The Climate Change–Health Connection: Compounding Challenges for Scholars and Practitioners

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Abstract

Global climate change governance, global health governance and the connection between climate change and health—in both theory and practice—have been rising on national and international academic, scientific and government agendas. The connection has been addressed by multilateral organizations, such as the United Nations (UN), plurilateral summit institutions such as the Group of Eight (G8), numerous non-governmental organizations in both the health and environmental spheres, academics in both fields and key national governments across the globe. Like so many issues, the climate-health connection was first identified by the scientific and academic community, but now government officials and policymakers are responding to the challenges and complexities that the connection has brought. The UN Framework Convention on Climate Change (UNFCCC), the G8 and the Major Economies Forum (MEF) along with regional organizations led by the Arctic Council and the Organisation for Economic Co-operation and Development (OECD) have all dealt with this link. The World Health Organization (WHO) has recently become active on the issue, with climate change serving as the theme for the 2008 World Health Assembly. But will scholars and practitioners be able to work together to solve the serious challenges that the climate-health connection has brought?

Introduction

Challenges identified under dual categories are growing in frequency, intensity, scale and scope. Issues once conceived under the single categories of the economy, security, trade, food and agriculture, and the environment are now being seen as integrally connected (Fidler 2007, Blouin 2007, Hsu and White 2007, Smith and Álvarez 2008). Intellectual property, bioterrorism, food and nutrition, zoonotic disease transmission, migration, water and sanitation, and virus sharing are all cases of the global challenges that are being examined not only in a cross-border sense but in a cross sector and cross disciplinary one as well.

Among these many clear and compelling connections, climate change has been identified as potentially the "biggest global health threat of the 21st century" (Costello et al. 2009). Research confirms that the impacts of climate change on health will be severe without a significant, effective policy intervention. Moreover, "management of the health effects of climate change will require … new ways of international cooperation that have hitherto eluded us" (Costello et al. 2009). Indeed, interconnected, overlapping areas such as climate change and health are as difficult to manage as they are to label. The question of "Who's problem is it?" is not easy to answer, particularly in the current segmented, incomplete, decentralized galaxy of global governance. The UN's long established, siloed system, with separate specialized functional institutions for health and several for climate change; non-governmental organizations (NGOs) that are focused on specific environmental or health problems; and national governments that

have separate ministries and agencies for health and the environment, offer few of the connections needed now.

But effective global governance of climate and health requires such connection and coherence. Therefore this paper examines the climate-health connection that scholars have identified, key practitioners' recognition of these connected challenges and the recent global governance response to them. It assesses who has reacted most effectively to the interconnected challenges. And it suggests several innovative and holistic approaches that could be employed to help fill the existing governance gaps on climate-health.

The Climate-Health Connection

It has become increasingly evident that there is a close, compounding, complex climate-health connection (Steiner 2009; Sturchio 2009; Walpole, Rasanathan and Campbell-Lendrum 2009; Friel et al. 2008; Costello et al. 2009; WHO 2009c). In 2008 the World Health Organization (WHO) reported that "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 (LDCs), and increase the hazards of extreme weather" (WHO 2008d). Since the 1990s, these climate-health intersections, both direct and indirect, have risen in both number and intensity (Haines, McMichael and Epstein 2000).

Citizens' have also become more concerned about the climate-health connection. In 2001, 32% (the most popular response) of global respondents said they were most concerned by the health impacts of climate change. This was followed, after a great gap, by climate change impacts on droughts and water shortages (17%), species loss (15%), extreme weather (13%), economic costs (6%) and sea level rise (4%) (Leiserowitz 2007). A 2007 Canadian survey showed that 82% of the population was concerned with "climate change and its impact on health." 82% were also concerned about the "potential for climate change to encourage spread of disease." At the same time, Canadians felt that neither their federal or provincial governments were doing enough to address health and environmental concerns: 46% gave provincial efforts an "A" or "B" grade. An even lower 36% grade was given for federal efforts (Canadian Medical Association 2007).

