

This key sheet is part of a series aimed at DFID staff and development partners examining the impact of climate change on poverty, and exploring tools for adaptation to climate change.

This key sheet looks at the impact of climate change on the health of the poor. It aims to guide the reader through the key issues of:

- Poverty and health;
- Impact of the current climate on health; and
- Impact of climate change on health.

Lastly, this keysheet advises on the implications of climate change for the health sector.

04 The impact of climate change on the health of the poor

Climatic variability already significantly affects the health of the poor. Climate change increases these challenges.

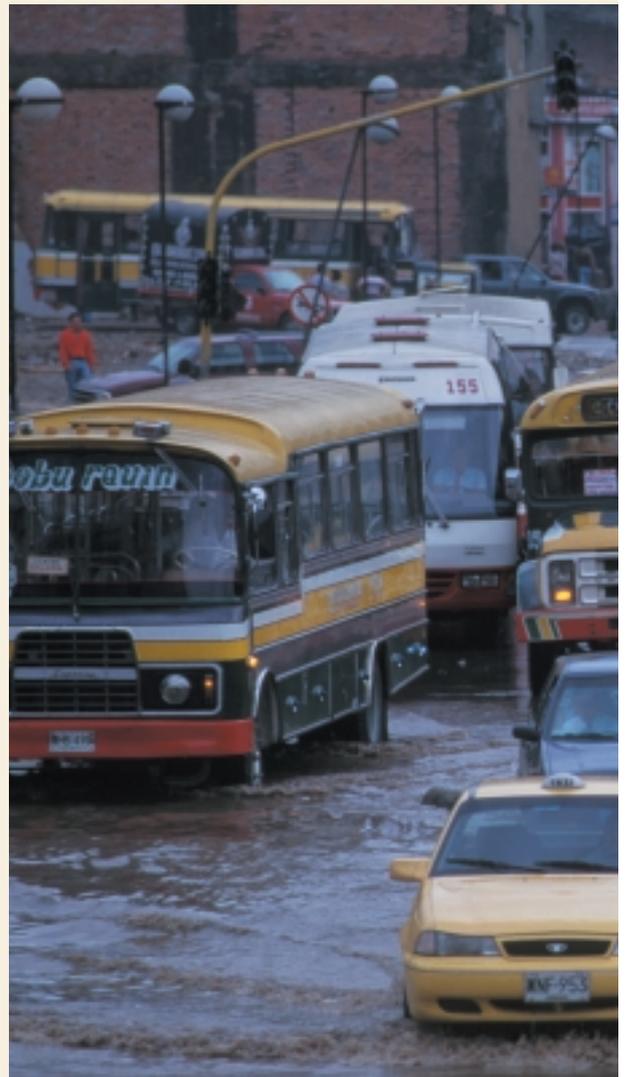
Our current climate has a number of implications for the health of the poor. Different aspects of the climate (including average climate conditions, seasonality and climate extremes) affect health: e.g. vector diseases such as malaria are limited by temperature and humidity; outbreaks of cholera often show seasonality; and climate extremes can have a number of health impacts from flooding, heat waves and wind-storms.

Responding to these challenges requires us to reduce the vulnerability of the poor more generally and to improve planning to take into account the impacts of increasing climate variability.

Climate and health

The Millennium Development Goals (MDGs) recognise the role of poor health in increasing the vulnerability of individuals of certain age groups, gender and social status, and of perpetuating vulnerability by hindering education and livelihoods.

Climate change will worsen health principally through: increased vulnerability to poor health due to reduced food security and water security; water-borne diseases associated with reduced water quality due to floods and drought; more favourable conditions for the



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Climate change will modify the dispersal, reproduction, maturation and survival rate of vector species

spread of vector-borne and air-borne diseases; and the direct link between temperatures and heat stress¹.

Food and water security

Food insecurity and water insecurity are likely to increase because of the greater frequencies of droughts and floods, which have a direct impact on areas vulnerable to malnutrition. Climate change will also have an impact on food supply in the wider economy (due to impacts on large-scale agriculture, loss of land through rising sea level and salinisation, and the impacts of rising sea level and changes in water temperatures, currents, freshwater flows and nutrient circulation on fisheries production).

