

## Reducing the impact of climate change

The most recent report of the Intergovernmental Panel on Climate Change (IPCC) found that there is overwhelming evidence that humans are affecting climate and it highlighted the implications for human health. The World Health Organization (WHO) is helping countries respond to this challenge, primarily by encouraging them to build and reinforce public health systems as the first line of defence against climate-related health risks.

There is mounting scientific evidence that climate change threatens the health of millions of people, but many governments are only just starting to act. WHO's new strategy is to provide them with evidence and advise them on the best course of protective action.

For WHO, the shift to working in this way has been rapid: 12 months ago, save for a few workshops in developing countries, its environment-related activities were mainly based on publishing. But this refocusing of priorities echoes

a change of opinion among Member States that can be traced in part to the severe heatwaves that engulfed Europe in 2003.

"When the heatwaves came, there were thousands of additional deaths in countries with some of the best health systems in the world," recalls Diarmid Campbell-Lendrum, a senior scientist in the department of Public Health and Environment at WHO. "It was a dramatic reminder that we are vulnerable and we need to think about how to manage these risks."

This shocking experience spurred Europe to take action. But outside Europe, making the link between climate and health has been harder because of the difficulty of demonstrating that climate is responsible for specific health risks and of describing the wide range of possible outcomes. Often-cited consequences of changing temperatures include droughts, floods, alterations in the burden of vector-borne and water-related disease, and increases in freak weather events or natural disasters that can affect health through injury, malnutrition or impoverishment.

But there are a number of indirect health effects that are difficult to quantify because, explains Campbell-Lendrum, "we can't say that climate

change is the only cause of an event, only that it increases the likelihood of those changes occurring." The difficulty of defining a causal relationship makes health-sector planning for environmental change a challenge.

There is, however, consensus on which countries are most likely to feel the effects of climate change the soonest. Small island states, being characteristically low-lying and geographically isolated, are most clearly at risk of adverse effects, says Campbell-Lendrum.

But capacity for preparedness also depends on a country's resources and its

public health system. And for countries that combine all of these risk factors – much of Bangladesh, for instance, and many African countries – without appropriate preventive action, the future looks bleak.

The main message WHO has tried to get across to these vulnerable places is the importance of building and reinforcing public health infrastructure, implementing an epidemiological surveillance system and increasing capacity to respond to vector-borne disease. However, since the Geneva-based WHO climate change team started doing workshops with countries in 2000, they have found that some of the member states' worries differ from the headquarters team's predictions. "It is only when you work directly with practitioners on the ground that you get the real identification of problems," explains Campbell-Lendrum.

A pilot project this year in seven countries to test ways to combat climate change's health effects has shown inter-

“When the heatwaves came, there were thousands of additional deaths in countries with some of the best health systems in the world.”

*Diarmid Campbell-Lendrum, senior scientist in WHO's Public Health and Environment department.*



The photo "Camel boy" by Boniface Mwangi won third prize in the WHO photo and video contest Images of Health and Disability 2007 Special Theme: Health and Environment. A child eats as he waits for his parents to water the family herd of camels at a watering point in Al-Akaburu, Garish district in Kenya. During water scarcity many nomad families are forced to share their water with their livestock. Many deaths from dysentery and diarrhoea are caused by drinking contaminated water.

Boniface Mwangi

esting results. Barbados, Bhutan, China, Fiji, Jordan, Kenya and Uzbekistan were involved in the scheme supported by WHO and the United Nations Environment Programme. According to Campbell-Lendrum, the main worry WHO had expected to encounter was a rise in sea levels. But countries were more concerned about water stress, either floods or droughts. That thinking makes sense when you look at the public health context, says Campbell-Lendrum, because these countries already have problems supplying water to outlying areas, and they have a high burden of disease sensitive to water supply, such as diarrhoeal disorders. "But these are not the things we would have picked up on from Geneva," he says.

Another surprise came from arid Jordan. "We had expected them to tell us that they would have problems supplying clean water to households," Campbell-Lendrum explains. "In fact, they think they can guarantee these supplies. Their main concern is that actions to address climate change in other sectors, such as scaling up the use of wastewater in agriculture, would bring new health risks, such as chemical and biological contamination of food."