To date, most of the emphasis on the climate-health connection has been on how climate change affects health. Here the evidence—from heat wave deaths, the increasing number and severity of extreme weather events to the increasing spread of infectious vectors—has been abundant and is still growing, even if some of the specific climate-health pathways and impacts, especially at the regional and local level remain under investigation and debate within the scientific and policy communities (see appendices A-C; Holmes 2008; Costello et al. 2009; WHO 2009a; IPCC 2007b).

More recently there has been increasing attention to the reciprocal relationship of how health impacts climate change (WHO and Health without Harm 2009; Walpole, Rasanathan and Campbell-Lendrum 2009; WHO 2009d). Research has focused on the large carbon footprints produced by hospitals, the contribution of active transportation (such as walking and bicycling) to both health and carbon control and the link between healthy populations and higher greenhouse gas emissions. This is an important new effort because it has underscored that the climate-health link flows two ways. It shows that health has an impact on climate. Much more work needs to be done to explore this side of the climate-health connection. But it is already becoming clear that both issues can serve as a cause of as well as a solution to problems for the other. Therefore both can be affected by actions taken by the other. This means that climate and health both have

something to gain from collaboration and coordination, and something to lose if no coordination and collaboration takes place (Walpole, Rasanathan and Campbell-Lendrum 2009).

The Health Community's Response

The policy response to this increasingly accepted and understood linked challenge has been limited. Because health and climate actors tend to operate independently, most of the responses have been independent. Climate and health actors have both responded, but not in the well communicated, coordinated or collaborative way that is required (WHO 2009b).

The health community has increasingly drawn the climate-health link (WHO 2009b; Chan 2008). This is not surprising as climate change has contributed to many clear negative outcomes for health. At the global level the WHO, the leading institution dedicated to health issues, has acknowledged the climate-health link on several occasions since 1990. The first available intergovernmental document on the interconnected topic was published by the WHO in 1990. It examined the scientific aspects of climate change, the potential direct and indirect effects it was having on health and concluded with several recommendations for policymakers (WHO 1990).

In 1996 and 2000, the WHO followed up with additional reports on the topic (WHO 1996, 2000). In 2005, it published a factsheet on climate-health links (WHO 2005). And in 2008, its World Health Day focused on the adverse health affects of climate change. Here WHO director-general Margaret Chan made a statement outlining the five major health consequences of climate change: increases in malnutrition; rising deaths, injuries and disease outbreaks caused by extreme weather events; increases in diarrhoeal disease; a growing number and intensity of heatwaves; and the changing distribution of insect vectors (Chan 2008). On 24 May 2008, the World Health Assembly issued resolution 61.19 on climate change and health. The resolution urged member states to take action to mitigate the health impacts of climate change. (WHO 2008a, 2008b, 2008c, 2008d, 2008e, 2008f). In 2009, in the lead-up to the Copenhagen Conference on Climate Change in December, the WHO published a brochure and background report on how climate change affects health (WHO 2009b; WHO 2009c). It also hosted an event on the sidelines of the Copenhagen conference, aimed "to facilitate the inclusion of health concerns in the new agreement, decision-making, resource allocation and outreach activities…. [and] to facilitate information exchange and mutually beneficial interactions amongst the stakeholders for raising awareness and actively involving the health sector in responding to the climate change challenge" (WHO 2009e).

Regional and national bodies, such as the WHO's Regional Offices for South-East Asia and Europe, the Pan American Health Association and Health Canada, have also acknowledged the climate-health connection (WHO 2009f; Health Canada 2005, 2008, 2009a, 2009b; Berry et al. 2009). Other regional bodies, including the WHO's Regional Office for Africa, have established dedicated programs for the environment-health link (AFRO 2009).

Beyond international, regional and national bodies, civil society actors have mobilized to advance the climate-health cause. The NGO community, as well as foundations and public-private partnerships have all played a role (Cooper and Kirton 2009). For example, the Global Fund to Fight AIDS, Tuberculosis and Malaria noted that "more than 41 percent of the world's population is at risk of acquiring malaria, and the proportion increases yearly due to deteriorating health systems, growing drug and insecticide resistance, climate change, and war" (Global Fund 2004; Bill and Melinda Gates Foundation 2009). In 2009 International Save the Children Alliance (2009) published a report on "Feeling the Heat: Child Survival in a Changing Climate."

