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**Teaching Climate Change and Health: the Contribution of
Development Studies and Sustainable Development**

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Abstract

Climate change and health: the contribution of development studies and sustainable development

The climate is changing. In its wake, people's health is adversely affected. Those most affected are the most vulnerable, the poorest. But everyone is potentially vulnerable – global health security is threatened. The greatest health affects are projected to include increases in malaria, diarrhoeal disease, fatal accidents from severe weather and increases in malnutrition. Mostly this is an increase in problems already recognized by the international community as requiring prioritized attention: they are to be found among the Millennium Goals. Climate change adds an additional dimension of responsibility to this international agreement as many recognize that it is the industrialized countries that are at least partly responsible for climate change. Both development studies and sustainable development promote an inter-disciplinary approach that is useful in gaining an understanding of the problem. Sustainable development emphasizes the constraints of the environment – in this case both the global environment and local resources such as water. It also specifically includes a long-term perspective that is necessary when considering climate change, as well as future generations. Sustainable development is also explicitly normative. Development studies brings focus to poverty, politics and power including the differing values, beliefs and interests of the many and varied actors involved. It can add a historical perspective to why things are as they are, as well as provide insight to different potential institutional approaches to addressing the problem. In the case of climate change and health, both development studies and sustainable development are merged and further strengthened with ties to both public health and bioethics.

Climate change and health: the contribution of development studies and sustainable development

Introduction

Climate change and health; a timely topic in 2008 – but not one central to my initial studies as one of the first students of sustainable development in the early 1980s. It remained out of my field of focus as I continued my work, receiving my doctorate in development studies some years later. But health and climate change are of interest to my current students; my development studies students, my environmental studies students and my students from other disciplines studying at the Norwegian University of Life Sciences. In my teaching about the interface of the two, I draw from both development studies and sustainable development to create cases of current interest. I reach one group of students more easily through development issues, the other more easily through the idea of sustainable development. Is there a dichotomy between the approaches – or is it just a question of perspective? Does it matter? As a teacher, I would like to reach all of my students to facilitate their learning both about a topic and with a well grounded, theory-based approach. This paper focuses on development, sustainable development, and the relationship between them with respect to climate change and health. It begins with an introduction to development and sustainable development then turns to the presentation of a few cases created to bring together both development and sustainable development perspectives. This is followed by a brief conclusion.

Development studies and sustainable development

Corbridge (1995: xv) suggests that development studies is largely about learning to ask questions about societal change. I agree suggesting to my students that development studies is about learning how to learn in order to promote positive change. Given this view, a central objective in educating students of development studies is to foster critical thinkers; thinkers that look critically at issues and problems, ask questions about them and spark debates. We cannot know what problems and issues our students will face tomorrow; we cannot know what contexts they will work within. The best we can do is to open our students' eyes to different perspectives and assist them in seeing how these may be relevant to the problems they are facing and will face in the future. With respect to the normative project of promoting change in this study, let me be clear about my own position. I believe that we need to mitigate climate change. I believe that we should provide all people with access to basic health care. And, I believe that to a large degree, health is both socially and environmentally determined and therefore that promoting health for all also entails a far larger project of social development and environmental conservation.

I use the topic of climate change and health as an example as it is timely. As typical in a sustainable development approach, it clearly ties the global and the local; and the environment and development. I find a combination of approaches from development studies and sustainable development useful in my teaching both because of the concepts they offer and because they seem to be assessable to different groups of students – providing different gateways to understanding the topic.

In my view, development studies tends to focus on the current situation and the past in particular places. It has as a project to describe and understand economic and social

problems, often with the aim of promoting change. It looks through the lenses of politics, poverty and power to provide us with insight into which actors are central to the current state of affairs and which are marginalized. Central, powerful actors are better positioned to promote their own beliefs, values and interests. Existing power structures position particular actors and put in place particular rights and responsibilities promoting some actions and possibilities and restricting others. In this way, development studies sheds light on the ways in which people are caught in poverty and why this is so. It focuses on disparities of wealthy and poor countries, as well as disparities between groups within countries. Emphasis is put on the role of the state and relations between states. While some see the state's role as enabling a functioning market, others put more emphasis on the provision of public goods, including education, health and infrastructure. More recently, question is raised about how the state functions; emphasis is on state failure – on governance and transparency of decisions and actions and the consequences of these failures on different social groups. Emphasis is also given to relations between states both in terms of promoting development and in promoting their own political interests. I use development studies and theory to elucidate issues of poverty, politics and power.

