaths per year between 2030 and 2050, with the direct damage costs to health could be USD [2-4 billion](#) per year even by 2030. The drivers of climate change — principally fossil fuel emissions — pose a heavy burden of disease, contributing to the [7 million deaths](#) from air pollution annually. By 2070, between 2 to 3.5 billion people are predicted to reside in areas [unlivable](#) due to heat.
- **Climate change will make heatwaves and other extreme events more deadly.** It will also make air pollution worse, increase the spread of infectious diseases and lead to the breakdown of food systems. Currently, [communities in Europe](#) are the most vulnerable to heatwaves due to Europe's ageing and highly urban population.
- **By the end of the century, the health and well-being of billions could be impacted.** Between 540-590 million people could be undernourished, projected sea level rise of 1m could threaten to displace up to [565 million people](#), while nearly [one billion](#) people could be exposed to mosquito-borne diseases, and more than [350 million](#) people could face heatwaves.
- **There is a great need for health professionals to become trusted voices in support of global efforts to reduce emissions and protect people from the threat of climate change.** Health professionals, like climate scientists, can help design climate policies that improve health outcomes and human well-being, adapt to climate impacts and communicate the need for an accelerated response.
- **Integrating health to climate change [policies](#) offers a major opportunity to reduce emissions and improve public health.** Health and science professionals are well placed to act as a bridge between policymakers and society, working together to push for more ambitious climate policies on everything from the energy to the land sectors. Mitigation policies to limit temperature rise to 1.5°C, for example, could prevent [~150 million](#) premature deaths over the course of the century.



George Nikitin / Greenpeace

- **Health cost savings from well-designed climate mitigation and adaptation policies can substantially offset the costs of climate action.** Globally, the [health cost savings](#) from decarbonisation alone will more than cover the entire costs of implementation. Meeting the goals of the Paris Agreement could save over [one million lives](#) a year worldwide by 2050 from air pollution alone. With COVID-19 economic recovery packages, there is an opportunity to align and deliver a triple win — one that improves public health, creates a sustainable economy and protects the environment.

Introduction

The world has already warmed by between [1.06-1.2°C](#) compared with pre-industrial levels, making climate change the [biggest global health threat](#) of the 21st century. Its harmful effects spread across every country and income group, threatening the food, air, water, and shelter that society depends on. The health of more [vulnerable, marginalised and disempowered people tends to be harmed first and worst](#).

Over the years, climate scientists have warned that without [transformational action](#), temperatures will keep rising and impacts will worsen. The most comprehensive estimate by WHO predicts that, between 2030 and 2050, climate change can cause approximately [250,000](#) additional deaths per year, and the direct damage costs to health could be [USD 2-4 billion](#) per year by 2030. However, the death figure will likely be [much larger](#), because it fails to account for other climate-related factors.¹ For example, climate change can [reduce food production](#), leading to a total of 529,000 adult deaths between 2010-2050. Similarly, up to [132 million](#) people will be pushed into extreme poverty by climate change by 2030, making them more vulnerable to its health impacts.



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There is a great need — and an extraordinary opportunity — for health professionals to become trusted voices in support of global efforts to reduce emissions and protect people from the threat of climate change. Health professionals are increasingly [engaged](#) on the issue — from working with communities impacted by extreme weather events to taking steps to reduce emissions from health systems. A recent [survey](#) with 4,654 health professionals found that “most of them felt a responsibility to bring the health effects of climate change to the attention of the public (86% somewhat or strongly agreed) and policy makers (90% somewhat or strongly agreed)”. But time constraints, insufficient knowledge about climate change, and the belief that their engagement with the public would not make a difference are some of the barriers these professionals face. These [barriers](#) can be [addressed using various resources](#) — continuing professional education, communication training, patient education materials, policy statements, action alerts, and guidance on how to make health-care workplaces sustainable. The health professionals surveyed also believe that a [culture shift](#) is needed whereby public education and policy advocacy focused on climate change are widely accepted and supported by the health community. Health professionals, like climate scientists, can help design climate policies that improve health outcomes and human well-being, reduce emissions and adapt to climate impacts.