The Climate Community's Response

Climate actors have acknowledged the connected climate-health challenges. As the leading international institution on climate change, the United Nations' Framework Convention on Climate Change (UNFCCC) and its Conference of the Parties (COP) and Meeting of the Conference of the Parties (MOP) have made an effort to govern the climate-health connection. In the 1990s, the UNFCCC set the overarching framework for the international community to tackle climate change (UNFCCC undated). The climate-health connection was there in its "constitutional" document from the start in 1992. Articles 1 and 4 declared, as the core connecting principle, that climate change caused "significant deleterious effects" for (public) health and that the signatories should "minimize adverse effects" on health. Also identified were several climate-health pathways such as drought, food, agriculture, water, natural disasters and other social consequences (UNFCCC 1992; Smith and Martínez 2008; Kirton and Guebert 2009a).

From this strong start, however, the UNFCCC's recognition of the climate-health connection has varied, and most recently has declined and now disappeared. A direct climate-health connection was made at the COPs in 1996, 1999, 2000, 2001, 2002, 2003 and at the MOP in 2005. But no link has been made at either since 2005. From 1992 to 2005 several key links were identified, including how climate change, extreme weather events and ozone-affecting chemicals were causing health problems that were significant, deleterious, adverse and potentially irreversible. The members recognized that developing countries, small island states, Central America and Africa were being affected the most. They endorsed principles and instruments for minimizing the adverse effects, such as the expression of regret, adaptation, the monitoring of debt relief finance, climate funds, forecasting, early warning, prevention, the setting of integrative objectives, technology transfer, afforestation and reforestation. And the Intergovernmental Panel on Climate Change (IPCC) was identified as the key actor responsible for carrying out the UNFCCC's work (UNFCCC 1992, 1995, 1996, 1998a, 1998b, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2008c, 2009a, 2009b; Kirton and Guebert 2009a).

Certainly the UNFCCC made an early effort to govern the climate-health area, by acknowledging in its early years the connections between the two. However, more telling is what the UNFCCC has not done. The UNFCCC has not recognized the WHO in its documents as a relevant international organization, even though several other UN bodies, such as the Food and Agriculture Organization (FAO) and International Energy Agency (IEA) have been (Kirton and Guebert 2009a). It gave no indication of acting or actively asking member countries to act on the serious climate-health challenges it identified. And while the scientific evidence supporting the climate-health connection increased, particularly in the late 2000s, the UNFCCC's attention to the area disappeared completely after 2005, even as the WHO's rose. The Copenhagen Accord statement on December 18, 2009 again gave no attention at all to the climate-health link.

This recent neglect by the politically-driven UNFCCC is all the more surprising, given the findings of the scientifically based, scholarly-supported IPCC. The scientific case for forging the climate-health connection, and for doing so fast and in full, is not in doubt. Since the IPCC was established, the comprehensive, complex, direct climate-health connections it identified have been consistent, clear and compelling. The climate-health connection and the WHO as a relevant actor were identified as early as the IPCC's Second Assessment Report in 1995 (IPCC 1995). Both were identified again in the Third Assessment Report in 2001. The IPCC's attention to health subsequently increased (IPCC 2007a). A detailed analysis of the climate-health concerns were put forward in the IPCC's Working Group II Report, "Impacts, Adaption and

Vulnerability." The executive summary of Chapter Eight, which was dedicated exclusively to health, noted 15 specific climate-health challenges (see also Appendix D). The IPCC's attention to health has been supported and driven by partnerships and collaboration with various stakeholders. They include the WHO, which sits on the IPCC and has published a series of reports on the health risks of climate change since 1990.

Beyond these policy and scholarly-driven communities, major environmental NGOs, including the David Suzuki Foundation, Pollution Probe and AcidRain.org, have all identified climate-health challenges. Several development-based organizations, such as World Neighbors have too. However, while various organizations have acknowledged and taken action on climate-health issues, there has been no major move by climate and health NGOs to collaborate on the topic (Kirton and Guebert 2009a). Within civil society, the governance gap between climate and health endures.

