

CLIMATE CHAOS: HEALTH IMPLICATIONS OF CLIMATE CHANGE

As we continue to burn fossil fuels, the atmosphere warms, and world climate changes. Higher temperatures, changes in precipitation patterns, and rising sea levels lead to more frequent heat waves; more frequent intense storms; increased flooding; in some places, increased drought; loss of shoreline and greater risk from storms in coastal and low-lying areas. These bring increased risk of disease, injury, nutritional deficit, and death.

Extreme Weather and Water-Related Health Impacts. As climate change intensifies, intense precipitation events occur more frequently. Atlantic hurricane frequency, intensity and duration have all increased and are projected to continue increasing.¹

- Severe storm surges on coastal areas can be devastating. Hurricane Katrina displaced over 1 million people and caused over 1,800 deaths. Hurricane Sandy inundated parts of New York City, flooding subways, cutting off power, and causing downtown hospitals to evacuate their patients.
- The rise in sea levels from melting polar ice endangers people, animals and crops in coastal areas worldwide.
- 2012 saw 11 weather and climate disaster events with losses exceeding \$1 billion in damages. This makes it the second-costliest year for climate disasters in the U.S. since 1980, with more than \$110 billion in total damages.²

Heat-Related Illness and Death. Although storms may be more visible, most years, heat waves are the leading killer among extreme weather events in this country.

- Extreme heat can cause effects ranging from heat cramps to heat exhaustion to heat stroke. Heat stroke can result in delirium, convulsions, coma and possible death.
- In the 2003 European heat wave, an estimated 70,000 people died due to heat-related illness. Causes of death included heat stroke and illnesses that are exacerbated by heat, including heart attack and lung disease.³
- The number of reported heat-related deaths and illness is expected to rise due to the projected increase in frequency, duration, and magnitude of extreme heat events.

Deterioration of Air Quality. Higher temperatures contribute to the formation of ground-level ozone, a dangerous air pollutant. Millions of Americans live in areas that already fail to meet the health standards for ozone.

- Ozone exposure can reduce lung function, permanently damage lung tissue, provoke new cases of asthma, and aggravate other chronic lung diseases.⁴
- Ozone affects the cardiovascular system and can increase the risk of dangerous heart arrhythmias.⁵
- Ozone exposure increases the number of low birth weight babies, currently the leading cause of infant mortality. Exposure to ozone in the first and third trimester of pregnancy can cause 20% intrauterine growth retardation.⁶

¹ IPCC. Climate Change 2007: The Physical Science Basis, Summary for Policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: <http://www.ipcc.ch>

² Smith, A., and R. Katz, 2013: U.S. Billion-dollar Weather and Climate Disasters: Data Sources, Trends, Accuracy and Biases. *Natural Hazards*, DOI 10.1007/s11069-013-0566-5.

³ Robine, Jean-Marie; Siu Lan K. Cheung, Sophie Le Roy, Herman Van Oyen, Clare Griffiths, Jean-Pierre Michel, François Richard Herrmann (2008). "Death toll exceeded 70,000 in Europe during the summer of 2003". *Comptes Rendus Biologies* 331 (2): 171–178. doi:10.1016/j.crv.2007.12.001. ISSN 1631-0691. PMID 18241810. Retrieved 17 May 2010.

⁴ U.S. EPA. *Smog – Who Does it Hurt? What You Need to Know About Ozone and Your Health*. U.S. EPA Office of Air and Radiation, Washington, DC: 1999. <http://www.epa.gov/airnow/health/smog.pdf>

⁵ Rich DQ, Mittleman MA, Link MS, et al. Increased Risk of Paroxysmal Atrial Fibrillation Episodes Associated with Acute Increases in Ambient Air Pollution. *Environ Health Perspec* 2006; 114:120-123.