Sustainable development emerged as an important political, rather than academic concept in 1987 after a 15 year incubation period within the environmental movement. The concept is the intentionally fuzzy outcome of negotiations. As a result, it is interpreted and implemented in different ways (Adams 2001). As compared with development studies' focus on problems, sustainable development is premised on the possibility of creating win-win situations and mutual supportive actions; on the idea, for example that we can have both sustained economic growth and conserve the environment. Sustainable development recognizes the interconnectedness of the environment, economic and social systems. It recognizes and includes an understanding of a limited world where the environment constrains development options, but where economic growth continues to be seen as central for the development of poor nations. It also includes an understanding that actions taken in one place have the potential to affect people in other places and future times (Baer and Athanasiou 2007; Pierce and Jameton 2004). As such, the view introduces a need to include environmental and social costs when evaluating change. Similarly, it introduces ideas of environmental and social justice to the development agenda. It is largely future-oriented. This orientation draws with it the concept of uncertainty. Where uncertainty is too high, or potential consequences considered too risky, the approach promotes a precautionary approach. Finally, sustainable development explicitly connects the global and local levels often with emphasis on what can be done locally and planned globally. I use sustainable development in my teaching to bring focus to issues of environment, time, uncertainty and participation. I also use it in discussing a systems approach.

There are many potential ways to approach health. This paper suggests that focusing on health as a desired end draws in its wake a need to highlight both the environment and social equity. A focus on health also offers a perspective for making the links between environment, production and consumption and waste generation and disposal explicit, understandable and relevant to students. A major reason for this is that most of us can agree that health is a desired end. Often we speak of income and economics as if they are ends in themselves. In sustainability literature, this is further extended to include environmental conditions and social relations. McMichael suggests that the reason we seek and value wealth, a sound environment and just social conditions is that they are a means to achieving our collective long-term health and survival (2006:579). How we conceive of them has implications not only in how we approach the study of health and sustainability, but also to how we incorporate it into a broader policy.

Sen (1999) gives a central place to health given its role in sustaining people's capabilities¹. In his book, *Development as Freedom*, Sen claims that the freedom to flourish lies at the heart of development. Good health is integral to this freedom. Poor health hinders people in participating and acting in society. Sen writes in terms of empowerment when he discusses the freedom to flourish. Here he includes three dimensions as central – material, psychosocial and political. When we consider the three cases below, Sen's three dimensions are found in all of the cases. With respect to material empowerment, Sen discusses the access and use of resources. This includes technology and medical care, but also housing, water, sanitation, food and the environment. All the cases below deal with health care problems that already exist and that we have the knowledge to address. We will see that in all the cases, those most at risk lack adequate access to resources. But while part of the problem, it is not only a question of access to things.

Sen also discusses the psychosocial which he explains as control over one's life. Health and climate change provide interesting examples with respect to this factor. The cases will remind us that Hurricane Katrina displaced millions of people, as have floods in Bangladesh and China. Extended and repeated droughts do the same. They force people to starve or to move from the places they and their ancestors have lived. Malaria kills and debilitates. Poor health contributes directly to the feeling of a loss of control over one's life. In the cases presented here, it is suggested that climate change can contribute directly to poor health for many people in the world. But this is only a part of the picture with respect to the loss of control over one's life. During the last few decades, tremendous emphasis has been put on individual responsibility for health. Individual behavior is seen as the key to such health problems as smoking, obesity and cardiovascular disease. While not denying the importance of the behavior and genetic disposition to an individual's health, research into the social determinants of health informs us that good health is not only dependent on the individual and the health care system (CSDH 2007; Marmot 2004; 2007). McMichael and Beaglehole (2000:496) explain with respect to analyzing health issues, "The individual-level perspective fails to conceptualize the population's health as a public good, as something that affects social functioning, community morale, and collective economic performance. Analysis at these different levels addresses complementary, qualitatively distinct, types of questions." Structural inequality created in social and economic conditions creates inequality in health.

Finally, Sen includes the political – both having a political voice and participating in political processes. The cases address the question of participation at the international level in relevant international agreements and conventions. But the complexity of the problem also underlines that having a political voice and participating in political processes must address all levels – from the local, national, regional and global. In addition, it must include not only specific health problems (such as malaria, diarrhea and malnutrition discussed below), but development more generally.

The medical philosopher Daniels (2008) stresses the need for fair processes in priority setting. Fair processes ensure, as Sen suggests, that all central stakeholders are heard. This is important because stakeholders' values, interests and beliefs as well as contexts of action differ. Attention to fair processes ensures attention is paid to explicit reasoning and

¹ McMichael (2006) also discusses the qualities of health in line with Sen. He writes, "The view of population health as a central criterion of society's management of the living environment mirrors Amartya Sen's discussion of the role of 'freedom'. The constitutive dimension refers to freedom as a goal, a right, and end in itself. Freedom, though, like health also has instrumental value; it facilitates poverty alleviation, economic productivity, social cohesion and so on (ibid.:580)".

transparency of processes. An important issue is to ask ‘Who is talking – and who is being heard?’ For example, it includes not only decision-makers, but also researchers and those directly affected². In the cases discussed below, it would also include people from these different groups from both wealthy and poor nations. Also central is consideration of where discussions and debates of such issues will take place. Is the World Health Organization the place? Or the UN more generally? Should major non-governmental organizations lead the debates (Doctors without borders? Red Cross/ Crescent)? Or should they take place in regional governmental organizations? Different arenas are used by different stakeholders to include some things and exclude others. Rules within the differing decision-making arenas differ with respect to exclusion and inclusion, with respect to who can participate in debates, what can be debated and how debates will take place. All of these things affect the outcome. When rules and agreements are made in different arenas, it is likely there will be overlap of both issues and regulations raising the need to further negotiate (Bergström 2005; Fowler 1994). It therefore becomes important to openly and explicitly discuss how priorities are going to be made - priorities between populations within a state, a region or the world; priorities between health and threats, and priorities between types and levels of care.