The Climate-Health Response of Plurilateral and Regional Institutions

Outside the UN system, plurilateral and regional institutions have governed both health and climate and done so in an integrated way. Climate governors outside of the UN-system, such as the Major Economies Meeting (MEM)/Major Economies Forum (MEF), have acknowledged the climate-health connection. The MEM/MEF, which was created in mid-2007 to advance the talks on climate change and prepare for the December 2009 UNFCCC's Copenhagen conference, did not acknowledge the health-climate connection at its first two American-hosted meetings (MEM 2007, 2008b). However, when France took over as host for the third meeting in April 2008, President Nicolas Sarkozy noted the health-climate connection in his speech: "The situation is urgent, since climate change already poses a major security challenge. … We must without delay take the full measure of the vital problems faced by the countries of the South, where there is increasing demand for food but shrinking food supply and worsening health conditions" (Sarkozy 2008). At the first meeting of the MEM at the leaders' level, as part of the G8 summit in 2008, the climate-health connection came through more directly and definitively: "Conscious of our leadership role in meeting [climate change] challenges, we, the leaders of the world's major economies, both developed and developing, commit to combat climate change in accordance with our common but differentiated responsibilities and respective capabilities and confront the interlinked challenges of sustainable development, including energy and food security, and human health" (MEM 2008a).

At the global level, the G8 has governed the areas of climate and health since 1979 (Kirton and Guebert 2009b; Kirton and Guebert 2010). In 1997, when the Kyoto Protocol was concluded with no attention to the climate-health connection, the G7/8 made the link for the first time. At their summit in Denver the leaders declared:

> Overwhelming scientific evidence links the build-up of greenhouse gasses in the atmosphere to changes in the global climate system. If current trends continue into the next century, unacceptable impacts on human health and the global environment are likely. Reversing these trends will require a sustained global effort over several decades, with the involvement of all our citizens, and changes in our patterns of consumption and production (G8 1997).

The leaders thus declared that climate change was a major challenge, one that affected human health, and did so in unacceptable, harmful ways. It was a challenge that required a response right away.

After an absence of several years, during which time the COP's attention to the connection flourished, the G8 returned to the connection in 2003, just as the COP's emphasis began to fade (G8 2003). The climate-health connection, missing from the 2004 American-hosted Sea Island Summit, came back at the British-hosted G8 Gleneagles Summit in 2005 (G8 2005a; G8 2005b). This time the G8 went further than in the past, identifying the specific impacts on respiratory disease and healthcare costs. In doing so it forged, for its first time, the trilateral climate-health-economy link. After an absence at the Russian-hosted St. Petersburg Summit in 2006. It again forged the link continuously in 2007, 2008 and 2009 (G8 2007; G8 2008; G8 2009). The G8 has thus given increasing attention to the climate-health connection. Its attention has been strongest when it had climate change as a priority issue, as in 1997, 2003, 2005, 2007, 2008 and 2009. This is in contrast to health, which was a priority only in 2006. Attention has also been stronger when the summits have been more closely connected to Africa and thus to the acute health challenges there (Cooper, Kirton and Schrecker 2007).

Other multi-issue international institutions, such as the OECD, have also forged the link. In 2006 at the meeting of its Development Assistance Committee (DAC) and Environment Policy Committee (EPOC), the OECD's participating ministers concluded that "global environmental challenges, such as climate change, biodiversity loss, and desertification, have important implications for the achievement of many development objectives: poverty alleviation, enhanced access to primary education, gender equity, reduced child mortality, improved maternal health, and the eradication of many diseases are closely linked to a healthy environment" (OECD 2006). The impacts of climate change on children's and maternal health was very clear. More recently, secretary general Angel Gurría remarked that "climate change is the defining issue of our era. Our health, our security and our economies are being threatened by climate change. Although uncertain, the damage is likely to be unevenly distributed, with poorer economies and households incurring greater losses" (Gurría 2008). The OECD has recently gone even further to merge climate and health with other important areas, such as the economy, food and agriculture, and security. It has also highlighted the need for health advocates to look beyond the traditional definition and scope of health to attain positive health outcomes. In particular, it has shown how health could benefit from supporting and advocating the climate change agenda (OECD 2009).

