

## ARTICLE

## Socially, politically and economically mediated health effects of climate change: Possible consequences for Africa

D C Bowles,<sup>1</sup> MA; C D Butler,<sup>2</sup> BMed, PhD

<sup>1</sup> National Centre for Epidemiology and Population Health, Australian National University, Canberra, Australia

<sup>2</sup> Faculty of Health, University of Canberra, Australia

**Corresponding author:** D C Bowles ([devin.bowles@anu.edu.au](mailto:devin.bowles@anu.edu.au))

In Africa, as elsewhere in the world, climate change looms as a profound health challenge in this century. Socially, politically and economically mediated ('tertiary') effects will probably be the most significant consequences of climate change, substantially exceeding the probable burden of its direct effects and infectious diseases. Climate change will decrease crop yields in many low-latitude areas, decreasing food security in many countries, including those in Africa. Under-nutrition will worsen, aggravated by diminished economic growth – one of the most widely predicted consequences of climate change. Furthermore, migration will increase, which will stretch and could even overwhelm health systems in destination areas, in addition to sapping donor locations of the financial and human capital they could use for further development. Mass migration heightens the risk of conflict, as does resource scarcity caused by climate change. Consequently, the capacity of states to meet the expectations of their citizens and impose law and order could further decrease, incentivising unscrupulous leaders to initiate or sustain conflict to enhance their support base. In summary, health systems on the African continent will be severely challenged by the increased demands caused by climate change, while their capacity will be diminished by its direct effects, reduced economic growth, additional migration and conflict. Adaptation is frequently treated as the best climate change response, but it is especially difficult in poorer countries, where even general development is threatened by these challenges. Reliance on adaptation would exacerbate the health gap. Global climate change mitigation is the surest way to preserve health, in Africa and elsewhere.

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In the longest paper ever published in the *Lancet*, climate change was called this century's greatest threat to health.<sup>[1]</sup> In this article, we discuss why this is plausible, with particular reference to Africa.

There are several classifications of the health consequences of climate change, but the one we prefer recognises three broad types.<sup>[2-3]</sup> In this classification, 'primary' effects operate most directly on the human organism, e.g. through acute or prolonged heat stress. 'Secondary' effects are less direct and more ecological, such as changes to the patterns of distribution of malaria and other vector-borne diseases. However, we are most concerned about the 'tertiary' effects. These are mediated socially, politically and economically.<sup>[2]</sup> For example, declining availability of essential resources will contribute to worsening of under-nutrition in many populations<sup>[4]</sup> and decreased economic growth globally. These consequences will have ramifications, with possible cascading effects, including decreased health system capacity, diminished funding to improve other health determinants, and increased migration and conflict.<sup>[5]</sup> Such tertiary effects merit intensive preventive action, especially climate change mitigation. They may significantly exceed the burden of primary and secondary effects. However, such a conclusion is unfamiliar and even unsettling for many medical and even public health professionals, as some regard these causal pathways as too 'upstream' or 'political'. Consequently, these pathways have received insufficient attention in the health literature, even though there is growing concern in other disciplines and broader society.

The scale of tertiary effects is influenced by regional primary and secondary effects, but even more so by the baseline social, political and

economic circumstances of an area. Many parts of Africa, scarred by persistent under-development, conflict and poverty, therefore appear to be at particular risk. Reports by the Intergovernmental Panel on Climate Change (IPCC) have consistently warned that climate change will impose disproportionate harm on the African environment, with drought intensification being a particular problem. Africa has a high concentration of politically fragile states.<sup>[6]</sup> Associated with this are widespread poverty, limited education, and a 'brain drain', all of which are likely to further amplify the tertiary effects in Africa and inhibit effective adaptation.

### Decreased economic growth

Climate change will inhibit the development of new sources of income in Africa in general and for subsistence farmers in particular. Without rapid and substantial mitigation, climate change is widely anticipated to limit future economic growth,<sup>[7]</sup> which could be further depressed by widespread migration and increased conflict, as discussed below.

### Under-nutrition

Climate change will possibly slow down or reverse progress towards solving world hunger.<sup>[4]</sup> It will also harm fishery productivity, both in the oceans and some of Africa's great lakes, for example through increased acidity. This will endanger access to the primary source of protein for millions of people on this continent.