The following three cases are constructed to bring attention to the interface of a global environmental problem that affects people locally. Each of the cases expects of us that we consider an uncertain future and accept that while we cannot know exactly what that future will bring, we can act in the knowledge and understanding that inaction is likely to hurt the poor the most. We need to consider how we might best bring about positive change – how we might best bring about development. The topic of climate change and health is complex. It combines a global environmental problem with international, national and local effects. All of the cases bring together environmental, economic and social aspects with some underlying understanding for why things are as they are - some insight to power and politics. As such, they bring together sustainable development and development studies approaches. To this they add perspectives of public health and bioethics particularly in forming questions that still need to be addressed. Before turning to the cases, a background is provided on the broader topic including a consideration of the qualities of climate change, health and the interface of the two.

Climate change, health and their interface

Background

The International Panel on Climate Change is now in full agreement that the climate is changing and that it will continue to change (2007). There is, nonetheless, great uncertainty about the extent and rate of change. In order to achieve full consensus among panel members, the agreed estimates of the rate are conservative. The panel’s report also includes a range of possibilities including estimates that climate change will happen much more quickly and dramatically. A major concern is if and when we will reach a ‘tipping point’; a point beyond which we will no longer be moving along a gradient of warming but instead will have shifted to a lower environmental state or level.

Types of changes we can expect to witness from climate change include: rising sea levels, increasing severity of weather, increasing temperatures and changes in climate patterns. Such changes affect health through increases in: numbers of victims of floods, landslides and droughts; infectious disease; sicknesses caused by food- and waterborne diseases and

² Lebel has designed a framework for working within the field of Ecohealth (2003). He stresses three pillars in this framework: transdisciplinarity, equity and participation. Participation, he argues, should include researchers, decision-makers and affected stakeholders.

malnutrition (Confalonieri et al. 2007). The Working Group on the International Panel on Climate Change reporting on Human Health writes that 150,000 individual died and that 5,500,000 disability adjusted life years were lost in the year 2000 (WHO 2007). The loss of lives and the threats to health are predicted to increase in the coming years. Climate change is also expected to affect the fulfillment of basic human needs including for safe drinking water, adequate food and secure shelter and social conditions – all of which are linked to public health (WHO 2005:2). Research on the social determinants of health informs us that there are major disparities in terms of health both within and between countries. Within countries these disparities are reflected in a gradient of health that is pervasive across different types of health problems from infectious disease to chronic disease and even to accidents (CSDH 2007; Marmot 2004; 2007). Given this, we know that the most severely affected with respect to health effects from climate change are likely to be today's most vulnerable including poor groups in the poorest countries. As it happens, they are also those with the least responsibility for climate change. Underlining this point, among the poor, children are expected to be hit the hardest (McMichael et al. 2004:1699).

With 90% agreement, the Panel has also come to the conclusion that climate change is caused by people (IPCC 2007). The main reason for this is the increase in the release of greenhouse gases (GHGs) since the beginning of the industrial period. Current levels of emission are being released at 300 times previous natural releases of GHG emissions (NCDC 2007). Industrialized countries have historically and will continue to have responsibility for the bulk of these emissions (IPCC 2007): industrialized countries have the main responsibility for climate change. Clearly there is a need for change both to mitigate and adapt to climate change and its effects. In considering options, it is imperative that we do not simply 'lock in' current disparities of wealth and income (Baer & Athanasiou 2007). It is also important to keep in mind the qualities of climate change, health and their interface.

Qualities of climate change, health and their interface

Two thousand scientists from diverse academic and geographic backgrounds serve on the U.N.'s IPCC. The group agrees that the climate is changing and that it is "very likely" that the change is caused by people, mainly people in developed countries (IPCC 2007). Beyond this fundamental consensus, there remains a high level of uncertainty concerning both the rate and extent of change – on what will be affected, on how things will be affected and how quickly this will happen. These issues are exceedingly complex and we lack a great deal of information about them. The rate of climate change is slow and we have yet to experience most of the effects. Changes are pervasive such that this one cause can have a diversity of outcomes including both multiple health effects and other effects. The information available is also often problematic: data is often aggregated. There are questions of both spatial and temporal scale, and often long time-lags between exposures and effects (WHO 2003:3; McMichael et al. 2004). Different methods and variables have been used, making it difficult to compare data both between places and over time. We have yet to gain the understanding to know just what information we lack. Thus, there is a high level of uncertainty and risk that pervades the entire field (McMichael 2004). Where there is scientific uncertainty and significant differences in opinion among potential stakeholders, there are strong arguments for including different stakeholders in risk analysis procedures (Mayo and Hollander 1991). This includes an emphasis on participation and how we can debate and negotiate priorities and actions in a fair way. Who is to be involved? What is to be discussed? Which arenas will be used and which procedures followed? The responses to these questions will shape the legitimacy and acceptance of the priorities and decisions made.