Regional organizations that deal with a wide range of issues, such as the European Council, the Asia Pacific Economic Cooperation (APEC) forum, the Arctic Council and the African Union have also made an effort to acknowledge the climate-health link (European Council 2001; APEC 1997; Arctic Council 1997; Arctic Council 2006; Arctic Council 2009a; Arctic Council 2009b; African Union 2008). However, apart from the Arctic Council, these regional bodies have not strongly indicated that they are well positioned or determined to govern climate-health challenges (Kirton and Guebert 2009a).

Closing the Governance Gaps: Proposals for Progress

While increasing efforts have thus been made to identify the climate-health connection at the global and regional levels, much more could and should be done. In the physical world, the direct and indirect climate-health connections continue to expand. It is becoming clearer that the link flows two ways and that both areas are suffering from the harmful impacts of the other; it is also becoming evident that actors in each field could help each other too. More and more institutions have acknowledged that the connection is real and a cause for concern. But the global and

regional governance responses needed to effectively deal with these interconnected challenges have not yet come. The health-climate link has fallen in importance on some agendas, while it has risen on others. But the best recent evidence suggests that the impacts will only get more severe as time goes on (IPCC 2007b; Costello et al. 2009).

Thus, several gaps remain in confronting the climate-health challenge. First, in the scientific and scholarly world more research needs to be done to show how the climate-health connection is real and growing and to identify the complex causal pathways that connect the two (IPCC 2007a; IPCC 2007b). This is critical if politicians and policymakers are to move in a significant way to address the challenges. The scientific case for the close climate-health connection needs to continue to be built, in a way that resonates with actors in both the health and climate communities and the broader public too. Such a scientific program should flow from the long established, cumulative findings of the IPCC, with the WHO involved in an equal way.

Second, and closely linked with the first proposal, health actors need to intensify their focus on the impact that they can have on climate change. Developing such a "health first" strategy will help ensure that the health community not only focuses on shaming the climate community into action, but also makes efforts of its own to improve climate change. This will show that the health community can go beyond the discourse of victimhood to take ownership and responsibility on the matter. Thus empowered, health actors can work strategically to advance the climate agenda in its vision, mitigation, adaptation, reduction targets and timetables, sectoral actions, finance, investment and technology, in order to achieve better climate change and public health outcomes together.

One way is to identify the climate mitigation, as well as just the climate adaption links. Here climate change and heath both lose from specific activities that can readily be reduced. One way is to reduce the use of coal, as German chancellor Helmut Schmidt recognized as long ago as 1979. Coal clearly causes global warming and harms human heath, from deaths from mining accidents and black lung disease, through to mercury emissions and ambient air emissions from sulphur dioxide and carbon dioxide emissions when coal is burned. More broadly, mitigation depends on the supply of energy that has well-established positive direct and indirect climate and health effects. A systematic study could identify where the combined climate and health co-benefits are greatest, across all energy sources, from wood, peat and coal, through oil and gas in various forms, to nuclear, hydroelectricity, wind, geothermal, solar and tidal. The results would help guide efforts in health and climate but also in the more broadly connected areas of finance, investment and technology (Kirton and Guebert 2009a).

In the realm of adaptation, a premium should be placed on well-known deadly diseases, particularly insect vectors such as malaria, that global warming will bring further north and south (Berrang-Ford et al. 2009; Global Fund 2004). Action on these diseases in the areas where they are prevalent will help prevent their spread to uninfected areas. Other needed adaptation efforts are those that directly cause death in large volume. Natural disasters, drought, desertification, famine and water contamination are at the core here (see appendices A, B and C). There is also the new and growing challenge of "climate refugees or migrants" (including those who bring diseases with them) and the expensive development and humanitarian efforts that they create.

Third, broader connections should be identified, starting with those already made, to heighten the attention given to climate-health concerns. Here, the connection between the economy and food and agriculture stands out, but other links such as traditional security concerns could be important too. In the realm of finance and economics, suggestions of how to mobilize established international financial institutions (IFIs), national governments, NGOs and businesses to finance

activities that simultaneously enhance climate change control and health could be useful. One priority is to get the climate institutions to systematically identify and assess *ex ante* the health impacts of their programs and proposals and then use the results as criteria in the funding that is allocated. The converse is true for the health organizations, starting with the WHO. Another suggestion is to have the major IFIs, including the IMF and Financial Stability Board (FSB), as well as the World Bank and regional development banks, categorically identify the climate and health impacts of their activities and privilege those activities where the climate-health co-benefits are most pronounced. Financing healthy and clean energy alternatives and reducing energy subsidies, as the G20 Pittsburgh Summit in September 2009 agreed to do, are examples of how this approach might be employed (G20 2009; Kirton and Koch 2009; Kirton and Guebert 2009a).