Coordinated and transformational action is key to [reducing](#) the burden of ill health, enhancing resilience and addressing global inequality. With COVID-19 economic recovery packages, there is an opportunity to align and deliver a [triple win](#) — one that improves public health, creates a sustainable and equitable economy and protects the environment.

¹ Such as population displacement, disruption of healthcare services and reductions in farmers' productivity.

Climate change will damage health in a number of ways

Climate change impacts² human health both directly – through extreme weather, and indirectly – by worsening air pollution, increasing vector-borne and other infectious diseases, undernourishment, etc. While no one is immune, vulnerable, marginalised and disempowered communities tend to suffer the most³. This section presents some of these climate-health impacts.

Because climate change affects many of the social and environmental determinants of health, climate change will continue to undermine public health. To tackle the exacerbating crises, we need to build in more health systems resilience. The health community will play a critical role in the response to climate change, according to the WHO, that stresses the severity and frequency of extreme weather, potential food system breakdowns, drought, and increased risk of violent conflict associated with resource scarcity.

1. Climate change will make heatwaves and other extreme weather events more deadly.

- **The frequency, duration and intensity of heatwaves are increasing at an alarming rate.** There have been more and longer heat waves since 1950 and they are now one of the key causes of weather-related deaths. High temperatures also raise ozone levels and other pollutants in the air, which can increase the risk of cardiovascular, respiratory and renal diseases.
- **Heat extremes reinforce existing health inequalities.** Exposure and heat-related deaths among vulnerable populations are growing, particularly for women and elderly people. In 2019, 475 million additional exposure to heatwaves happened worldwide, representing some 2.9 billion additional days of heatwaves experienced. These affected vulnerable people the most. Globally, there was a ~54% increase in heat-related deaths⁴ for elderly people (+65 years) in the last 20 years, reaching a total of 296,000 deaths in 2018. The threat is worse in disadvantaged communities, for example, a study done in Southern California found that residents in low-income census tracts were less likely to use air conditioners when temperatures got hot, putting them at heightened risk. The monetised value of global heat-related mortality increased from 0.23% to 0.37% of GDP between 2000–2018. Currently communities in Europe are the most vulnerable to heat-related deaths due to Europe’s ageing and highly urban population.
- **Extreme heat and drought⁵ increase the risk of wildfires.** These more than doubled in 114 (58%) of 196 countries during 2016–19⁶. As a result, there has been an increase in population exposed to wildfires in 128 countries since the early 2000s, with the US seeing one of the largest increases. Wildfires not only cause deaths and environmental devastation, their smoke increases heart and lung damage as well as the displacement of communities.
- **Heat stress affects people’s ability to work outdoors, reducing productivity and economic output.** By 2015, heat-related reduction in labour capacity resulted in earnings losses equivalent to an estimated 3.9–5.9% of GDP in the lower-middle-income countries tracked. In 2019,



BC Wildfire Services

² <https://apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2015/12/03/15/34/public-health-opportunities-to-address-the-health-effects-of-climate-change>;
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(09\)60935-1/fulltext#sec1214288e724](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(09)60935-1/fulltext#sec1214288e724)

³ Ibid.

⁴ This indicator tracks the global total number and spatial pattern of heat-related mortality from 2000 to 2018. See supplementary materials for more info.

⁵ In 2018, there was a larger number of exceptional drought events affecting all populated continents and the global land surface area affected by an excess number of months in drought was more than twice that of the historical baseline.