Evaluations of risk and harmful consequences have changed in recent decades. The precautionary principle was forwarded under the Rio process in both Agenda 21 (UNCED 1992) and in the Convention on Biological Diversity (CBD) (UNEP 1992). The precautionary principle recognizes risk and uncertainty and is meant to safeguard against serious and irreversible harm to the environment (including humans) (COMEST 2005). Climate change is widely regarded as a risk of such large proportions that it threatens the very future of the world as we know it. It may also be irreversible at least in human time scales. Where there is risk of such outcomes, the precautionary principle leads us to act on the side of caution. In this way, the precautionary principle creates a guide for prioritizing between actions – for example that the environment - in this case mitigating climate change - needs to be given priority over other considerations such as utility.

Climate change has a special potential to affect health due both to the nature of the problem and to the way decisions are being made. Climate itself is highly variable and health is affected by a myriad of other factors (McMichael 2004:1547). It is also generally considered difficult to eliminate or substantially reduce the cause factor of climate change. Climate change works through both a diversity of causal pathways and creates a diversity of potential outcomes often with long delays between cause and effect. An appropriate time scale with respect to measuring affects of climate change is considered to be in the range of 50-100 years. Typically health effects are considered in the range of days, months or occasionally up to 10-20 years. Actions in one place may (negatively) affect people in another place. Thus the interface of health and climate change is characterized by a high level of uncertainty. One might raise the question if we can also raise the precautionary principle here - but for people; that we should act in accordance with the medical principles ‘do not harm’ and ‘do good’ when approaching the threats to health caused by climate change.

Often in health, our focus is on the individual. The cases below indicate that an individual focus is insufficient if we are interested in addressing the health effects arising as a consequence of climate change. Health is largely affected by social, political and environmental context. With respect to the social and political, Fiddler (2002) raises the need to develop a theory of public health as a global public good. He suggests three distinct but interdependent levels of analysis: the national level which would focus on public health issues connected with foreign affairs; the international level which includes relevant international law; and the global level which includes the role of non-state actors in public health governance (Fidler 2002). Albeit to a limited degree, the cases below illustrate these different levels and provide examples of their relevance to public health. With respect to the global governance of health, we find both state and non-state actors with significant power to affect national and international processes including both global debates and legal processes (ibid.).

Case One: Malnutrition

The first case is malnutrition. In severe cases, malnutrition can and does lead to death – particularly in children under five years of age. Malnutrition also makes people more susceptible to diseases. As with many public health issues, addressing malnutrition is thus also a means of preventing other health problems. Currently, 14% of the world population is malnourished. Of these, 31% are to be found in Sub-Saharan Africa and 21% in South Asia (FAO 2007). According to the FAO (2002), food security is ‘a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’. As such, the definition includes both a consideration of the production of food and the possibility to access food supplies.

Climate change may increase malnutrition because of changes in weather patterns, for example through increased intensity and occurrence of both droughts and floods – particularly in the driest areas of the world (Confalonieri et al. 2007; McMichael et al. 2004). There are apt to be large variations in local conditions – with more extremes of both wet and dry weather. Parry et al. have been studying the effects of climate change on food production since the early 1990s. Their work has increasingly taken account of the complexity of the food production system and the resultant effects on yields and food supplies by incorporating both biophysical effects (meteorological variables such as rising temperatures, changing precipitation patterns, increased atmospheric carbon-dioxide levels) and socio-economic factors (food prices and number of people at risk from hunger). Despite increasing complexity in their models and improved data sets, the main conclusion of their work has stayed largely the same through two decades, namely that “[c]limate change is likely to reduce food [production] potential and that risk of hunger will increase in the most marginalized regions (Parry et al. 2005:2125)”. They explain that crops in these marginalized areas are already near their maximum temperature tolerance and that dryland, non-irrigated agriculture predominates. As many of the people in these areas are subsistence farmers and pastoralists, decreases in crop production will cause an increase in malnutrition. In addition, lowered food supplies to the market will increase food prices affecting the possibility for poor people to access food through purchase.

Parry et al. (2004) predict in their studies that there will be an increasing polarization between wealthy and poor nations as the result of substantial increases in prices and risk of hunger in the poorest nations. For example, well over half (65%) of those estimated to be at risk of hunger due to climate change are in Africa. In comparison, as we are currently witnessing, wealthy nations will continue to be able to purchase food supplies and may thus buffer decreases in production. In addition, wealthy nations are better positioned to adapt to climate changes through new investments in technology.