Malnutrition is a global health problem and it is estimated that approximately 790 million people do not have adequate nutrition. Regions where malnutrition is widespread are usually areas characterised by erratic rainfall, resulting in highly variable agricultural yields seasonally and from year to year. This yield variability can lead to malnutrition or even famine where it is combined with the absence of effective coping strategies or safety nets. Groups that are most at risk from malnutrition include the rural producers, pastoralists, rural labourers, the urban poor people, refugees and displaced people. Pastoralists in particular will be affected by lowered livestock productivity and death due to drought, floods or disease.

Water quality

Currently approximately 1 billion people do not have access to safe water, and suffer from water-borne diseases. Climate change will increase the occurrence of conditions that favour the spread of water-borne disease. Increases in temperature and humidity result directly in increased rates of reproduction and survival of bacterial, protozoan and viral pathogens. Many diarrhoeal diseases, which can be transmitted via multiple routes, peak in the hottest months of the year, e.g. Salmonella and Shigella.

In situations of drought, the reduced water supply results in an increased rate of water-borne disease due to both physical and human factors: there is an increased concentration of pathogens in water sources as pathogens multiply at an increased rate, and the volume of water decreases; people are forced to use more contaminated sources as their preferred source runs out; and there will be increased concentrations of people around the remaining water points.

Floods can result in acute health impacts for vulnerable regions, through increases in infectious diseases increases in respiratory and diarrhoeal diseases because of crowding of survivors, often with limited shelter and access to potable water. Floods can also disrupt water supply or sewerage systems, and lead to exposure to dangerous chemicals or pathogens released from storage sites and waste disposal sites. Sudden onset of floods can also cause injury, and the impact on livelihoods causes increased anxiety and depression.

Vector-borne diseases

Vector-borne infectious diseases, such as malaria and dengue fever, have a significant impact on health and poverty. Currently, approximately 40% of the world's population is at risk from malaria, and this is projected to increase to 80% by 2080. More than half the world's population live in areas at risk of dengue fever.

Climate change will modify the dispersal, reproduction, maturation and survival rate of vector species and consequently alter disease transmission. Temperature, humidity, rainfall, soil moisture and the rising sea level are changes in climate that have implications for disease transmission. The following vector-borne diseases are considered sensitive to climate change:

- Malaria – transmitted by mosquitoes in tropical areas;
- Dengue – transmitted by mosquitoes;
- Schistosomiasis – transmitted by flat worm; and
- Tick-borne diseases.

Climate already plays a significant role in health

Our current climate has a number of implications for health of the poor and their livestock. Current climate affects health outcomes through:

- 'Climate envelopes' i.e. areas of a particular climate and ecosystem;
- Seasonality;
- Inter-annual variability;
- Climate extremes (shocks); and
- Climate shifts (decadal).

¹ Kovats, S., Ebi, K.L. and Menne, B. 2003 Methods of assessing human health vulnerability and public health adaptation to climate change. WMO and UNEP.

Climate change will increase the occurrence of conditions that favour the spread of water-borne disease

Climate envelopes

Certain diseases are confined to areas of a particular climate and ecosystem i.e. 'a climate envelope'. Malaria is a case in point where, depending of the type of mosquito-vector, the distribution is limited by certain climatic and environmental conditions, in particular temperature and humidity.

Seasonality

A number of infectious diseases (e.g. vector-borne and bacterial diseases) are closely associated with seasonal patterns. For example in the Gambia, diarrhoea in young children has been linked with the summer rains. In West Africa, meningitis is associated with dust in semi-arid conditions, and among people with poor, overcrowded living conditions.

Inter-annual variability

Variability in water supplies or food security can be a consequence of inter-annual climate variability where poor planning systems are combined with reduced rainfall or reduced river flows. In 2000, 18,000 villages in Gujarat were faced with serious water shortages following the worst drought in 100 years.

Climate extremes

Extreme climatic events can trigger infectious diseases or death, disrupting access to health services, and causing the displacement of people.

a) Infectious diseases and death

Infectious diseases and death are often associated with climate extremes. The poor are most often the victims of such impacts owing to their inability to protect themselves.

- Following the flooding associated with Hurricane Mitch (1999), the incidence of cholera increased four-fold in Guatemala and six-fold in Nicaragua.
- In May 2002 an intense heat wave hit southern India killing more than 1,000 people, mainly those living in over-crowded conditions or out-door labourers.
- Bangladesh has experienced an increase in cholera occurrence with the increase in the severity of El Niño-related floods over the past 70 years.
- Rift Valley Fever among livestock is associated with heavy rainfall: for example, flooding

associated with the 1997-8 El Niño led to the loss of huge numbers of livestock to Rift Valley Disease and resulted in a billion dollar ban by the Gulf States on trade from East Africa.

b) Disrupting access to health services

Climate extremes such as flooding or windstorms can disrupt access to health services through damage to facilities and transport networks.

