



“The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action.”¹

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Preparing for Global Warming: A Framework for Protecting Community Health and the Environment in a Warmer World

Scientists predict that global warming will have serious effects on public health, from worsening air quality, degradation of food and water supplies, and increasing levels of allergens to heat waves, flooding, and changing patterns of mosquito, tick, and flea-borne disease. Fortunately, early action by city managers, health officials, and the federal government can reduce the impact of these problems on our health by preparing and responding appropriately to the effects of global warming. But we must start now.

Because climate change is already damaging human and environmental health and welfare, preparedness projects must get underway even as we pursue aggressive regulations to reduce greenhouse gas emissions. Many communities are already extremely vulnerable to climate-related impacts and will remain so for years to come, regardless of proposed greenhouse gas regulations, unless there is sustained support for improving preparedness so that “a changing society can adapt to a changing climate.”²

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Preparing for and Protecting Against the Harmful Health Effects of Global Warming

Global warming can lead to increased flooding, sea level rise, more frequent and more serious storms, and dangerous heat waves, among other threats. Scientific studies have shown that even with aggressive measures to reduce greenhouse gases, the earth is committed to at least as much temperature change in the next 50 to 100 years as has already occurred in the last century.³ But because global warming will affect different regions in different ways, it is important for communities to develop their own targeted climate adaptation plans. City, county, and state health departments, along with other local and federal agencies like the U.S. Centers for Disease Control and Prevention (CDC), all share responsibility for preparing for the health effects of climate change.

The following four key principles provide a framework to help local governments and decision makers create climate response and preparedness strategies that address the most important problems caused by climate change in their areas.

■ **Identify local vulnerabilities** to prioritize and target local preparedness efforts. Vulnerabilities can be based on the demographic characteristics of a population (such as age) or physical characteristics of the environment (such as geographic location). For example, individuals, businesses, and municipalities within flood plains might choose to prioritize preparedness for storms and flooding. Areas where wildfires have occurred frequently in the past should expect them to worsen. Municipalities with known watershed vulnerabilities and drinking water infrastructure problems should expect that the problems will likely worsen with climate change unless they are prioritized and addressed.

■ **Track health threats** to rapidly identify new and emerging local hazards, including infectious diseases in humans, heat-related mortality, and morbidity after floods and other extreme events. It is also important to track environmental conditions that can signal an emerging threat, such as disease epidemics in wildlife, which may later evolve and spread into human populations, and aquatic algal blooms that can lead to food-borne disease outbreaks among people who eat contaminated shellfish.

■ **Consider global warming's impacts when designing new and existing communities.** Because many of the threats associated with global warming are generally predictable, it is possible to design or adapt buildings and communities to be more resilient. For example, elevated temperatures in cities (known as the urban "heat-island effect") can be reduced by increasing green spaces and reducing black pavement. Structural damage from wildfires can be minimized by choice of building locations and building materials, as well as by clearing brush in residential areas.



Women on boat in flooded residential neighborhood in Tupelo, Mississippi

■ **Prepare health care providers and the public for dealing with the effects of global warming.**

Communities should be informed about the likely timing of impacts, the possible size of the impacts, and how to address uncertainty, including specific responses such as how to evacuate during a flood or how to help an elderly relative during a heat wave. Likewise, physicians and other health care providers will benefit from proactive training in global warming preparedness.

For any community attempting to become better prepared for global warming, the strategies and unifying principles described here can help reduce local vulnerability, improve human and environmental health, and increase our ability to thrive in a climate-uncertain future. In addition, in order to prevent additional future impacts and protect public health, governments must act quickly to control sources of global warming pollution. Congress must address global warming through mandatory legislation that reduces global warming pollution on the order of 20 percent by 2020.

Increased Funding Is Needed to Prepare Communities for Global Warming

Increased funding is needed for national, state, local, and individual efforts to prepare us for climate change. To develop the capacity to prepare for the public health challenges of climate change, the CDC will require additional funding of \$20 to 50 million. The funding would support a centralized national effort at CDC, scientific research, and support for state and local preparedness.



Links to Resources: More Information on Global Warming Preparedness

- NRDC offers information on the consequences of global warming and ways to improve preparedness, available at: www.nrdc.org/globalWarming/fcons.asp. Ideas about how smart growth policies can help solve global warming are also available at: www.nrdc.org/smartGrowth/smartgrowth_helps_solve_globalwarming.asp
- The US Centers for Disease Control and Prevention (CDC) has information on protecting public health from climate change, at: www.cdc.gov/Features/ClimateChange/
- The US Federal Emergency Management Administration (FEMA) provides online information about ways to lessen vulnerabilities to many kinds of health threats via their "Ready America" program, at: www.ready.gov/america/index.html
- The National Wildlife Health Center tracks wildlife disease outbreaks, some of which are being impacted by changing climate, available at: www.nwhc.usgs.gov/
- Strategies to address heat waves with details on heat-health warning systems and ways to reduce urban heat islands are offered by the US EPA at: www.epa.gov/hiri/about/excessiveheatevents.html
- The United Kingdom Climate Information Programme (UKCIP) has a database of adaptation actions being taken by various agencies, available at: www.ukcip.org.uk/resources/tools/database.asp
- At a global scale, the Intergovernmental Panel on Climate Change (IPCC) published their Fourth Assessment Report in 2007. Working Group II of the IPCC reported on global warming impacts and adaptations at: www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter17.pdf
- The United Nations Framework Convention on Climate Change (UNFCCC) has information on adaptation at: unfccc.int/adaptation/items/4159.php
- The World Health Organization has made protecting health from climate change the theme of World Health Day 2008. More information on climate-health effects is available at: www.who.int/globalchange/climate/en/
- The American Public Health Association made climate change the theme of its 2008 National Public Health Week. A brochure and tool kit with educational outreach materials is available at: <http://www.nphw.org/nphw08/default.htm>.