Declining crop productivity may be even more important than decreasing fish and seafood yields in Africa, where many areas are experiencing rapid population growth. An increased frequency in extreme weather events, including drought and unseasonable rain,

is predicted to reduce agricultural productivity in many regions on this continent. For instance, the West African Sahel has experienced decreased rainfall and increased maximum summer temperatures, which negatively affect agricultural production.<sup>[8]</sup> Drought and famine in North-East Africa have been linked to climate change,<sup>[9]</sup> while human influences have increased the probability of increased dryness in East Africa.<sup>[10]</sup>

Warming temperatures worldwide have long been predicted to diminish agricultural productivity at lower latitudes (areas which are most populous and where most of the world's subsistence farmers live), with partial compensation at higher latitudes.<sup>[4]</sup> Such scenarios will possibly exacerbate existing global inequality, and could generate additional problems, including conflict. Without new sources of income, many in Africa and elsewhere may find themselves unable to purchase food in a globally competitive market to replace locally falling yields.

### Migration

The decision to migrate typically involves a myriad of factors, climate change being increasingly recognised as one of these. The contracting and changing availability of agricultural and pastoral land and diminishing productivity of many fishing industries will contribute to the decision to migrate. Migration will be influenced by the increasing frequency and severity of natural disasters, even though it is unlikely that climate change *alone* will promote migration. Shrinking land mass in the face of rising sea levels, particularly in agriculturally productive and densely populated river deltas (including those of the Nile), may be an exception.

The complexity of the causes of migration means that estimating the scale of future climate change or even environmental migration is challenging and contested.<sup>[11]</sup> Simultaneously, to conclude that migration associated with climate change is non-existent, and will remain so, is excessively nihilistic. A consensus view is currently emerging, with pioneers in this field predicting that by the middle of the 21st century there could be hundreds of millions of migrants influenced by climate and other environmental changes.<sup>[11]</sup> The health-related and other consequences on a crowded planet are potentially immense. For many of the same reasons that Africa's agriculture will possibly be disproportionately disrupted by climate change, and because of the decline in agriculture, this continent faces an especially high level of migration.

Migration, in a sympathetic world, is an effective method of climate change adaptation,<sup>[12]</sup> with associated health benefits. However, reaping these benefits depends on high levels of altruism on the part of migrants, and donor and recipient communities. History shows that humans generally react to resource scarcity with increased xenophobia and competition between groups rather than greater integration. However, even facing the prospect of being unwelcome or frank hostility, the 'push' factors that drive migration are so strong that most migrants will experience health gains.<sup>[5]</sup> The migration journey itself may be hazardous (such as across the Sahel and Mediterranean in an attempt to reach Europe) and also expose people to diseases to which they have little genetic or acquired resistance.<sup>[13]</sup>

In some cases, out-migration can release environmental pressure in donor communities and may also lead to remittances. The benefits may exceed, at least temporarily, the stress of climate change (such as rising sea levels) with health benefits. However, migration, especially to international destinations, is more plausible for those who are better off and better educated.<sup>[12]</sup> Where wealth and education are concentrated, movement of a few key individuals, even if they account for only a small proportion of the population, could be

decisive. The flight of economic and social capital that occurs with international migration could prevent areas and countries from escaping the poverty trap.<sup>[5]</sup>

However, even in scenarios of severe climate change, the vast majority of climate-associated migration is likely to occur within and between developing countries, and much of it will be rural to urban.<sup>[5,12]</sup> Many recipient areas could experience a functional decline in their health systems if the number of immigrants exceeds the available economic opportunities and infrastructure. Parallel losses in other sectors, including education, could also occur. Rapidly growing major- and mega-cities in developing countries, also on the African continent, are at particular risk. Developed countries, such as Australia, are likely to invest heavily in deterring unwanted migration in an attempt to minimise any such pressure and to preserve living standards, even though developed countries have the greatest capacity to accommodate additional people. Other countries (including India) are also strengthening their border protection regimes and in some cases providing financial incentives to intermediary countries in an attempt to restrict the flow of people.<sup>[14]</sup>