⁶ Compared with the period 2001–04

302 billion hours of potential labour capacity were lost, with India suffering the most. Indian labour capacity loss was equivalent to 4-6% of annual GDP and the International Labour Organisation (ILO) predicts the country could lose the equivalent of 34 million full-time jobs in 2030 due to heat stress, with agriculture and construction being the worst-hit sectors. The ILO warned in 2019 that heat stress from climate change could destroy the equivalent of 80 million jobs worldwide, with construction and agriculture workers — mostly women — primarily affected.

- **In the future, each additional unit of warming is projected to increase heat-related mortality.** Even if warming is limited to 1.5°C, twice as many megacities (such as Lagos and Shanghai) are likely to become heat stressed, exposing upward of 350 million more people by 2050.
- Since the 1990s, weather-related disasters have increased. **In 2019, 236 of these events had a USD 132 billion combined cost in economic losses**, with the value of total economic losses in low-income countries being nearly five times greater than in high income countries. In the future, climate change will lead to more extreme weather events with increasingly widespread health harms. By the end of the century, for example, a projected sea level rise of 1m could threaten to displace up to 565 million people, exacerbating the risk of death, injury, ill-health, water contamination and the disruption of livelihoods in low-lying coastal zones and small islands.

2. Climate change can worsen air pollution, leading to more deaths and respiratory diseases.

- **Air pollution is the 4th main contributor to death, cardiovascular and respiratory diseases worldwide.** Every year nearly 7 million people die from exposure to outdoor and household air pollution, mostly in South and Southeast Asia and Western Pacific regions.

- **Air pollution disproportionately affects vulnerable populations.** In fact, 91% of deaths from ambient air pollution occur in low-income and middle-income countries. In the US, communities of colour and other minorities bear a disproportionate burden from air pollution — more than 72% of African Americans live in areas that violate federal air pollution standards, and Hispanic people are exposed to 63% more air pollution than White people. Children are also especially vulnerable, as exposure to air pollution in early childhood can lead to reduced lung capacity.



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- **Air pollution and climate change often share the same causes** (e.g burning of fossil fuels, wildfire smoke and emissions from agriculture). Burning coal releases greenhouse gases (GHG) that warm the atmosphere and ambient particulate matter (PM_{2.5}), causing more than 1 million deaths every year.
- **Climate change can also worsen air pollution**⁷. For example, ozone-related deaths are projected to increase, and with a rise in warming to 1.5°C, the increase could be from 382,000 deaths in 2000 to about 1.7 million globally by 2100 in a wide range of future warming scenarios.

3. Disease transmission is likely to increase.

- **Climate change drives changes in weather patterns and extreme weather events, creating the conditions for infectious diseases to emerge and spread.** For example, in 2015-2019, climate suitability for the transmission of malaria increased by ~39% and ~150% for regions in Africa and the Western Pacific, respectively. From 1950 to 2018, the global climate suitability for the transmission of dengue fever increased by 8.9% for *Aedes aegypti* and 15.0% for *Aedes albopictus*. These mosquitoes are also the principal vectors for chikungunya, yellow fever and Zika virus.
- **Health inequities are also clear in deaths caused by vector-borne diseases.** Deaths are about 300 times higher in developing countries than in developed countries.

⁷ Particulate Matter-related mortality could increase or decrease depending on climate projections and emissions assumptions.

- **The higher the warming, the greater the health risks.** Climate change has already contributed to the spread of some vector-borne diseases (those spread by other animals). But as many non-climate drivers play a role in vector-borne disease transmission (such as poor sanitation), climate change's role in transmission cannot be assumed in all regions of the world. Vector-borne diseases, such as malaria, dengue, chikungunya, yellow fever, Zika virus disease, affect mainly tropical and subtropical low- and middle-income countries. But, developed countries will also be affected by diseases, such as Lyme and other tick-borne diseases in North America.



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In the future, **climate change will make conditions even more suitable for diseases to spread, reaching previously unaffected areas.** By 2080, nearly one billion people could face “their first exposure” to a host of mosquito-borne diseases under extreme global warming. The range of the West Nile, Lyme disease and other tick-borne diseases are expected to increase in parts of North America and Europe. Malaria, dengue fever and other major mosquito-borne infectious diseases can also increase due to climate change.