How can WHO help vulnerable countries? It can provide technical support for improving basic public health services, making best use of water supplies and ensuring water safety. These activities have been part of WHO's climate change strategy for a while, but WHO is planning more. Dr Maria Neira, director of the Public Health and Environment department, says that WHO will release a Global Framework on Protecting Health from Climate Change at the United Nations Framework Convention on Climate Change conference in Bali, Indonesia, in December.

This document, which is currently undergoing peer review, will contain numerous recommendations for countries, policy-makers, the private sector and

### Countries that participated in a pilot project this year to test ways to combat the health effects of climate change

- Barbados
- Bhutan
- China
- Fiji
- Jordan
- Kenya
- Uzbekistan

### Projected health impacts of climate change

(The IPCC assigns confidence levels according to the scientific evidence available)

- Increase malnutrition and consequent disorders, including those relating to child growth and development (high confidence)
- Increase the number of people dying and suffering from disease and injury due to heatwaves, floods, storms, fires and droughts (high confidence)
- Continue to change the range of some infectious disease vectors (high confidence)
- Have mixed effects on malaria; in some places the geographical range will contract, elsewhere the geographical range will expand and the transmission season may be changed (very high confidence)
- Increase the burden of diarrhoeal diseases (medium confidence)
- Increase cardio-respiratory morbidity and mortality associated with ground-level ozone (high confidence)
- Bring some benefits to health, including fewer deaths from cold, although it is expected that these will be outweighed by the negative effects of rising temperatures worldwide, especially in developing countries (high confidence)

(From the IPCC report working group II, Chapter 8, available at: [www.ipcc-wg2.org/](http://www.ipcc-wg2.org/))

even the general public on what can be done to reduce environmental damage and improve health. But the key tenet of the document, and the current focus of WHO's advocacy, will be using the health argument to push for policies that promote public health while reducing greenhouse gas emissions. According to Neira, this document bolsters the economic case for action on climate change now rather than later.

Neira argues that preparing for the health effects of climate change is not just about preparing for the likely increase in case loads or changes in the burden of disease. It is about making governments aware that health departments need to talk to their colleagues in other areas of government to convince them that health needs to be part of different agendas, including planning, transport and trade. "The health sector needs to be empowered to be part of decision-making" in those areas, she says.

Thanks to effective campaigning and support from WHO Director-General Dr Margaret Chan – who earlier this year said climate change "may turn out to be the most ominous struggle" facing health in coming years – there is already high-level support for this strategy. Chan has since made protecting health against the effects of

climate change next year's theme for World Health Day (7 April 2008) and WHO's 60th anniversary celebrations. Spanish Prime Minister José Luis Rodríguez Zapatero stated his support for the WHO strategy at the UN Climate Change Summit in New York in September and pledged 3 million euros (US\$ 4.227 million) for its implemen-

tation. "Countries are more and more realizing that health can be a driving force for this climate change agenda, and there will be negative effect on health for not taking action now," says Neira.

Given the scale of the changes needed to combat climate change, optimism is often in short supply. However, both Neira and Campbell-Lendrum say there is an important oppor-

tunity to convince emerging powers like China and India that implementing policies now to reduce greenhouse gas emissions can have benefits that are immediate and local, as well as long-term and global.

"There are many reasons that people will advance not to do it. But if we make these changes, there are potentially very large benefits," says Campbell-Lendrum. "The message is: if you cut greenhouse gas emissions, it is not all pain and no gain." ■

Hannah Brown, *London*

“Countries are more and more realizing that health can be a driving force for the climate change agenda and there will be a negative effect on health if action is not taken now.”

*Maria Neira, director of WHO's Public Health and Environment department.*



## Will increased awareness of the health impacts of climate change help in achieving international collective action?

Three experts discuss the ideas outlined by Antonio Postigo. They debate the importance of health in spurring action on climate change and look at how the international community can best respond.

