

Protecting **Health**  
from **Climate Change**

CONNECTING SCIENCE, POLICY AND PEOPLE



**World Health  
Organization**

## WHO Library Cataloguing-in-Publication Data

Protecting health from climate change: connecting science, policy and people.

1.Climate – trends. 2.Environmental health. 3.Carbon dioxide. 4.Greenhouse effect. 5.Disaster planning. 6.Risk assessment. 7.Vulnerable populations. 8.World health - trends. I.World Health Organization.

ISBN 978 92 4 159888 0

(NLM classification: WA 30.5)

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# SUMMARY

## Climate change puts at risk the basic determinants of health

There is now widespread agreement that the earth is warming, due to emissions of greenhouse gases caused by human activity. It is also clear that current trends in energy use, development and population growth will lead to continuing – and more severe – climate change.

The changing climate will inevitably affect the basic requirements for maintaining health: clean air and water, sufficient food and adequate shelter. Each year, about 1.2 million people die from causes attributable to urban air pollution, 2.2 million from diarrhoea largely resulting from lack of access to clean water supply and sanitation, and from poor hygiene, 3.5 million from malnutrition and approximately 60 000 in natural disasters. A warmer and more variable climate threatens to lead to higher levels of some air pollutants, increase transmission of diseases through unclean water and through contaminated food, to compromise agricultural production in some of the least developed countries, and to increase the hazards of extreme weather.

Climate change also brings new challenges to the control of infectious diseases. Many of the major killers are highly climate sensitive as regards temperature and rainfall, including cholera and the diarrhoeal diseases, as well as diseases including malaria, dengue and other infections carried by vectors. In sum, climate change threatens to slow, halt or reverse the progress that the global public health community is now making against many of these diseases.

In the long run, however, the greatest health impacts may not be from acute shocks such as natural disasters or epidemics, but from the gradual build-up of pressure on the natural, economic and social systems that sustain health, and which are already under stress in much of the developing world. These gradual stresses include reductions and seasonal changes in the availability of fresh water, regional drops in food production, and rising sea levels. Each of these changes has the potential to force population displacement and increase the risks of civil conflict.

## All populations are vulnerable – but some are more vulnerable than others

All populations will be affected by a changing climate, but the initial health risks vary greatly, depending on where and how people live. People living in small island developing states and other coastal regions, megacities, and mountainous and polar regions are all particularly vulnerable in different ways.

Health effects are expected to be more severe for elderly people and people with infirmities or pre-existing medical conditions. The groups who are likely to bear most of the resulting disease burden are children and the poor, especially women. The major diseases that are most sensitive to climate change – diarrhoea, vector-borne diseases like malaria, and infections associated with undernutrition – are most serious in children living in poverty.



We have a common interest in facing up to health risks wherever they occur. Ongoing climate change, coupled with globalization, will make it more difficult to contain infectious diseases within their current ranges. Health challenges arising from population displacement and conflict are unlikely to stay confined within national borders. Improved health conditions for all populations, alongside more rapid and effective international disease surveillance, constitute a vital contribution to global public health security.

### Protecting human health is the “bottom line” of climate change strategies

Climate change can no longer be considered simply an environmental or developmental issue. More importantly, it puts at risk the protection and improvement of human health and well-being. A greater appreciation of the human health dimensions of climate change is necessary for both the development of effective policy and the mobilization of public engagement.

Strengthening of public health services needs to be a central component of adaptation to climate change. The international health community already has a wealth of experience in protecting people from climate-sensitive hazards, and proven, cost-effective health interventions are already available to counter the most urgent of these. Broadening the coverage of available interventions would greatly improve health now. Coupled with forward planning, it would also reduce vulnerability to climate changes as they unfold in the future.

Many policies and individual choices have the potential both to reduce greenhouse gas emissions and produce major health ‘co-benefits’. New research has shown that the range and magnitude of the potential health gains is larger than previously appreciated. More sustainable policies on household energy, electricity generation, agriculture and nutrition, transport and the built environment, could each bring significant reductions in major burdens of disease, including respiratory infections, cardiovascular disease and cancer. These local and immediate health benefits would offset a large part of the costs of climate change mitigation, and provide a strong political and personal motivation for action.

The diverse, widespread, long-term and inequitable distribution of health risks makes climate change a truly global challenge, calling for an unprecedented degree of partnership. An effective response will require actions from across society: from individuals, the health sector, as well as community and political leaders. This requires a sharing of responsibilities between the populations that make the greatest contribution to climate change and those that are most vulnerable to its effects, in order to safeguard and enhance global public health security. The skills, capacities and shared values of the public health community can make an important contribution to a fair and effective response to climate change.

# WHAT ARE THE RISKS?

## 1. Climate change: past and future

The basic facts are now firmly established. The earth is warming rapidly, mainly because of emissions of greenhouse gases caused by human activity. If current patterns of fossil fuel use, development and population growth continue, this will lead to ongoing climate change, with serious effects on the environment and, consequently, on human lives and health.

CLIMATE CHANGE IS HAPPENING NOW. Warming of the global climate is unequivocal and is shown by increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. The ten warmest years since the instrumental record of global surface temperature began in 1850, have all occurred within the last 13 years.