Drought and subsequent famines are considered to be the most deadly weather-related disaster (McMichael et al. 2006). Famines are included in the existing system to address human catastrophes. But the malnourishment described above is not the description of a one-off event. This refers to environmental changes that are in part caused by changes in weather patterns in areas with highly vulnerable populations. This malnutrition is long-term: and it is apt to be chronic. It is a result of a complex system that includes governance policies, infrastructure, market systems and food production (Dreze et al. 1981; Sen 1999). This complex problem requires more than food aid and medical interventions. It requires development interventions: intervention to ensure long-term access to food including transparency in the governance system, developing public health systems robust enough to work with local problems, identifying and further developing alternative sources of employment, developing drought tolerant crops and contributing to development more generally.

Recognizing both the number of people affected and the role of wealthy, industrialized nations in causing climate change, we face a moral imperative to address these health threats. One way of approaching this is by fulfilling existing national obligations under international agreements. There are a number of international agreements that create moral obligations for signatory nations in an attempt to ensure that everyone has secure access to food. Following World War II, the international community has recognized a common interest in establishing rules with respect to issues that cross national boundaries and has sought order and terms of cooperation. The agreements draw largely on humanitarian reasons to help one’s fellow human beings. With respect to working to secure a right to food, these agreements include:

- The Universal Declaration of Human Rights of 1948 (UDHR)
- International Covenant on Economic, Social and Cultural Rights (Article 11) adopted in 1966 (UNHCHR)
- Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security – the Right to Food Guidelines – adopted by the FAO Council in 2004 (FAO 2007).
- The UN Millennium Goals – Goal 1: Eradicate extreme poverty and hunger (UNMDG).

While it is positive that such agreements recognize human rights, they tend to fall short of their aims as positive obligations cannot be enforced. They also tend to focus on the short-term problem of provision of food supplies rather than working to ensure long-term access to food.

The question can also be raised to what extent nations consider such agreements as overriding national sovereignty. State parties may incorporate such agreements into national law systems but one may ask what happens when human needs come in conflict with national priorities. Under what circumstances will human needs be considered as overriding national interests - when the global atmosphere that we all share is threatened? When global health is threatened? And, who is to be involved in negotiations: a group of national representatives also pursuing their individual sovereign interests, non-governmental organizations and international corporations and/ or those most affected?

Case Two: Infectious disease – Malaria

The second case is malaria. Malaria is a vector-borne disease. Currently, it is considered to be the most important one in the world with an estimated 500 million clinical episodes annually. Of these attacks, it is estimated that between 700,000 and 2.5 million people will die: 75% of these deaths will be African children (Thomson et al. 2006; WHO 2005; Wikipedia 2007b). In addition, it is estimated that malaria causes a loss of 1.3% of annual economic growth in the countries where it is most prevalent (WHO 2007b). Recognizing the seriousness of these consequences, the international community has agreed that the control of epidemic malaria is an international health priority. It has set targets for both early detection and control of the epidemic [WHO/UNICEF, 2005; MDG Goal 6].

Despite these targets, there is evidence that the geographic areas where malaria is found have been expanding since the 1970s. The reasons for expansion are complex and certainly include land use change, environmental degradation and worsening access to public health care systems. But it is also known that malaria is highly climate sensitive (Pascual et al. 2006). It is believed to be the vector-borne disease most sensitive to climate change (WHO 2003:11). Studies show that temperature and the incidence of malaria are already increasing in Eastern Africa Highlands and in South America (Githeko et al. 2000; Pascual et al. 2006; Zhou et al. 2004). In South America, the increase of malaria attacks has been linked with seasonal extreme climatic events, specifically the strong effects of El Niño (Githeko et al. 2000:1140). Patz et al. (2006) discuss the significance of the non-linear and threshold responses of malaria as a biological system to the effects of regional temperature change. They show that even small temperature changes can have significant impacts as the biological response of mosquito populations increase by at least one order of magnitude (ibid; Pascual et al. 2006:5829). According to a report by the WHO (2003:11), “[g]lobally temperature increases of 2-3° C would increase the number of people who, in climatic terms, are at risk of malaria by around 3-5%, i.e. several hundred million. Further, the seasonal duration of malaria would

increase in many currently endemic areas.” Climate change is thus recognized as posing a considerable risk to the further geographic spread of malaria, including to higher altitudes.

We might ask, “Who is responsible for addressing malaria?” Certainly we expect a combined response from immediate caregivers supported by communities and nation states that finance and run robust public health care systems. But we also find an international interest and willingness to address this problem. This may be humanitarian, but certainly also includes a recognition of the importance of health to development. Sick people cannot work or care for one another. As with the malnutrition case, we find that international commitment to global health arises from positive moral obligations. Through multilateral agreements many nation states have committed themselves to addressing malaria. This is most recently through commitment to The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global fund 2007) and the Millennium Development Goals (Goal 6). Moral obligations should, in accordance with these agreements, be used in national priority setting and budget allocations.