Investment incentives that focus on areas where the climate-health co-benefits loom largest are another option to explore. This could include adding a health component into new green infrastructure investments, such as ensuring that energy-efficient buildings are designed and built in ways that help rather than harm human health (WHO and Health Without Harm 2009). The construction of carbon reducing hospitals would be an obvious place to start. It could also include ensuring that health investments, such as the development of pharmaceuticals, do not harm the environment. Specific initiatives such as clean low carbon cooking in households and mobilizing micro-finance for health could be advanced.

Fourth, in the political intergovernmental realm of global governance, climate and health actors need to work together in a more comprehensive, coordinated, collaborative and coherent way. Here, closer cooperation at the international level between the leading climate body — the UNFCCC — and the leading health body — the WHO — is most important in solving these truly global challenges. In 2001, a WHO report on climate change and human health noted that "Intersectoral and interagency collaboration is essential to address climate related health problems and maximize effective resource use. Capacity building at all levels was agreed to be an important component among measures needed to reduce vulnerability to climate variability and change" (WHO 2001). However, while the WHO has worked with the UNEP and WMO, the critical climate-governing UNFCCC has remained absent in recent years. The UNFCCC has yet to recognize the WHO as a relevant international organization in its COP and MOP decisions, even though several other UN bodies have been. Thus, highlighting the benefits of a collaborative approach between the two remains key.

Fifth, and finally, more action is needed from comprehensive, concerned, multi-issue, plurilateral global governors. This starts with the G8, which has a strong history of governing climate and health and other important issues such as the economy and security. It now includes others that have the capacity to govern multiple issues, such as the G20. Leaders who convene at G8 and G20 summits have the authority and capability to forge the connection between climate change and health, and do so in the context of today's predominant concern with the economy (Kirton and Guebert 2009a; G20 2009). This is also true at the national level, where leaders with present priorities on, or previous experience in climate, health or both, or who have recently arrived in office promising new directions, are well positioned to take the lead. U.S. president Barack Obama, declaring at home through his Environmental Protection Agency just before the opening of the 2009 UNFCCC Copenhagen conference that greenhouse gases are a health hazard, was a clear case of this (*Globe and Mail* 2009). Opportunities such as these will continue to arise at international meetings of national leaders, which have become far more frequent in recent decades (Anderson and Sands 2009).

Conclusions

The scientific and scholarly community has shown that the climate-health connection is genuine, great and growing. The political and policy community has acknowledged that the connection is real and deserving of attention. However, the governance response to these interconnected challenges has, on the whole, been less successful and effective. Thus practitioners, from both the health and climate change communities, need further instruction and guidance from the scholarly community on how to better tackle this issue.

The recent surge of information, analysis and attention on this issue suggests that a positive change could come in the near future. However, this will require a major effort from climate and health actors from the scientific, political, policy and civil society communities and from all levels of governance. This will not be easy. It will require perseverance, creative thinking and innovative approaches. It will require collaboration and coordination across borders, disciplines and scholarly and policy divides. But a successful and effective response is critical, not only for health and climate change, but for global governance more broadly — as it becomes increasingly clear that the global challenges being faced are no longer separate. They are interconnected and interdependent. The links between them need to be governed in such a way as well.