- The 1997-1998 El Niño flooding and hurricane events across Ecuador and Peru resulted in damage to 34 hospitals and 485 health centres, many of which were the only facilities for miles around.
- The 1999 floods in Mozambique caused damage to road networks estimated at US\$6 million. Despite the essential role of health services following such a disaster there is often no means in place to protect medical supplies or quickly reinstate access to health services.

c) Displacement

Extreme events are also associated with the displacement of people, makeshift accommodation, inadequate facilities, and inadequate nutrition. Incidences of TB and malaria have been found to increase in refugee camps as a result of the overcrowded conditions and lack of protective elements of the home.

Climate shifts

Climate shifts over decades can result in land-use change and migration. Land-use influences the environmental conditions that limit certain diseases, and migration can have implications for the spread of diseases (e.g. HIV/AIDS).

The inability of developing countries to cope with the current climate

The current climate impacts the health of the poor as a result of:

- The vulnerability of the poor;
- A lack of planning for risks including climate risks; and
- The inability of developing countries to afford to undertake preparedness or preventative action.

Food insecurity is likely to increase

Vulnerability of the poor

The impacts of climate on the health of the poor is often a result of underlying vulnerabilities such as lack of clean water, lack of sanitation services, overcrowded living conditions and a lack of access to human or livestock health services.

This was clearly illustrated following disaster floods in China during 1954: 90% of deaths were due to communicable diseases including dysentery, typhoid and cholera. Following improvements in water and sanitation, no such epidemics were reported after the 1998 Yangtze flood.

Lack of planning

Water and food security is determined by political and institutional factors as well as water availability. Often, planning does not take into account climate variability and its impacts on the poor.

Developing countries' planning processes (including Poverty Reduction Strategies) fail to account for the impacts of current climate on health.

Lack of preparedness and prevention

Developing countries are particularly susceptible to the climate's impact on health due to their inability to afford the necessary preparedness and prevention strategies. For example, malaria is not a significant problem in countries where the public health services can afford to take environmental control procedures and provide effective treatment, and individuals can afford private protection from malaria.

Preparedness and prevention also require good climate and surveillance information to delimit risk areas and set up early warning systems. This is often lacking in developing countries.

Longer term climate change

Climate change is predicted to increase temperatures, alter climate envelopes and seasonality, and increase inter-annual variability, the frequency and intensity of some climate extremes and decadal climate shifts.