Another reason states are willing to address the malaria problem is that malaria is a communicable disease. Communicable diseases are increasingly recognized within foreign policy as ‘health security issues’ as they pose a threat to a nation’s citizenry (Chan 2007; Rockenshaub et al. 2007; WHO 2007c, WHO 2007d, Yach and Bettcher 1998). The SARS³ epidemic was a poignant illustration of the health-interconnectedness of the global community. Given the increased global movement of people, food, information and infectious disease, health issues are increasingly recognized as not being contained by national boundaries (Arhin-Tenkorang and Conceição 2003; Fidler 2002). Many states recognize that infectious health risks are best addressed by a coordinated international response (Campbell-Lendrum et al. 2007). International collaboration is a means to protect national citizens’ health by containing communicable diseases and preventing their spread. It is not merely an oversight that the international community has chosen to specifically target HIV/AIDS, tuberculosis and malaria instead of securing and ensuring well-functioning primary health care systems for all and integrating treatment of these diseases within such systems. The recognition that the threat of communicable diseases may well arise in another place expands the scope of protection of a state to include a broader geographical area than the nation itself. While this view widens the scope of how a nation prioritizes among its limited funds, it does not question the basic tenet that it is a nation that has responsibility to its citizenry to create and manage public health systems to protect their national health interests.

But not all share the view that public health remains limited to being a national obligation (Campbell-Lendrum et al. 2007; Feachem and Sachs 2002; Smith et al. 2003). A different perspective on the increase in the incidence and spread of malaria concerns consideration that the people who will be most affected by increases of malaria caused by climate change are those living in the areas newly susceptible to epidemics. Among these people, mainly Africans, those most apt to die are children – particularly poor children (Snow et al. 1999). These children have no responsibility for climate change. And, for the most part, neither have their parents. But the consequences of actions of people living somewhere else can be fatal for them. In addition, a broader conception of public health also recognizes that the consequences go beyond the health of individuals. An increased disease burden is apt to both reduce economic growth and increase poverty (Arhin-Tenkorang and Conceição 2003).

³ SARS is an acronym for Severe Acute Respiratory Syndrom. It is a respiratory disease caused by the SARS coronavirus. Beginning in November 2002 and lasting until July 2003 there was a pandemic with 8,096 known cases and 774 deaths (Wikipedia 2008b).

Daniels (2008) discusses the problem of prioritizing among health issues and suggests that reasonable agents prioritize based on considerations of who is worst off, the numbers of people affected and the need to right a wrong. Malaria is special in that there is reason to prioritize it globally because of its current and potential impact (death to many children and debilitation of many more as well as potential regional effects on development). It also affects large numbers of people and it can potentially affect even more. In addition, malaria cannot be resolved nationally because of the nature of the disease and because of the changed global context of the world with increased travel and trade. Finally, in so far as climate change is the cause, its increase is the result of action taken by people in one place affecting people somewhere else. In other words, while Daniels' ways of prioritizing may easily conflict with one another (one disease may make people worst off while another affects more people), in this case the number of people affected and the potentially fatal consequences indicate that malaria should be an overall priority in global health. Moreover, climate change is projected to be one of the causes for the spread of new epidemics. On this background, it is understandable that the global community has chosen to target it specially, but, unfortunately, the amount of funding allocated is inadequate to address all of those affected. We still face a priorities problem: Should we focus on one geographical area over another? Should we focus on prevention – or treatment? On epidemics or on endemic areas? On workers or children? And, in view of environmental concerns, should we allow the use of environmentally toxic chemicals such as DDT to reduce the threat of infection (Resnik and Roman 2007:239)?

Case Three: Fatal accidents and diarrhea

In the third case, we turn to fatal accidents and diarrhea. Although the two seem to represent extremes of the health scale, both can be serious effects of water-related disasters. Perhaps the most dramatic case when considering health and climate change is the case of fatal accidents occurring as a result of extreme weather. Diarrhea is less dramatic, but much more pervasive. It also can kill, particularly children (Fewtrell et al. 2007; WHO/UNICEF 2006). Increasing incidents of extreme weather are predicted to result in an increasing number of catastrophic events – heatwaves, storms, floods, droughts and landslides. Both floods and droughts will also increase incidences of diarrhea – the first from flooding and destruction of infrastructure, the latter from lack of water for basic hygiene (IPCC 2007). Generally, people living along coastlines are most vulnerable to severe storms and flooding. Among these, it is the poor, and people in poor countries and poorly governed countries that are most vulnerable as the stability of structures, information and response plans are apt to be weak (Campbell-Lendrum and Corvalán 2007).