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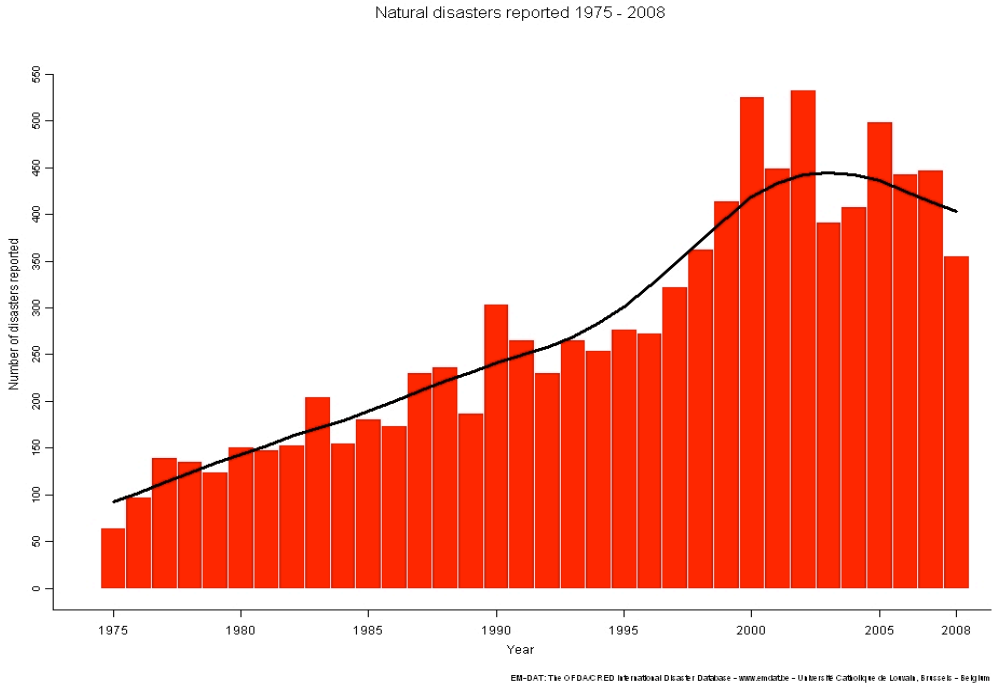
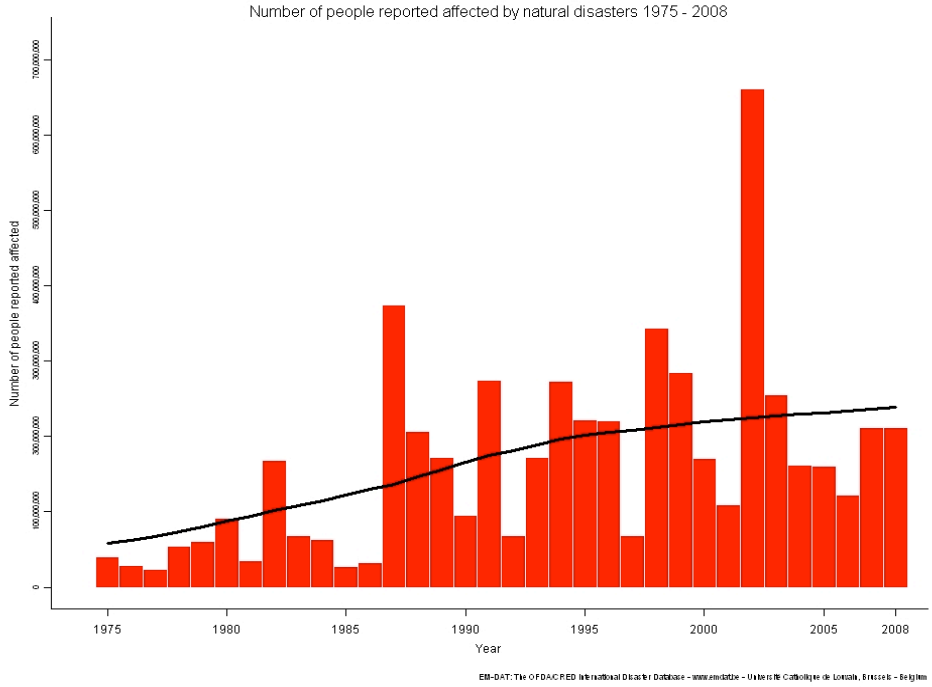
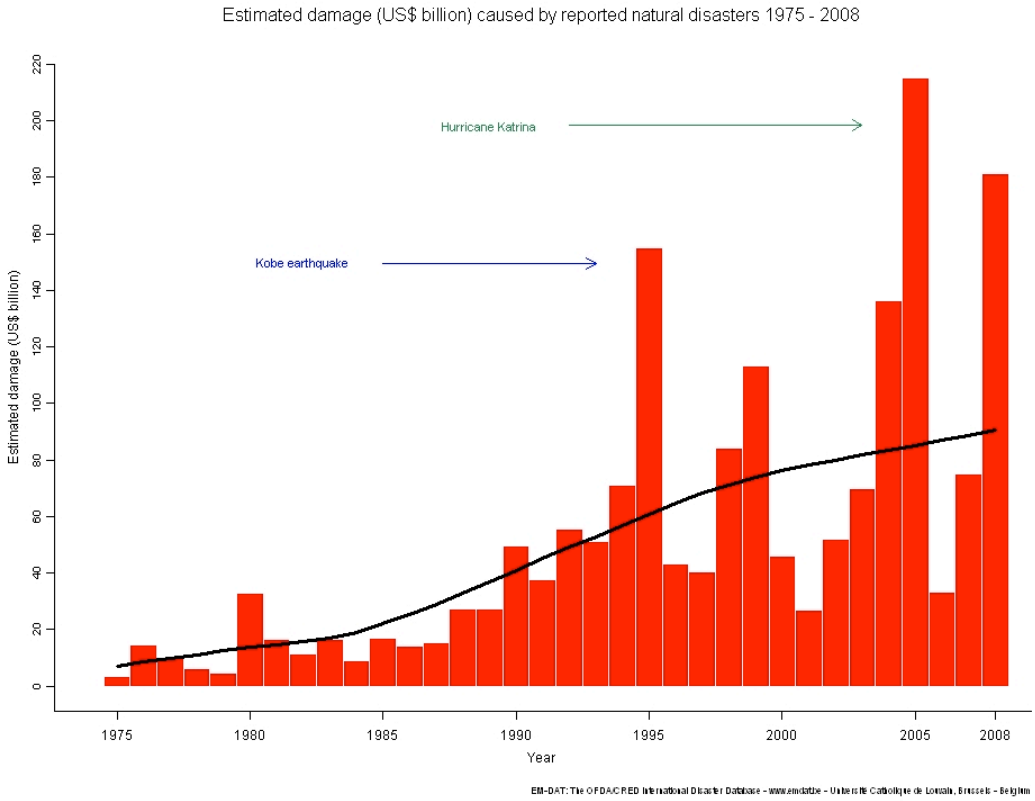
Appendix A:
Number of Natural Disasters, 1975-2008