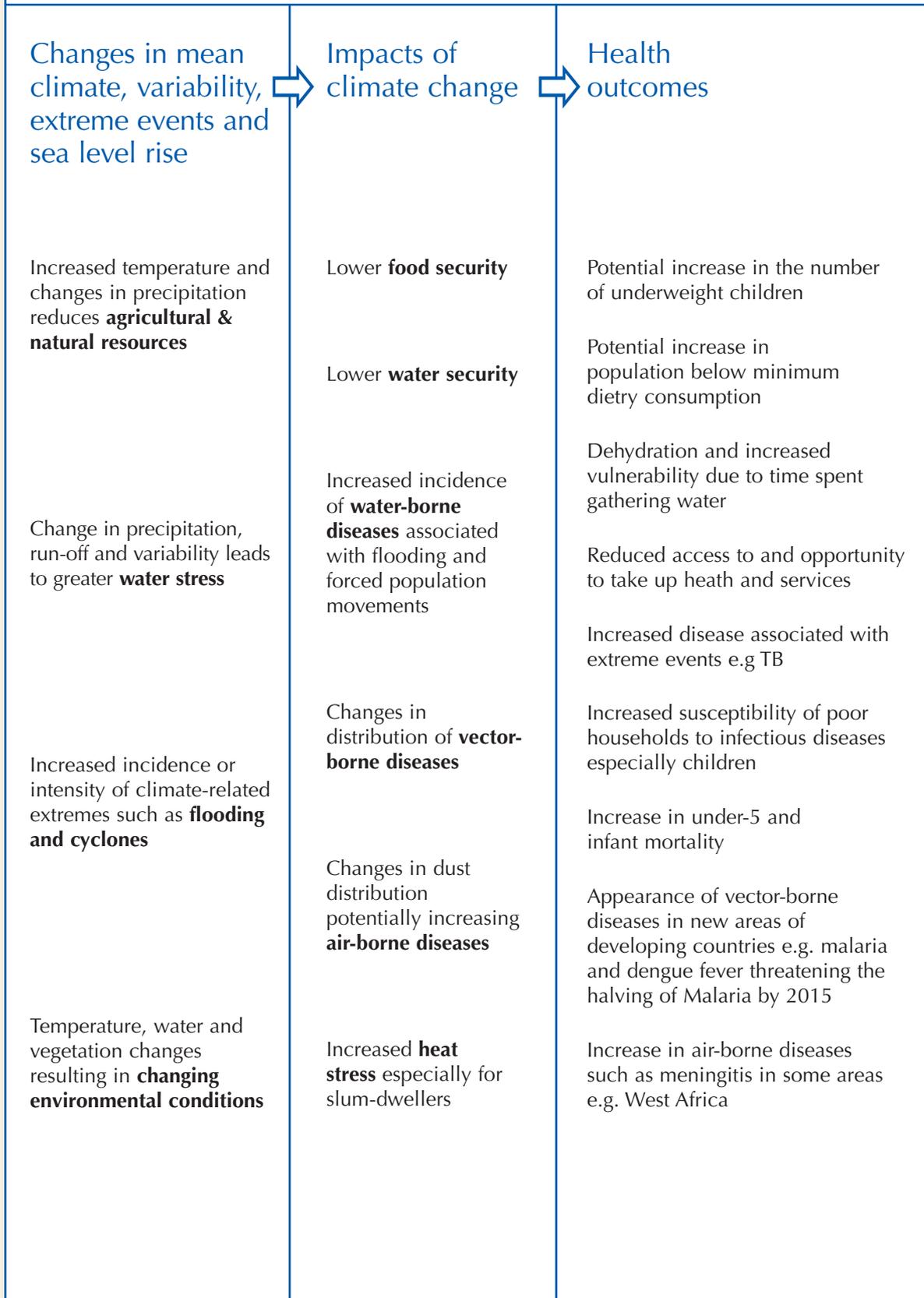
Despite the uncertainty of specific predictions, especially on a small scale and in the near future, the general trends associated with

climate change suggest the following implications for the health of the poor and their livestock (Figure 1).

- Increased food insecurity: Over 800 million people currently suffer from hunger. Increased variation in rainfall changes in seasons and increased droughts or flooding has implications for food security, and malnutrition.
 - Increased water insecurity: Water insecurity currently afflicts 1.2 billion people. Even without taking climate change into account, the number of water insecure people is predicted to increase by 600 million by 2025. Climate change adds urgency to addressing this deficit through its impact on rainfall, river flows, lake levels and groundwater recharge. Alterations in inter-annual variability and the threat of more frequent droughts could significantly worsen this situation.
 - Increase in water-borne diseases: Increased flooding events associated with climate extremes may increase water-borne diseases such as cholera and other diarrhoeal diseases.
 - Changes in vector-borne diseases: Climate change may cause shifts in vector-borne diseases. For example, an increase in malaria has recently been recorded in the East African Highlands, where increasing temperatures may be one of the causes.
- There have also been estimates of an additional 1 billion people at risk of dengue fever resulting from climate change. Dengue fever has recently been reinvading urban slum settlements of South America, and with no vaccine or drug available, the disease has serious consequences for those infected with a number of strains.
- Increase in air-borne diseases: Increasing levels of dust associated with the droughts and climate change in West Africa are thought to be contributing to the spread of some strains of meningitis.
 - Increased heat stress: Increases in temperature with climate change may result in heat stress becoming increasingly significant in urban areas, especially for slum dwellers.
 - Increased livestock diseases: It is likely that there will be increases in some livestock diseases, for example Trypanosomiasis which is associated with Tsetse vectors in Africa.

Figure 1

The impacts of climate change on health



The country-level response

Addressing health vulnerabilities to climate change requires strengthening of planning systems and putting more emphasis on preventative approaches to health rather than curative measures. It also requires a multisectoral approach, for example to ensure adequate water supply and sanitation, and an effective food security policy, to ensure that all health risks are addressed and opportunities for improved health are harnessed. For example:



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Improved planning

- Plan critical health facilities to take account of climate risks;
- Analyse the risks of current climate and future climate change to both national and international (e.g. roll back malaria) health policies and programmes;
- Analyse the risks of climate change to water supply and sanitation, and to food security plans and programmes; and
- Allocate additional funds for rehabilitation of health services and restoration of access following climatic extremes.