- **Climate change will likely cause substantial future pandemic risk** by driving movement and contact between people, wildlife, reservoirs, and vectors, plus the spread of their pathogens. The COVID-19 pandemic is not directly driven by climate change, but it has shown the world how pandemics can wreak havoc on the world's healthcare systems, economies and people's lives.
- 4. Climate change exacerbates the risk of food insecurity and the breakdown of food systems.**
- **Rising temperatures and extreme weather events are decreasing yields,** making it harder to increase or even maintain global food production. A recent study found that climate change decreased the productivity of the global agricultural system by 21% since 1961—a slowdown that is equivalent to losing the last 7 years of productivity growth. It is estimated that global yield potential for major crops declined by 1.8–5.6% between 1981 and 2019. Countries in the subtropics and tropics are most vulnerable to crop yield declines with women, the young, elderly and poor at most risk within populations. Nutrition levels of food (e.g. protein, zinc, iron) are also expected to decline, putting countries at very severe risk of increased hunger and malnutrition, especially low-income nations.
 - **In the future, for every degree celsius of additional temperature rise, global crop yields will constantly decline and become more variable.** As extreme weather events become more frequent, multi-breadbasket failures — i.e., simultaneous shocks to production in a sufficient number of key food producing regions affecting global production — could happen every 10 years.
 - **Declining food availability and nutritional content is likely to increase costs globally, with low-income consumers particularly at risk from higher food prices.** This can lead to hunger, micronutrient deficiencies and increased diet-related mortality. For example, in the 2°C scenario, by the end of the century there would be an average of 25 million more people undernourished compared to a 1.5°C scenario.⁸ Also, according to the IPCC modelling, there could be an increase in the population at risk of insufficient energy intake of between 6–12% in 2050.⁹ All models project an increase in the risk of hunger with rising temperature scenarios.

⁸ Projected global undernourished population is 530-550 million at 1.5°C and 540-590 million at 2°C .

⁹ Based on modelling for SSPs 1, 2 and 3 respectively compared to a no climate change reference scenario.

The health benefits of climate solutions can deliver win-win outcomes for society and the planet

As human and environmental systems are inextricably linked, integrating [health to climate change policies](#) offers a major opportunity to reduce emissions while creating many near-term and local health [benefits](#). Aligning with the recent COVID-19 outbreak can be a triple win as recovery packages can focus on protecting public health and promoting a sustainable economy while preserving the planet. In this context, health and science professionals are well-placed to act as a bridge between policymakers and society, working together to push for more ambitious climate policies. Some examples are:

- Mitigation policies to limit a temperature rise to 1.5°C could prevent ~150 million premature deaths over the 21st century.** Among these, transitioning away from fossil fuels and adopting clean energy could be one of the [greatest public health opportunities](#) stemming from reduced emissions and air pollution, plus increased energy access. The more [stringent](#) these mitigation measures, the larger the [public health benefits](#) — from improvements in air quality to reductions in school absenteeism, hospitalisations, premature births, cardiovascular illness and deaths. A [recent study](#) estimated that if nine countries¹⁰ “adopted climate policies consistent with the Paris agreement and the Sustainable development goals, it would lead to an annual reduction of 1.18 million deaths due to air pollution, and 5.86 million deaths due to diet-related risk factors by 2040¹¹. Adopting the more ambitious health in all climate policies scenario would result in a further reduction of 462,000 and 572,000 annual deaths attributable to air pollution and to diet, respectively¹². Combined with increased numbers of jobs (up to 9 million per year), the transition of employment from fossil fuel to low-carbon industries can also [improve occupational health](#) of employees. Investing in already low-carbon intensive industries, like the care sector, which employs many female, BAME and migrant workers, could both [strengthen social and health infrastructure](#) as well as lower carbon. Globally, the [health cost savings](#) from decarbonisation alone will more than cover the entire costs of implementation.
- Building local, healthy and sustainable food systems is crucial to keep warming below 2°C.** Food production causes a [quarter](#) of the world’s GHG emissions and unhealthy diets are related to [~9 million deaths](#).¹³ With livestock [being particularly emissions intensive](#), increasing policies and awareness campaigns to enable people to eat more healthily and sustainably (more plant-based, fewer processed foods and lower in calories) could reduce emissions (between [0.7-8 billion tonnes of CO₂ per year](#)). It could also lower many diet-related diseases and deaths, particularly if people eat less red meat, which has led to [72%](#) more deaths over the last 30 years. If combined with policies to reduce food waste and improve farming methods, more food can be produced using fewer resources, [safeguarding](#) supply while reducing environmental footprint.
- Adaptation policies that are context-dependent can improve human well-being in all countries.** Morbidity and mortality could be reduced at the same times as helping people cope with climate impacts. For instance, [heat-early-warning systems help lower injuries, illnesses and deaths, with positive impacts for sustainable development](#). [Adapting the healthcare](#) system is also vital in



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¹⁰ Brazil, China, Germany, India, Indonesia, Nigeria, South Africa, the UK, and the USA

¹¹ Compared with the current pathways scenario. [See study for more details](#).

¹² These benefits were attributable to the mitigation of direct GHG emissions and the actions that reduce exposure to harmful pollutants, improved diets and safe physical activity.

¹³ This also includes tobacco use, physical inactivity and harmful use of alcohol.

order to strengthen its resilience, especially as the COVID-19 pandemic has highlighted the level of [ability to cope](#) with future health shocks. Ensuring universal health coverage (UHC) is key to enable people to [adapt and cope](#) with a changing climate. Adaptation policies are essential, but there is a [limit](#) to our ability to adapt. Even modest climate change could expose many people to [unprecedented](#) heat stress – by 2070, between 2 to 3.5 billion people are predicted to reside in areas [unlivable](#) due to heat.



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4. **Health cost savings from climate action can offset costs of action.**

Recent [estimates](#) show that climate solutions could cost around USD 25 trillion globally, but the resulting savings are five to six times larger. Keeping global temperatures below the 1.5°C could yield a global net economic savings of [USD 145 trillion](#), a value that does not account for the many trillions of dollars saved by improving public health and avoiding climate damages. In fact, other studies show that the value of the health gains would be approximately [twice the cost](#) of the policies enacted to meet the goals of the Paris Agreement. China and India could generate even larger [net benefits](#) by pursuing the 1.5°C target (USD 0.27–2.31 trillion and USD 3.28–8.4 trillion, respectively). The health gains of limiting warming by 2.0°C would also [offset the costs in other regions](#), such as the European Union (7–84%) and the USA (10–41%). In the [15](#) countries with the highest greenhouse gas emissions, the health impacts of air pollution are estimated to cost more than 4% of their GDP while actions to meet the Paris goals would cost [-1%](#) of global GDP.

Conclusion

With increasing temperature and extreme weather events, the health impacts of climate change are increasingly being felt across the world. More people are dying from extreme heat; the suitability for the transmission of infectious diseases is increasing; and crop yields are falling, causing a rise in food insecurity.

Health and climate professionals understand the urgency, there have already been [several calls](#) to action in the health community, but more work has to be done in order to push for public and political engagement towards tackling both climate change and health. There is now a window of opportunity to take action together, aligning climate change response and the pandemic recovery to deliver improved public health for generations to come. ■

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The Global Climate and Health Alliance is an alliance of health and development organizations from around the world united by a shared vision of an equitable, sustainable future, in which the health impacts of climate change are kept to a minimum, and we reap the maximum health benefits of climate change solutions.