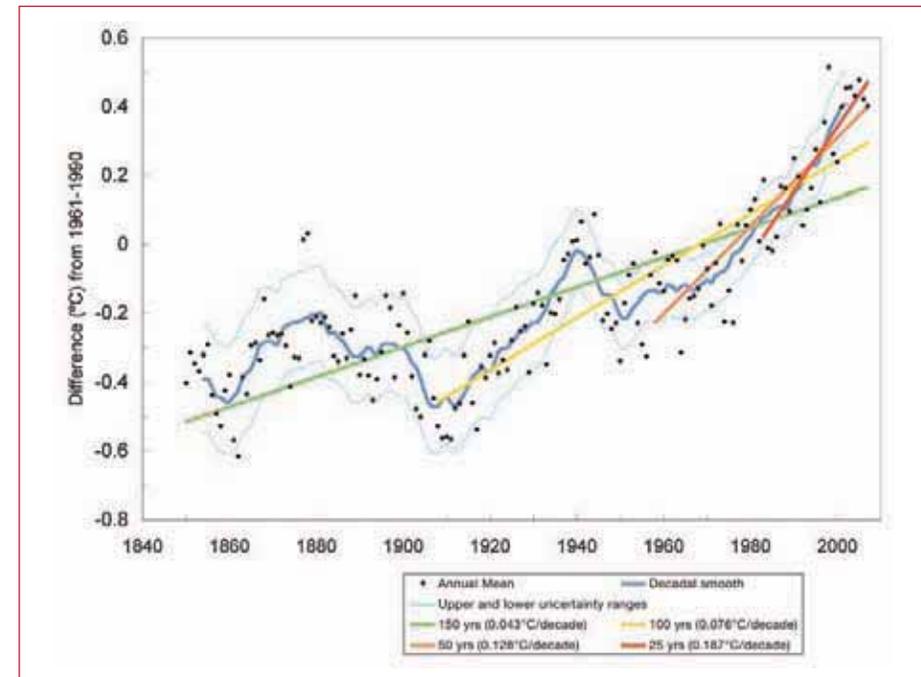
GLOBAL WARMING HAS ACCELERATED IN RECENT YEARS. The world warmed by approximately  $0.75^{\circ}\text{C}$  in the last 100 years (see Figure 1a). The rate of increase in the last 25 years, however, is much higher, at over  $0.18^{\circ}\text{C}$  per decade. This temperature increase is widespread over the globe, with land regions warming faster than the oceans.

SEA LEVELS ARE RISING, GLACIERS ARE MELTING AND PRECIPITATION PATTERNS ARE CHANGING. Sea levels have risen faster in the last decade than in the previous 30 years. On average, there has been a global reduction in mountain glaciers and snow cover. From 1900 to 2005, precipitation increased significantly in eastern parts of North and South America, northern Europe and northern and central Asia, but declined in the Sahel, the Mediterranean, southern Africa and parts of southern Asia. Globally, it is likely that the area affected by drought has increased since the 1970s.

EXTREME WEATHER EVENTS ARE CHANGING IN FREQUENCY AND INTENSITY. It is considered that heatwaves have become more frequent over most land areas, the frequency of heavy precipitation events has increased

Figure 1 (a). Global temperature rise.

Annual global mean temperatures and decadal variations for the period 1850–2005, with linear trends for the last 25, 50, 100 and 150 years.



Source: based on data from the UK Hadley Research Centre.<sup>2</sup>

over most areas and, since 1975, sea level has risen worldwide. There is also some evidence that intense tropical cyclone activity has increased since 1970.

HUMAN ACTIVITIES ARE NOW THOUGHT TO BE THE MAIN CAUSE OF THE CHANGING CLIMATE. Most of the observed increase in temperatures since the mid-20th century is very likely to be attributable to the increase in

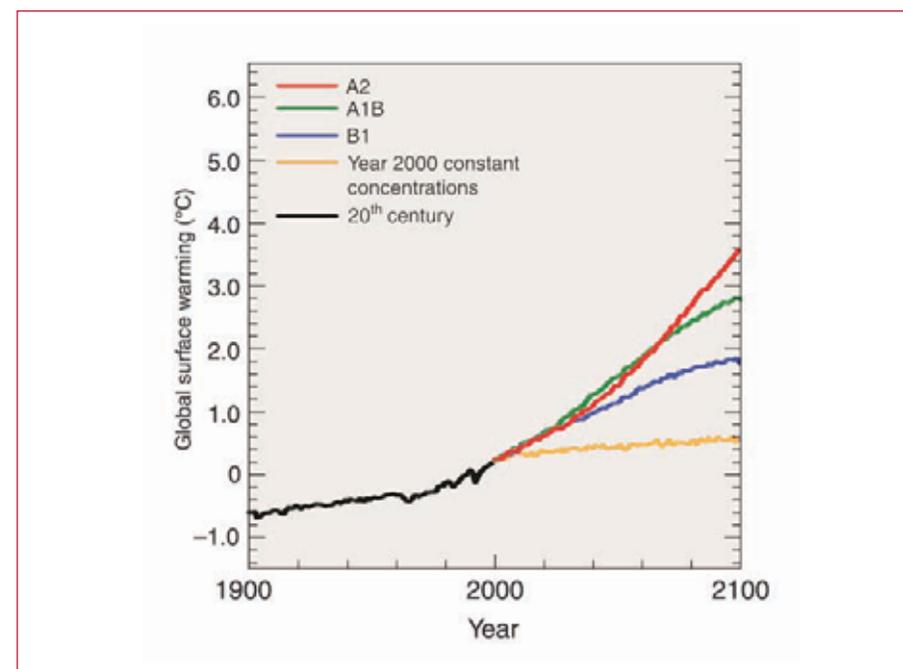
concentrations of greenhouse gases released by human activities, mainly carbon dioxide (CO<sub>2</sub>) emitted by burning of fossil fuels. Levels of carbon dioxide have increased from pre-industrial levels of 280 parts per million to 386 parts per million in 2008.