### THE ISSUE

#### Antonio Postigo

London School of Economics, Development Studies Institute, United Kingdom

Climate change is estimated to cause some 150 000 deaths annually, a figure that could double by 2030. The lack of a credible global system to reduce greenhouse gases is one example of the difficulties of finding a path for collective action on issues that affect the whole world. Could a better understanding of the impact climate change has on human health help break the political impasse?

Environmental experts predict increasing temperatures, rising sea levels, that coastal areas will receive more rain and inland areas more droughts,

and more frequent extreme weather events. However, estimating the burden of disease due to climate change is difficult. Climate change will have the most severe impact on countries with a low capacity to adapt. But if changes happen rapidly even rich countries will suffer problems such as heat stress, more respiratory illness, and changes in vector- and rodent-borne diseases. Some projections estimate that in 80 years climate change may double the population living in areas at risk for dengue fever and increase by 2–4% the proportion of people living in malaria risk areas.

#### Key message

The health effects of climate change require specific interventions in addition to greenhouse gas reduction

Even if an international agreement on emissions was reached, it would not stave off the existing effects of climate change on health. Specific interventions are therefore necessary, but first we need more research and evidence. There is an urgent need to standardize international protocols for surveillance to monitor changes to human-health indicators as the climate alters. And the international community must help developing countries build up the preventive and adaptive capacity through financial and technical assistance. ■

### COLLECTIVE ACTION

#### Andy Haines

Professor of Public Health and Primary Care, London School of Hygiene and Tropical Medicine, United Kingdom

Health is just one part of the spectrum of impacts of climate change but I think the risk of endangering health increases motivation on decision-makers because there would be many benefits that strengthen the case for acting now.

The problem is that we are at a relatively early stage in the evolution of climate change and many of the effects will not become evident for decades to come. When advising on what preparations are necessary, it is important to remember that it is not just change but variability in climate that will cause the worst problems. Health systems need to consider climate in terms of natural disasters and fluctuations in disease burden. However, the good news is that many of the likely relations between climate and health will respond to measures that should be taken anyway, so they are not completely new policies.

#### Key message

Health is an argument for action, but success depends on the current track record of disease control



Nimai Chandra Ghosh

The photo "Sleeping on the river bed" by Nimai Chandra Ghosh won a special mention in the WHO photo and video contest Images of Health and Disability 2007 Special Theme: Health and Environment. A boy sleeps on a dried-up river bed in India. Experts believe that climate change is increasing the frequency and severity of droughts.

But we are not doing them well enough now. Malnutrition is a good example. Most climate-change scenarios suggest that agricultural production might shift and this has health consequences, particularly in sub-Saharan Africa where many people are already malnourished.

Good policies will therefore be crucial – but they are strategies that need to be in place already.

Reinforcing public health systems is key to helping us adapt. And there are lots of other win-win situations to be derived from considering the

health impacts of climate change in future policy changes. However, success depends very much on progress in coming decades on controlling the diseases most likely to be climate sensitive. ■

## PRO-HEALTH POLICIES

### Maria Neira

Director, Public Health and Environment department, World Health Organization, Switzerland

I think one of the major problems with mainstream thinking about climate change and health is that people focus only on the actions that need to be taken to respond to things like more cases of malaria. But they really should be thinking in terms of how this extra stress fits into the entire environmental health agenda. By considering the issue more broadly we could reduce by 25% the global burden of disease.

For this to work, the health sector needs to sit with other sectors and say health needs to be part of your agenda. They need to be empowered to be part

of decision-making. For the World Health Organization (WHO), this means providing health officials with specific evidence about the consequences of climate change and what they can do. We are telling them that they need to have a good epidemiological surveillance system in place. They need to be better prepared to respond to vector-borne disease. They need to take into account likely increases in patient numbers and natural disasters that create injuries. But the more ambitious thing is to provide health sectors with a catalogue of potential

### Key message

Good climate-change preparation policies should also reduce the burden of disease

interventions to discuss with other sectors that can reduce current risk factors for poor health as well as preparing for the future. For example, interacting with transport officials that make decisions on the use of private cars presents the opportunity of reducing respiratory diseases. Talking to urban planners will make sure any policy changes also affect obesity and inactivity. And bureaucrats involved in the management of chemicals could act to prevent pollution-related ill-health. ■

## SPECIFIC VULNERABILITIES

### Ulisses Confalonieri

Professor of Public Health, Oswaldo Cruz Foundation (FIOCRUZ), Brazil

Health is always a strong argument for taking action. But when it comes to climate change, the problem is that there is not enough research on health impacts in country-specific contexts. For example, many people in sub-Saharan Africa may be affected by changes in climatic conditions but there is no research coming from those countries on how climate will affect the livelihoods of the population.

