Vulnerability and Adaptation to the Health Impacts of Climate Change

ANTONIO POSTIGO

ABSTRACT *Antonio Postigo argues that in contrast to the increasing recognition of the environmental outcomes of climate change, its consequences on human health have received little attention. These health impacts will be largely shaped by socio-economic factors being more severe among vulnerable communities in developing countries. He outlines the need to integrate health vulnerabilities into climate change mitigation and adaptation strategies. Greater consideration of the health effects of climate change could help build stronger political priority for climate policy.*

KEYWORDS *climate change adaptation; developing countries; health; socio-economic determinants of health; poverty and health; vulnerability assessment*

Introduction

The influence of *local* climatic conditions on human health was already noted by the IV BC physician Hippocrates. Mounting evidence suggests that we have now entered an era of *global* climate change (CC) that could have serious consequences for human health. The *Fourth Assessment Report* of the Intergovernmental Panel on Climate Change (IPCC) considers that current changes in climate, chiefly global warming, are with at least 90 percent probability related to human behaviour (IPCC, 2007a: 135–137). Since the Industrial Revolution but especially over the last three decades, human activities have dramatically increased the concentration of greenhouse gases and hastened global warming. The IPCC Report forecasts that average temperatures could increase 1.1°–6.4° C by the end of this century. Global warming will be accompanied by changes in the hydrological cycle, with increasing rainfall over coastal zones and drought in mid-continental regions at low-to-medium latitudes. Extreme-weather-events (EWE) will also become more frequent and intense and mean sea levels could rise significantly (IPCC, 2007a: 810).

As ongoing efforts on mitigation—by reducing greenhouse gas emissions—will be insufficient to stave off global warming, adaptation strategies—to anticipate and prepare for CC and reduce the burden—are increasingly being seen as an essential part of climate policy. However, formal climate policy instruments and institutions continue to be biased towards mitigation when not militating against progress on adaptation (Pielke *et al.*, 2007: 597–598). Likewise, research and policy on CC have traditionally centred on

environmental concerns and only more recently have addressed its effects on development. Despite health impacts often constituting the largest single cost of environmental damage, the health dimension has also been largely ignored in CC risk and adaptation assessments. It is estimated that CC is *already* claiming significant mortality and morbidity worldwide (over 150,000 lives annually) mostly in developing countries (McMichael *et al.*, 2004: 1545), which have hardly contributed to current global warming. Climate change could thus become a major barrier for global (and within-country) health equity. Just as ill-health is both a key outcome and determinant of poverty (Postigo *et al.*, 2007: 39–46), vulnerability to the health impacts of CC is also influenced by socio-economic conditions unrelated to climate. Despite numerous initiatives around the environmental effects of CC, political will – at both national and international levels – has been lacking to secure effective mitigation/adaptive action on the scale needed. It remains to be seen whether the impending health impacts of CC need to be fully realized to break the political impasse.

The following sections briefly outline the effects of CC on human health and discuss factors shaping health vulnerability. It is argued that health vulnerabilities – most related to extra-climatic socio-economic and political conditions – need to be factored and integrated within current efforts to mainstream climate mitigation and adaptation into development strategies. Health being a global public good, greater consideration to the health consequences of CC could help achieving collective action not only for climate policy but also for addressing the extra-climatic determinants of health vulnerability.

Assessing the health impacts of climate change

Developing reliable CC impact models is critical in identifying vulnerabilities, defining priorities and designing appropriate adaptation policies. However, uncertainties regarding variability over the CC trend (e.g. EWE) and complexities related to factors modulating response capacity mean that CC impact models are more apt on global/

regional projections than on local forecasting. Modelling the health burden of CC faces additional methodological challenges. First, the impacts of CC on health – as health itself – depends on a range of non-health and non-climatic variables (e.g. socio-economic, environmental and political factors) that are difficult to model. Second, most of the adverse health outcomes from CC result from local rather than global impacts, where forecasting models have been less adequate. Likewise, CC models are better at projecting average climatic change rather than variability, on which much of the effects of CC on health will depend. Still, important insights have been gained by studying the impacts of seasonal/regional climatic cycles such as the ‘El Niño Southern Oscillation’ (ENSO) (Patz *et al.*, 2007: 311–313). ENSO events are accompanied by deadly EWE and changes in the distribution/seasonality of certain diseases. While the health effects of CC will be multidimensional, and in some locations and populations could be beneficial, current and projected negative impacts are significant (reviewed in IPCC, 2007b: 396–405).

(1) Direct impacts:

- *Thermal stress.* Heat waves will become common and severe, especially in urban areas, with increased mortality among elders, infants and those in ill-health. With populations in most parts of the world becoming more urban heat-related deaths could rise significantly.
- *Respiratory illnesses.* Higher temperatures and levels of ultraviolet radiation will favour the formation of ground level ozone, increasing sensitivity to allergens.
- *Extreme weather events.* The frequency and intensity of EWE will increase and impacts will be larger in less developed countries with low adaptive capacity. In addition to direct deaths and injuries, EWE prompt population displacements creating conditions conducive for epidemic outbreaks.