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“Heat-related deaths are preventable, and there are lots of tips we can offer people to help them stay healthy in heat waves: limit your physical exertion, eat lighter meals and don’t use your oven (or use a microwave instead), take cool baths or showers, open your windows if you use a fan, and even if you prefer not to use the air conditioner, run it for a few hours to decrease the inside temperature.”

CHRIS GALLAGHER, CALL
CENTER DIRECTOR AT THE
PHILADELPHIA CORPORATION
FOR AGING

Case Study: Heat Wave Preparedness in Philadelphia

As global warming raises the average temperature of our planet, heat waves are increasing in frequency, length, and intensity. From the severe heat wave that killed more than 700 people in Chicago in 1995 to the unprecedented heat wave that killed as many as 35,000 people in Europe in 2003, a series of record-setting hot temperatures over the last few decades has given us an alarming glimpse of summers to come if global warming continues unmitigated. Philadelphia, PA began taking heat waves very seriously in the early 1990s, and created a Hot Weather-Health Watch/Warning System after a severe heat wave in 1993 caused an estimated 118 heat-related deaths.⁴ In effect, by applying the four principles outlined above, Philadelphia is also making great strides toward protecting residents from global warming.

The city worked with local agencies that could help identify vulnerable groups, including nursing homes and elder care centers. The city sponsored a “buddy system” that urged individuals to check on older neighbors, friends, and relatives during heat waves. Climate-health researchers identified which were the most health-hazardous types of local weather and temperature conditions, and shared their research with the National Weather Service (NWS). NWS tracked approaching weather conditions predicted for Philadelphia and issued heat warnings. Whenever the NWS issued a heat warning, a series of public health interventions coordinated by the Department of Public Health were triggered.

Philadelphia’s Cool Homes Program encouraged climate-smart design,⁵ in which the City Energy Coordinating Agency also collaborated and gave free energy audits and temperature-lowering building materials to homes in the southwest Philadelphia neighborhood that had experienced the highest rate of heat-related deaths. A combination of reflective roof coatings, insulation, and whole-house fans reduced bedroom air temperatures several degrees.



Lastly, the city launched a public education campaign, with coordinated efforts by the NWS, Philadelphia city government, social services, health officials, the news media, local businesses, and concerned citizens. This included television, radio, and newspaper publicity about the coming heat wave and how to avoid heat stress; a “Hotline” operated with the Philadelphia Corporation for Aging to give callers free information on avoiding heat stress; cessation by the local utility of water and power service suspensions; increased staffing of Fire Department Emergency Medical Services; and increased daytime outreach efforts by homeless services. It has been estimated that the system saved 117 lives between 1995 and 1998.⁶ According to Chris Gallagher of the Philadelphia Corporation for Aging, “These problems apply everywhere, and other communities may want to tailor their own heat-health preparedness plans to deal with local vulnerabilities.”

Heat-health warning systems have now been in operation long enough in Philadelphia and other cities that the systems’ success can be evaluated. Educational improvements are still needed so that residents know what exactly to do to protect themselves when heat waves strike.⁷ Nevertheless, studies have shown that better heat wave preparedness is already saving lives.

1 Joint Science Academies’ Statement (June 7 2005). Global response to climate change. Available at: <http://royalsociety.org/displaypagedoc.asp?id=20742> (June 7 2005 press release available at: <http://royalsociety.org/news.asp?id=3226>).

2 Pielke, Jr R, Prins G, Rayner S, Sarewitz D. 2007. Lifting the taboo on adaptation. *Nature* 445:597-598 (Climate Change 2007 Commentary, 8 February 2007).

3 Intergovernmental Panel on Climate Change (IPCC), 2007: *Climate Change 2007: The Physical Sciences Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon S, Qin D, Manning M, Chen Z, Marquis M, Averyt KB, Tignor M, Miller HL (Eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA.

4 Ebi KL, Teisberg TJ, Kalkstein LS, Robinson L, Weiher RF. 2004. Heat watch/warning systems save lives: estimated costs and benefits for Philadelphia 1995-1998. *Bulletin of the American Meteorological Society* (August 2004), pp.1067-1073.

5 US EPA, 2007. *Heat Wave Response Programs*. Heat Island Effect web site, available at: <http://www.epa.gov/hiri/about/heatresponseprograms.html>.

6 Ebi et al. (2004).

7 Sheridan SC. 2007. A survey of public perception and response to heat warnings across four North American cities: an evaluation of municipal effectiveness. *Int J Biometeorol* 52:3-15.