In Brazil, the federal government has recently become really concerned about the prospect of a changing climate, and its impact on health, and is now designing a national plan for adaptation, although as yet there is no concrete action. We don't have enough research or even monitoring to support the argument that the health of people here is already being affected. We do have climatic scenarios for South America as a whole,

### Key message

In addition to global action, developing countries need external help to identify their specific vulnerabilities



Nigel Bruce

The photo "Smoke over roofs" by Nigel Bruce won a special mention in the WHO photo and video contest Images of Health and Disability 2007 Special Theme: Health and Environment. The photo is of roofs in Gatlang, Nepal. Solid fuel use is not only damaging to people's health – it is unsustainable for the environment. The consequences are indoor and outdoor air pollution and respiratory disease.





Dennis Rito

The photo "Slum Dwellers" by Dennis Rito won a special mention in the WHO photo and video contest Images of Health and Disability 2007 Special Theme: Health and Environment. The photo shows children who live under a bridge in Manila in the Philippines. People who live in urban slums and insanitary housing conditions face a high risk diarrhoeal and other infectious diseases, while children are the most vulnerable to these environment-related diseases.

and some of these are very worrisome because the semi-arid regions in the northeast, home to 50 million people, may become desert. However, I believe we need a broad discussion of specific regional vulnerabilities. Countries must identify what are their specific health problems and how they will get worse because of the new stress caused by a changing climate. For us in developing countries, this is the key issue. We are not going to develop global climate models, since we don't have the science or the financial resources. But we need to know how we can assess vulnerable people in our own countries. This will give us a better technical proposal to put to governments and lobby for action. But for most countries it will require external technical and financial input. ■

### India's last bastion of polio at "tipping point"

The world is on the brink of eradicating polio, but success depends largely on removing the pocket of wild poliovirus in the Indian state of Uttar Pradesh.

The most dangerous form of polio has reached a historic low in a stronghold in India. The single most important pocket of polio – Moradabad and surrounding districts in western Uttar Pradesh – has repeatedly exported wild poliovirus to other states in India and abroad. But epidemiologists there say they have reached a "tipping point" in the eradication campaign.

Polio remains endemic in just four countries – Afghanistan, India, Nigeria and Pakistan – down from 125 countries in 1988. Nine other countries reported importation of poliovirus in 2006. Polio is caused by poliovirus type-1, type-2 or type-3. Type-2 poliovirus was eliminated worldwide in 1999. In 2006 there were 338 cases of type-1 polio in the western part of Uttar Pradesh state. By the end of September 2007, the core endemic area of the western part of Uttar Pradesh state had been free of type-1 poliovirus for nine months. Never before has the most virulent and most dangerous form of the disease disappeared from its Indian heartland for such a long period. Only four type-1 polio cases had been identified in the whole of western Uttar Pradesh by the end of September 2007. In 2006, the key area had 338 cases.

"The real challenge to global polio eradication is the persistence of type-1

transmission in western Uttar Pradesh," said Dr Hamid Jafari, project manager of the World Health Organization's (WHO) National Polio Surveillance Project. "If type-1 can be eliminated here, we can definitively say the war on polio worldwide can be won".

Polio is so resistant to eradication in this part of India because of the combination of extreme poverty, poor sanitation and the high population

density. Such conditions facilitate transmission of the virus and compromise the efficacy of the oral vaccine.

In 2005, India moved away from its exclusive reliance on traditional trivalent oral polio vaccine and started using monovalent oral vaccines, which target either of the remaining two serotypes – type-1 and type-3. These newer vaccines are more efficacious per dose and boost immunity faster than trivalent vaccines.