⁶ *Env Health Persp* 113: 1638-1644 (2005)

Water-borne Diseases. Increases in heavy rainfall, especially when interspersed with periods of drought, can contribute to flooding and contamination of water supplies. There are a number of dangerous waterborne diseases such as hepatitis, giardiasis, and cryptosporidiosis – and even fowleri, the brain-eating ameba.⁷

- Flooding can cause sewer overflows, with potential increase in infectious diseases.
- Flooding can cause injuries and deaths, mold, psychological effects, and an increase in the populations of rats, mosquitoes and other disease-bearing hosts.
- Globally, infectious diarrhea is one of the most prevalent of the world's water-borne diseases. Usually a symptom of a gastrointestinal infection, it can be caused by a variety of bacterial, viral and parasitic organisms. Severe diarrhea may be life-threatening, particularly in young children and people who are malnourished. This is expected to worsen with climate change, driven by factors including flooding.⁸

Insect-borne Diseases. Rising temperatures and changes in precipitation expand the habitable areas for disease-carrying insects. This increases the potential for the spread of diseases like dengue fever, yellow fever, malaria, Lyme disease, tick-borne encephalitis, and hantavirus pulmonary syndrome. Non-climatic factors also determine disease spread.

- Mosquitoes, which can carry malaria, dengue fever, West Nile Virus, and other diseases, are highly sensitive to temperature changes. Higher temperatures boost their reproductive and biting rates, lengthen their breeding season, and shorten the time it takes for the malarial pathogen to mature to an infectious state.
- Increasing temperatures may expand the viable range of mosquitoes to higher elevations and more northern latitudes, potentially putting at risk previously unexpected populations.
- According to the World Health Organization, in 2010 219 million people around the world were infected and 660,000 died from malaria.⁹ As global warming continues, some estimates predict that as many as 90 to 200 million additional people may be at risk of malaria by the latter half of this century.¹⁰

Damage to Crops. Variable and extreme weather damage crops and can reduce the food supply.

- Climate change threatens agriculture through severe storms, flooding, extreme heat, drought, more water evaporation, decrease in pollination, and sea level rise (cropland underwater or contaminated with salt).
- Estimates vary, but for every 1.8°F increase in global average surface temperature, we can expect about 10 percent declines in yields of the world's major grain crops – corn, soybeans, rice and wheat. Climate experts predict that global temperatures may rise as much as 5.4° to 9°F if we continue burning fossil fuels at our current rate. This could lead to 30% to 50% declines in crop production.^{11,12}
- Nearly one-third of the world's land surface may be at risk of extreme drought by 2100.¹³
- Food prices will rise as climate change reduces the amount of food available. And people get angry, even violent, when food becomes more expensive. The combination of decreasing food production in the face of increasing food demand may lead to widespread social unrest and hunger – even catastrophic global famine.

The threats to health posed by climate change are multiple, they are severe, and they are increasing. To reduce climate change, we must slash our combustion of fossil fuels and pursue an urgent transition to solar, wind and other clean, safe renewable energies.

⁷ Patz J et al. "Climate Change and Waterborne Disease Risk in the Great Lakes Region of the U.S." Am J Prev Med 2008;35(5). August 2008.

⁸ St. Louis M. and Hess J. "Climate Change: Impacts on and Implications for Global Health." Am J Prev Med 2008;35(5). August 2008.

⁹ WHO. "Malaria." World Health Organization. <http://www.who.int/mediacentre/factsheets/fs094/en/>

¹⁰ Van Lieshout M, Kovats RS, Livermore MT, Martens P. Climate Change and Malaria: Analysis of the SRES Climate and Socio-Economic Scenarios. *Global Environmental Change*. 2004; 14: 87 – 99

¹¹ Committee on Stabilization Targets for Atmospheric Greenhouse Gas Concentrations, Board of Atmospheric Sciences and Climate, Division of Earth and Life Studies, National Research Council. Climate stabilization targets: Emissions, concentrations, and impacts over decades to millennia. National Academies of Sciences. 2011.

¹² Henson R. Warming world: impacts by a degree. National Academies of Sciences. 2011.

¹³ Burke et.al. Journal of Hydrometeorology, Sept. 2006