CONTINUED WARMING COULD LEAD TO ABRUPT OR IRREVERSIBLE IMPACTS. Melting of ice sheets on polar land could cause several metres of sea level rise, with major inundation of low-lying areas. Drying and burning of the Amazon basin, and warming of peat bogs, could release large amounts of greenhouse gases, further accelerating climate change.

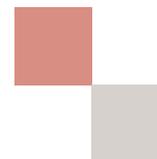
HUMAN-INDUCED CLIMATE CHANGE WILL CONTINUE FOR AT LEAST THE NEXT FEW DECADES. Even if emissions of greenhouse gases were to halt immediately, temperatures would be expected to rise by over 0.6°C in this century. The development paths that the world chooses, however, will have a strong influence on this increase (see Figure 1b). In a world that places high priority on sustainable energy use, temperatures are expected to rise by 1.8°C (likely range: 1.1–2.9°C). If societies place a lower emphasis on sustainability, temperatures are expected to rise by 4.0°C (2.4–6.4°C), with a greater probability of abrupt or irreversible impacts.<sup>1</sup>

**Figure 1 (b). Projected global temperature rise in the 21<sup>st</sup> century.**

Projected temperature changes (relative to 1980-1999) in selected development scenarios, from lower emphasis on sustainable development and cooperation (A2) to greater attention to environmental protection and regional integration (B1). The orange line is the projection assuming greenhouse gas concentrations were held constant at year 2000 values.



Source: Intergovernmental Panel on Climate Change (IPCC), 2007.<sup>1</sup>



## 2. Climate and its impact on the fundamentals of health

Climate change will affect, in profoundly adverse ways, some of the most fundamental pre-requisites for good health: clean air and water, sufficient food, adequate shelter and freedom from disease. The global climate is now changing faster than at any point in human civilization, and many of the effects on health will be acutely felt. The most severe risks are to developing countries, with negative implications for the achievement of the health-related Millennium Development Goals and for health equity.

EXTREME AIR TEMPERATURES AND AIR POLLUTION ARE HAZARDOUS TO HEALTH. Heatwaves are a direct contributor to deaths from cardiovascular and respiratory disease, particularly among elderly people. High temperatures also raise the levels of ozone and other air pollutants that exacerbate cardiovascular and respiratory disease, and pollen and other aeroallergens that trigger asthma.

FLOODS, DROUGHTS AND CONTAMINATED WATER RAISE DISEASE RISK. More variable precipitation is occurring, with an increase in the frequency and intensity of both floods and droughts. At the same time, higher temperatures are hastening rates of evaporation of surface waters and melting the glaciers that provide fresh water for many populations. Lack of fresh water compromises hygiene, thus increasing rates of diarrhoeal disease. In extreme cases, water scarcity results in drought and famine. Too much water, in the form of floods, causes contamination of freshwater

directly into wider prevalence of malnutrition. In turn, malnutrition and undernutrition increase the severity of many infectious diseases, particularly among children.

A MORE EXTREME AND VARIABLE CLIMATE CAN DESTROY HOMES, COMMUNITIES AND LIVES. Expected increases in the frequency and severity of flooding and storms will result in the destruction of homes, medical facilities and other essential services, impacting particularly on people in slums and other marginal living conditions. Gradual sea level rise, particularly coupled with stronger storm surges, will tend to lead to more frequent and more severe coastal flooding. The consequent destruction of homes and communities will eventually force unprotected populations to seek safer ground, often increasing environmental and social pressures in their new locations.

CLIMATE CHANGE BRINGS NEW CHALLENGES TO THE CONTROL OF INFECTIOUS DISEASES. Many of the major killer diseases transmitted by water and contaminated food, and by insect vectors are highly sensitive to climatic conditions and weather extremes. Climate change threatens to slow, halt or reverse current progress against many of these infections.

NOT ALL OF THE EFFECTS OF CLIMATE CHANGE WILL BE HARMFUL, BUT ON BALANCE HEALTH DAMAGES ARE PROJECTED TO OUTWEIGH THE BENEFITS. A warmer climate is expected to bring benefits to some populations

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