(2) Indirect impacts. Climate change could also affect human health via more indirect, complex and not always fully understood mechanisms:

- *Infectious diseases.* CC may *potentially* alter the geographical and/or seasonal pattern of

diseases transmitted through vectors (e.g. mosquitoes, ticks, etc.). *Real* transmission will ultimately depend on socio-economic conditions and the effectiveness of public health programmes. Increases in temperature and humidity could accelerate the replication of pathogens and increasing the longevity and activity of vectors, resulting in new areas (e.g. higher altitudes and/or latitudes) becoming favourable for transmission. Likewise, global warming could also alter the temporal prevalence of certain infectious diseases making perennial their transmission which is currently blocked during winter. By the end of the century, CC could double the population living in areas at risk for dengue fever while the person-months of exposure to malaria in Africa could increase by 16–28 percent. Climate change could also affect the natural ecosystem of rodents and other animals that serve as hosts for human diseases (e.g. leptospirosis, Lyme disease, etc.).

- *Water-related diseases.* Droughts and destruction of water infrastructure during EWE could increase the reliance on unsafe sources of water, especially among the poor, increasing chances for the spread of typhoid, cholera, salmonellosis and other dysenteries that are important causes of mortality in the developing world.
- *Sea level increase.* Populations living in low-lying coastal regions could be affected by the predicted rise in sea levels. Mass flooding could cause deaths, trigger epidemics and provoke large population displacements.
- *Food production.* EWE and rising sea levels could destroy large areas of cropland. In some locations global warming will reduce agricultural output, affect the distribution of crops' pests and threaten food security.

Understanding health vulnerability to climate change

The association between CC and conventional patterns of economic growth has propelled since the 1980s the need for mainstreaming sustain-

ability and climate mitigation into development strategies. Still, until recently CC was seen as an environmental concern, not a development issue. It was especially with the publication in 2001 of the Third IPCC report – highlighting how CC could contribute to poverty – that attention was turned to issues such as vulnerability and adaptation to CC. By itself climate mitigation is limited in its capacity to reduce vulnerability to CC impacts as these are driven by many non-climatic factors (Pielke *et al.*, 2007: 598). Vulnerability of ecosystems to CC depends not only on their exposure to changing conditions but also on their capacity for adaptation. Climatic variability and EWE are not new and historically humans have adapted with more or less success to their impacts. As with animal and plant populations located at marginal habitats, human communities more vulnerable to CC are the geographically, socio-economically and/or politically marginalized.

The vulnerability of individuals, households and communities to the health outcomes of CC will be shaped by the same variables that affect their health status (Postigo *et al.*, 2007: 39–56). Understanding interrelations among these factors is important for assessing health vulnerabilities to CC and informing measures for adaptation.

First, level of development and other local conditions (e.g. public infrastructure, land use and building planning, and population density) and/or the robustness of emergency/disaster preparedness and response systems (e.g. forecasting, early warning, and evacuation procedures) are key determinants of vulnerability to heat waves, EWE and certain infectious diseases. For instance, in Bangladesh – which accounts for around half of all the casualties associated with tropical cyclones worldwide – the relative risk of being killed by a cyclone is 300 times higher than in Japan despite a 30 percent lower physical exposure to these events (Shultz *et al.*, 2005: 23–28). Overall, CC will have more severe consequences in vulnerable developing countries with low adaptive capacity, but the impacts of *rapid* CC could overwhelm even the response of the richest countries.

Second, previous health status as well as the accessibility and resilience of public health systems are critical elements for CC health vulnerability

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and adaptation. Populations more likely to suffer from the health effects of environmental challenges, including CC, are those already in ill-health or vulnerable to it (e.g. poor nutrition) and lacking the ability to cope with further health risks. It is estimated that 99 percent of the *current* disease burden from CC occurs in developing countries and 88 percent among children under the age of five (McMichael *et al.*, 2004: 1543), populations already at higher risk of poor health independently of CC. HIV/AIDS has undermined the traditional capacity of many African communities to cope with droughts and floods and has increased their vulnerability to worsening health and poverty (Masanjala, 2007: 1035–1036). In many developing countries, lacking strong health systems, the spread of malaria and other diseases is mostly contained by climatic conditions, barriers that could vanish with CC.

Third, health vulnerability to CC is also rooted in poverty and the inequality of social, political and economic structures and processes that act as both determinants and outcomes of health. Poverty increases the vulnerability of individuals and communities across all CC impacts, including health, by undermining their adaptive capacity. For instance, poverty not only increases vulnerability to disease but, once they fall ill, the poor have lower rates of seeking medical attention and face higher barriers to access medical care.