The following year, however, another outbreak of type-1 polio occurred in India, again in western Uttar Pradesh, following a decline in vaccination



WHO/David Orr

Volunteers mark houses with a "P" where children have been vaccinated. They mark houses with an "X", where the children living there were not available and where volunteers must return later to finish the job.

coverage. From there, it spread quickly throughout the state and beyond. By the end of the year, 648 confirmed cases of type-1 polio had been declared throughout India.

The government of India embarked on an intensified vaccination strategy in western Uttar Pradesh and the neighbouring Bihar state at the start of 2007. By mid-September Bihar had already conducted 10 vaccination campaigns – a higher level of polio vaccination activity than anywhere else in the world.

This September, the eighth vaccination round was conducted in Moradabad. On the first day of the campaign 604 294 children were immunized at 3445 booths across the Moradabad district. By the end of the round a week later, 946 082 children had been immunized through the district.

“This is definitely our make or break year,” said Dr Vibhor Jain, sub-regional team leader for the National Polio Surveillance Project in Moradabad. “There’s no room for complacency but, so far, the results are very encouraging.”

The logistical challenge of the anti-polio campaign was evident: 1729 vaccination teams visited the more than 700 000 homes of Moradabad district during the September round, covering rural and urban areas. Additional teams visited transit sites such as railway stations, bus and rickshaw stands, busy intersections, markets, doctors’ clinics, even running trains. Some 30 “mobile” teams visited brick kilns, construction sites, sugar mills and factories where children live or accompany their parents.

The team that visited the Moradabad neighbourhood of Rehmat Nagar Society on 10 September comprised three female vaccinators (two of whom were volunteers paid 50 rupees, US\$ 1.2 a day), a volunteer “influencer” (a prominent member of the community who helps persuade reluctant parents to have their child vaccinated) and a United Nations Children’s Fund



Volunteer gives child oral polio vaccination while the father looks on.

WHO/David Orr

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*Dr Vibhor Jain, team leader, National Polio Surveillance Project.*

(UNICEF) community “mobilizer” who creates awareness within his, or her, community of the need for immunization. In the morning, they called on 115 families in the Muslim-dominated neighbourhood, categorized as a polio high-risk area. They vaccinated 19 children who had not been taken to one of five local booths the previous day, marking their houses with a “P” and marking with an “X” the dwellings of 24 young children not available for a variety of reasons. In the afternoon, they returned to those houses marked

with an “X”.

Careful management of anxieties over the immunization programme, particularly among poorer communities and those under-served by the health services, has improved vaccination rates. “In earlier rounds, we encountered families refusing to allow us vaccinate their children because they feared it would cause sterility,” said vaccinator Rita, an employee of the state’s child labour department. “But this time, we’ve had not one family refusing us. The way things are going we feel we’re now going to win the battle against polio.” Follow-up has also improved. “A vaccination team will

visit one house up to 10 times in one round if necessary,” said Dr Kanwaljit Singh, a surveillance medical officer in Moradabad. “The follow-through on “X” houses has become so efficient that I’d say more than 95% of children are vaccinated by the end of each round in this district”.

Other significant factors have been the improved identification and tracking of newborns since 2006; the increased emphasis on community involvement since 2006; and the introduction in 2007 of a comprehensive migrant vaccination strategy. This strategy targets children of migrant labourers who travel seasonally throughout northern India from Uttar Pradesh and neighbouring Bihar.

A perhaps inevitable consequence of using the monovalent vaccine against type-1 polio has been a resurgence of type-3 polio in India. Officials regard this situation as “manageable” and the priority remains the fight against the age-old enemy, type-1 polio.

“We know the world is watching what we’re doing in western Uttar Pradesh,” said Jafari. “If we can maintain the current level of success against type-1 polio till the end of the year, we’ll be able to start breathing a bit easier. There’s no margin for error. If we make a mistake, then we’ll pay for it and the virus could come back roaring.” ■

*David Orr, Moradabad*