Flooding is the most frequent natural weather disaster and is predicted to increase with climate change. In addition to physical infrastructure, floods affect human resilience and social organization (Confalonieri et al. 2007). South Asia and Latin America are the areas most affected by flooding: Bangladesh, for example, is extremely susceptible. In their floods of 2007 over a million people were affected, 298 were killed and nearly 60,000 homes were completely destroyed (Wikipedia 2007a). In China, in 2003, 130 million people were affected by flooding. With climate change we can expect to see an increase in storms as well as an increase in sea levels. The Greenland and West Antarctic ice sheet are already melting at faster rates than expected and scientists have now detected and attributed this to human-induced increases in ocean temperature over the past 45 years. While increased sea temperatures are predicted to raise sea levels with 11 cm, melting glaciers are predicted to raise sea levels in a range between 0.5 meters (margins of Greenland and Antarctic) to 7 meters (include Greenland ice sheet) to 70 meters (include Antarctic ice sheet) (Alley et al. 2005; Barnett et al. 2005; EESI 2007; Levitus 2005; Meehl et al. 2005). Rising sea level

directly affects those living on the coast; it also increases the vulnerability of those living farther inland to water-related disasters.

With respect to types of hazards raised by severe storms, we can turn to an example. Although we cannot know if Hurricane Katrina which hit New Orleans in the United States in August 2005 was a result of changing climate, we do know about the devastating consequences to millions of people in a wealthy country. And we do know that hurricane power is highly correlated with temperature: as temperature rises, storm intensity increases. Although there is a lack of consistency in databases, making conclusions uncertain with respect to whether or not changes can be ascribed to climate change, current trends indicate a substantial increase in tropical cyclones, or hurricanes, reaching categories 4 and 5 since 1970 (Nicholls & Alexander 2007:82; Webster et al. 2005).

Katrina was the sixth strongest Atlantic hurricane ever recorded. By the time it hit New Orleans, it was reduced to a class 3 storm and it brushed the city rather than hit it directly. Nonetheless, it killed more than 1800 people, destroyed over 200,000 homes and displaced over a million people. Recent estimates suggest damages at over US\$150 billion. Much of the damage from Katrina came because the levee system failed, resulting in massive flooding. After more than two years, hospitals, schools and bus service remain limited. The oil, forestry and tourism industries remain heavily affected. The current population is 66% of that it was at the time the hurricane hit (Brent 2007; Wikipedia 2007d).

Everyone is a potential victim of extreme weather events. Children are generally more vulnerable than adults. In the Katrina case, it was found that in addition to their vulnerability, it was difficult to track children, keep them together with their care givers and attend to their special needs when hospitalized as a result of the disaster (Shea 2007). We also know that in the Katrina case the poor, mainly black people, were more vulnerable than the wealthier white population. Logan (2008) reports that if no one were allowed to return to areas that were severely damaged during Katrina, New Orleans would lose 80% of its black population. Wealthier people lived in more secure structures, and could get into their vehicles and drive away and they had earlier access to information warning of the pending storm. Blacks generally lived in areas highly vulnerable to flooding, and lacked both transportation and timely information (Berube & Katz 2005; Brent 2007; CMAJ 2005; Fussell 2006; Logan 2008).

The health effects of extreme weather events include fatalities and injuries. They also include indirect effects arising in the aftermath of storms such as trauma and the effects of destruction of infrastructure including electricity, water and sanitation facilities. Together with extreme crowding these, in turn, can lead to outbreaks of cholera and other diarrheal diseases.

From this case, we can raise the question of who is most affected by health consequences of climate change. In the two previous cases we have seen that it is apt to be people living in some of the poorest nations in the world. In this case we see that also within nations, even within a wealthy nation, it is the poor who are disproportionately represented among those affected (UNEP 2002). The concept of vulnerability combines both a consideration of a physical threat to health and the community's potential to cope with these threats. As such, it integrates a consideration of environment and people, as well as the processes and actions linking them. Poverty is generally recognized as the main factor affecting vulnerability to environmental threats such as climate change. According to Brown et al. (2005), "The task of public health has always been to interpret and respond to the effects on human health of major social and environmental change." As such, public health has always been directed to

addressing human vulnerability. Recognizing the role of poverty within vulnerability underlines the importance of social equity in a public health approach. It implies that a major strategy for addressing health effects of climate change is to reduce poverty and address social welfare.

Conclusion

The three cases illustrate the complexity of the issue of climate change and health. Climate change is a global phenomenon that has different effects in particular local and national contexts. There is a great deal of uncertainty about it, both in terms of the types of ecological changes that will come in its wake and the ways that these changes will affect different groups of people. For the most part, the problems we expect to see are not new – they have a history that builds on existing economic, social and political disparities between nations. They will worsen the conditions of the already worst off – both within and between nations. Given that climate change is has thus far been principally caused by industrialized nations, it is they that bear the burden of responsibility for the expected changes. While there are a number of relevant international agreements and conventions for addressing the expected problems, this may dilute an approach to the overarching problem, allowing countries to remain complacent to the issue. Development studies and sustainable development provide relevant perspectives for looking at this complex topic. Both are inter-disciplinary in their approach. To the extent that they are two approaches, this probably comes more from their divergent histories than differences we will see in the future.