The links between poverty and CC vulnerability have prompted recent efforts for mainstreaming adaptation into development, emphasizing the potential for win-win synergies between climate adaptation and poverty reduction strategies (Richards, 2003: 11). Policymakers, donors and communities need to weigh potential tradeoffs in the way certain climate mitigation (e.g. increasing use of biofuels) and adaptation (e.g. livelihood diversification) strategies could negatively affect not only poverty and equality (of target population and/or others) but also climate itself.

In a parallel line of argument, awareness of the mechanisms through which CC affects health alerts us to the fact that health cannot be simply an add-on to either climate adaptation or development policies. But if there has been little consideration to the health impacts of CC, health stands even lower when it comes to adaptation strategies.

Identifying and assessing adaptation options to the health risks of CC is challenging and new methods and tools are currently being developed (Ebi and Burton, 2008). Still, many national adaptation assessments under the ongoing UNFCCC process (National Adaptation Program of Action) centre on agriculture, forestry and water resource management, paying little attention to health. In that sense, an additional source of health vulnerability could come from unintended consequences of ill-conceived climate policies. Mainstreaming climate mitigation and adaptation into development strategies could still lead to adverse health effects when they focus solely on environmental or poverty reduction outcomes. For instance, the use of micro-dams for energy generation (mitigation) or irrigation to cope with droughts (adaptation) or the use of pesticides to control changes in crops' pests (adaptation) have increased the incidence of vector-borne and water-borne diseases among African communities (Dolo *et al.*, 2004: 147–159; Ersado, 2005). Stakeholders should therefore consider the health side effects of CC mitigation/adaptation measures. Climate policy should not only be pro-poor and mainstreamed into development strategies but also be pro-health, thus achieving 'win-win-win synergies' between climate policy, poverty reduction and the promotion of health.

Concluding remarks

The lack of wide support for the *Kyoto Protocol* or of agreement on emission targets in the *Bali Roadmap* highlights the difficulties of achieving international collective action when dealing with global commons. A market-based approach to greenhouse emissions has been hailed as a feasible option but it will not only be difficult to monitor but also raise crucial moral dilemmas and perpetuate the bias towards mitigation (Pielke *et al.*, 2007: 598). Given geo-political/economic imbalances and the absence of supranational systems of governance and enforcement, new, fairer and more imaginative systems of global environmental management must be urgently sought.

In any case mitigation will not be enough to turn back the clock on global warming. While

developed countries are today the main per-capita contributors of global warming, poorest nations will have to endure the worst of its consequences. As growth strategies in the developing world heavily rely on fossil fuels, this equity imbalance may be lessened but the problem will only become larger. It is therefore important to look at CC not simply as an emissions and environmental issue but through the lens of vulnerable populations. A better understanding of the processes driving vulnerability to CC is needed in order to build and strengthen mechanisms for adaptation. Developing countries, which made only a small contribution to current cumulative greenhouse gases, will have to bear most of these adaptive efforts.

In addition to its intrinsic value as a critical element of human well-being, good health is a constituent element of our ability to work and generate an income. If poorer households and communities cannot respond to the health threats posed by CC, economic development will be stunted and inter- and intra-country inequality will increase. The good news is that vulnerability to most of the health impacts of droughts, floods and other climatic events is shaped by non-climatic factors that should be addressed by governments and donors independently of CC. Standardized protocols of surveillance and early warning to forecast disease outbreaks, reinforcing health systems and securing their accessibility by the poor, improving education, addressing poverty or investing in public infrastructure, to name only a few, will not only reduce vulnerability to the health risks of CC but will also enhance the resilience of populations to climatic and environmental challenges and hazards that exist apart from CC. In sum, identifying and addressing, through multi-sectoral approaches, the variables that act as determinants of health in specific populations (Postigo *et al.*, 2007: 57–83) not only is good health policy but also will ultimately improve adaptation to CC.

The involvement of the international community with financial and technical assistance to build CC adaptive capacity in developing countries will be crucial. The adverse health consequences of CC will be more serious in poor communities and countries, but they could be felt across the globe. In a highly integrated world, and where CC could alter the geographical pattern of many infectious diseases, health constitutes the ultimate global public good to which all countries should contribute.

Uncertainties and complexities regarding CC, the cost of mitigation and adaptation as well as a long time horizon for some of the impacts of CC to develop or for needed adaptive measures to be implemented contribute to lower the political priority of CC in national and international policy-making arenas. Despite strong and growing evidence about the negative effects that human-related activities have on the global environment, national and international efforts to deal with the problem have been for the most fitful and timid. Health concerns, especially when crossing borders and threatening developed countries, have always been strong cases for collective action (e.g. HIV/AIDS, SARS, avian influenza). It is not only the environment that is in peril, it is also our own health. Increasing awareness about the health impacts of CC could help build and strengthen the case for bolder mitigation and adaptation policies. As it has been argued:

[...] being so self-centered (i.e. anthropocentric) [...] human beings are likely to implement policies only once the effects of environmental degradation are shown to have a negative impact on human health and/or well-being (Soskolne and Broemling, 2002: 64).

Evidence for these impacts is growing and projections are grave enough to focus minds and move from words to action.

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