Improved preparedness and prevention

- Improve water and sanitation networks to prevent disease outbreaks associated with flooding or drought. For example in urban areas, the impact of floods can be reduced by infrastructure that removes solid waste and wastewater together with supplying drinking water;
- Improve surveillance of disease to help identify outbreaks and take preventative action. Health early warning systems can make use of climate, environmental and population movement data to improve prediction;
- Improve policies (including trade, agricultural, and land policies) and early warning systems to ensure food security; and
- Continue support for preventative control of vector-borne diseases to avert the emergence or resurgence of malaria risk areas with climate change.

Further key sheets provide detail on adaptation to climate change:

- Key sheet 06 Adaptation to climate change: Making development disaster proof;
- Key sheet 07 Adaptation to climate change: The right information can help the poor to cope;
- Key sheet 08 Adaptation to climate change: Can insurance reduce the vulnerability of the poor? and
- Key sheet 09 Taking initial steps towards adaptation.

Bibliography

Findley, S. 1994 Does Drought Increase Migration? A study from Rural Mali during 1983-85. *International Migration Review* Vol XXVII No. 3.

Abramovitz, J. 2001 *Unnatural Disasters*. Worldwatch Institute.

IPCC 2001 *Climate Change 2001: Impacts, Adaptation and Vulnerability*. Cambridge Publishing.

Findley, S., Zayan, A., Kere, M., Kone, Y. and Sogbo, G. 1997 Stretching the limits of health interventions in Burkino Faso. *Forum: Health Transition Review* :73-107.

Disasters Preparedness and Mitigation in the Americas: Issue No. 84: <http://www.paho.org/English/PED/NewsletterEng84.pdf>.

Githeko, A.K., Lindsay, S.W., Confalonieri, U.E. and Patz J.A. 2000. Climate change and vector-borne diseases: a regional analysis. *Bulletin of the World Health Organisation*, 78(9):1136-47.

Martens et al 1999 Climate Change and future populations at risk of malaria. *Global Environmental Change* 9 S89-S107.

Hales, S., de Wet N., Maindonald, J. and Woodward A. 2002 Potential effects of population and climate changes on global distribution of dengue fever: an empirical model. *The Lancet* 360, September 14 2002.

Rowland, M. 1986 *Dialogue on Diarrhoea*. The international newsletter on the control of diarrhoeal diseases Issue 26 (page 3): <http://www.rehydrate.org/dd/dd26.htm#page3>.

Patz, J.A. 2002 Commentary: A human disease indicator for the effects of recent global climate change. *PNAS* 99(20).

Bradley, D., Caincross, S., Haines, A., and Stephens, C. 2001 *Health and Sustainable Development*. IEED Option (World Summit on Sustainable Development).

Caincross, S. 2003 *Guidance Note On Environmental Health*.

WHO 2000 *Proceedings from the Workshop: Climate Variability and Change and their Effects in Pacific Island Countries*, Apia, Samoa, 25-28 July 2000. World Health Organisation.

WHO 1999 *Climate and Health: Working Group Meeting 18-19 May 1999 – Protection of the Human Environment*. Occupational and Environmental Health Series.

Thomson, M.C., Connor, S.J., Ward, N. and Molyneux, D. 2003 The impact of climate variability on infectious disease in West Africa.

Petrera M. and Montoya A. 1992 Loss in the time of cholera; Peru 1999. *PAHO Epidemiological Bulletin* 13 (3): 9-11.

WHO/Unicef 2000 *Global Water Supply and Sanitation Assessment*.

Further reading

McMichael, A.J., Campbell-Lendrum, D.H., Corvalán, C.F., and Ebi, K.L. 2003 Climate change and health. World Health Organisation. Available at <http://www.who.int/bookorders/index.htm>

Kovats, S., Ebi, K.L. and Menne, B. 2003 Methods of assessing human health vulnerability and public health adaptation to climate change. World Meteorological Organisations and UN Environment Programme.

Centre for Health and the Global Environment (Harvard Medical School): <http://www.med.harvard.edu/chge/>

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