One of the most important things that development studies can lend to our understanding of this issue is a focus on structural inequities. We find persistent health inequalities across the board (communicable diseases, non-communicable diseases, and even accidents) related to differences in income, education and social status. Policy interventions have the potential to flatten out the differences between disparate groups. Without such interventions, we already know that the health effects of climate change will disproportionately affect the poor both within and between countries. This provides a backdrop for all three of the cases. As all of the problems already exist we already know they are major problems for the poor. We can then ask who benefits from current inequities, who has interests in addressing these problems and who has responsibility for financing and providing services.

With respect to this, we can recognize three differing perspectives on 'global health'. Different actors are currently using this term quite differently to promote their various interests, ideas and beliefs. The cases illustrate this readily. Financing of the Global Fund for HIV/AIDS, Tuberculosis and Malaria has virtually exploded in the last two years. At the same time, there is a growing international interest in 'global health' or 'health security'. This brings up questions with respect to national sovereignty - on what happens between nations when interests, in this case to protect one's citizens from communicable diseases, extend beyond national boundaries in part because of the nature of the issue and in part from an increasingly globalized world. Increased travel and trade have greatly increased the potential for pathogens to move across national boundaries. Increased information has greatly increased the potential for both surveillance and for fear. One of the results of the increased funding has been the development of vertical programs targeted to particular diseases. While we are seeing some positive results of increased availability of drugs - we are also seeing public health care systems that remain understaffed. An interest in protecting the citizens of wealthy nations can be leading to the further breakdown of public health care systems in the south --- despite the best of intentions.

This can be contrasted with looking at global health as a global public good. It is recognized in this perspective that a functioning primary health care system everywhere is of benefit for everyone and - again because of the nature of the good - that it will be undersupplied. We can ask why this is so - again the structural approach mentioned above. We can also find roots to the 'development project'; a humanitarian perspective that underlies, at least in part, international agreements - such as Alma Ata Declaration or the Millennium Goals. These agreements recognize the human right to health - the latter including explicit connections to effects of environmental change. With respect to climate change, both the cases of diarrhea and malnutrition provide examples.

Finally, there is a consideration that has arisen with sustainable development. This is a view that those who have caused a degraded environment have responsibility for not only mitigating the problem - but also for the people they have affected both in other places and other times. All of the examples in the paper suggest that there will be an increasing number of people negatively affected by the health consequences of climate change. Uncertainty and risk are both high. The view provides justification for considering who should participate in decision-making processes. It also provides the link between the global and the local - that we now have global processes (climate change) that are having negative local effects, including health effects. This in turn raises questions of social justice.

Sustainable development has not satisfactorily encompassed climate change. The cases here point to a need to consider why problems are occurring particularly with respect to issues of power and politics. At the same time, sustainable development has provided us with some of the tools we need to encompass it. Sustainable development can be used to consider economics, environment and social factors. This systems approach is a strength in recognizing that there are not steady states, but rather continual trade-offs - both in physical realities and in the political decisions affecting these things. It forces us to look to the future and consider potential consequences of our actions. Is it a failing of the approach that our scientific and political institutions would prefer 'facts' to prognoses? These cases all discuss the tremendous uncertainty we are faced with - there are major problems in our methods - but also that these systems are just so complex that we cannot really know what the outcomes will be.

At the outset of this paper, I suggested that development studies was in part about learning to ask questions. The topic of climate change and health raises many such questions. These range from the global to the national and local. For example:

Is there a global responsibility for health that extends beyond humanitarianism? Do we share an obligation for the stewardship of global public goods, such as climate and health? Are there situations under which we need to address health inequality across national borders? And if there is a case for any or all of these questions, what processes will be considered as fair and legitimate to affected populations? Who is to be included? Who is to be included when we witness different nations and groups bearing the burden of actions taken in another place? When we witness people made worse off by a factor, namely climate change, over which they have no control? Who is to be involved in financing these issues? In the decision-making processes and policy creation, including deciding which health issues are to be prioritized? Who is to be involved in implementing activities and research?

How do we work within environmental constraints, i.e. how do we avert the climate from 'tipping' while at the same time securing local access to adequate and safe resources? How do we address the continued development, including the improved health, of poor countries given the constraints of climate change? Development at what cost? Development for

whom? How do we ensure changes in behavior of wealthy countries with respect to energy use and waste disposal?

There are many, many questions. Development studies, sustainable development, public health and bioethics all provide us with a foundation for asking and beginning to address them. Given the uncertainty, we could choose to look the other way. Instead, the underlying normative approach of development studies suggests that we concentrate our collective efforts on mitigating climate change and addressing the effects that are already upon us and that are expected to escalate. We have seen that the effects of climate change on health have the potential to affect everyone. Nonetheless we also know that those who are most vulnerable are the poor – both the poor within national boundaries and the poorest nations. Addressing these issues entails a broad approach that focuses both on health as an ends and a means. Given the importance of environment, social and political context to health, this means addressing both climate change and development.

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