Appendix B:
People Affected in Disasters, 1975-2008



Appendix C:
Damage Caused by Natural Disasters, 1975-2008



Appendix D:
IPCC Health-Climate Challenges, by Varying Confidence

Very High Confidence	High Confidence	Medium Confidence	Low Confidence
• Climate change currently contributed to the global burden of disease and premature deaths • Projected trends in climate change–related exposures of importance to human health will 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 • Economic development is an important component of adaptation, but on its own will not insulate the world's population from disease and injury due to climate change	• Emerging evidence of climate change effects on human health shows that climate change has altered the seasonal distribution of some allergenic pollen species • Projected trends in climate change–related exposures of importance to human health will increase malnutrition and consequent disorders, including those relating to child growth and development • Projected trends in climate change–related exposures of importance to human health will increase the number of people suffering from death, disease and injury from heat waves, floods, storms, fires and droughts • Projected trends in climate change–related exposures of importance to human health will continue to change the range of some infectious disease vectors • Projected trends in climate change–related exposures of importance to human health will increase cardio-respiratory morbidity and mortality associated with ground-level ozone • Projected trends in climate change–related exposures of importance to human health will 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 • Adaptive capacity needs to be improved everywhere; impacts of recent hurricanes and heat waves show that even high-income countries are not well prepared to cope with extreme weather events • Adverse health impacts will be greatest in low-income countries. Those at greater risk include, in all countries, the urban poor, the elderly and children, traditional societies, subsistence farmers and coastal populations	• Emerging evidence of climate change effects on human health shows that climate change has altered the distribution of some infectious disease vectors • Emerging evidence of climate change effects on human health shows that climate change has increased heat wave–related deaths • Projected trends in climate change–related exposures of importance to human health will increase the burden of diarrheal diseases	• Projected trends in climate change–related exposures of importance to human health will increase the number of people at risk of dengue

Source: IPCC 2007b.