### Conflict

Migration associated with climate change is expected to increase violent conflict, with resulting health implications. One study found significant conflict in the receiving area for half of the 38 episodes of environmental migration examined.<sup>[15]</sup> Migration often brings disparate ethnic groups into close proximity, sometimes in the context of resource scarcity. It can also spread ethnic tensions, conflict-steeped ideologies, arms and combatants, thus facilitating a kind of civil war 'contagion'.<sup>[16]</sup> The long-standing conflict in the Democratic Republic of the Congo was partly initiated by migration of combatants from Rwanda. Health consequences have been severe, although hard to document. Smaller-scale conflict can also result from migration, as occurred in Alexandra Township, near Johannesburg, South Africa, in 2008, when many South Africans attacked suspected illegal immigrants. Fatalities were limited to under 100 people, but hundreds were injured and thousands displaced, as mobs looted and destroyed immigrants' homes.<sup>[17]</sup> Conflict and migration are often mutually reinforcing, as seen in Rwanda, the Democratic Republic of the Congo, Sudan and Syria.

Migration is only one pathway through which climate change could enhance the risk of conflict. The latter will escalate as climate change deprives agriculturalists and others of their livelihoods and exacerbates the scarcity of local resources in much of the developing world. This will increase demands on the state and diminish its tax base and capacity to meet those demands. If a state is unable to guarantee the protection or livelihood of its citizens, they may look to other groups for protection, including ethnic groups. The latter may seek to enhance their capacity for self-protection, e.g. through arms acquisition, further eroding the capacity of the state to guarantee the safety of its citizens and thus creating a self-reinforcing feedback loop of instability.<sup>[18]</sup> As conditions in a country worsen, unscrupulous leaders may incite or fan conflict in order to distract the population and extend their support base. Examples of such tactics include ethnic clashes in Kenya in the first half of the 1990s<sup>[18]</sup> and more recently in Darfur, Sudan.

Two pathways in Africa could lead to interstate wars. Firstly, civil conflicts could spread and involve nearby states, especially where ethnic and national borders do not overlap, as in many former African colonies. Secondly, the struggle for control of a shrinking resource shared by multiple countries, such as the Nile or another major river, could become militarised.

A recent meta-analysis found that each standard deviation change of the climate toward warmer temperatures or more extreme rainfall is accompanied by a 14% increase in intergroup conflict.<sup>[19]</sup> The health consequences of additional conflict in Africa and the rest of the world are likely to be profound, and include increased morbidity and mortality and diminished health system capacity, especially during civil conflicts.<sup>[20]</sup>

## Health systems

Several convergent forces stemming from climate change may diminish health system capacity. Physical infrastructure will be at greater risk from extreme weather events, and may require relocation due to higher sea levels or altered rain patterns. Reduced economic growth will undermine government and private funding for health systems, with migration possibly leading to geographical mismatches between health infrastructure and demand.

At the same time, climate change would multiply the demands on health systems, especially in Africa. Primary and secondary effects of climate change will also worsen human health, and be exacerbated by a decline in the health system. Reduced economic growth may lead to decreased spending on the determinants of health, including basic infrastructure, education and environmental protection. Together, increased demands for health system services and decreased capacity to meet these demands could have catastrophic consequences for health.<sup>[20]</sup>

## Prospects for Africa

Africa, despite its minimal contribution to the causes of climate change, will experience some of its worst health effects. The direct consequences for agriculture and pastoralist communities are likely to be especially severe. Lack of food and rising food prices will worsen under-nutrition and dependency on food aid, increasing imports. Reduced economic growth could be felt most acutely in Africa as the world's poorest continent. Increased migration will further strain social systems, especially in already rapidly growing cities. The African continent contains some of the world's most fragile states, and several parts are at perennial risk of conflict.

Adaptation to climate change is frequently recommended as a response to climate change, especially by some in developed countries. Humanity has already committed future generations to endure climate change, owing to the cumulative nature of greenhouse gas emissions, which necessitates some adaptation. However, reliance on adaptation as the primary response to climate change is unlikely to

succeed, and will deepen the health gap between rich and poor, both in and between countries.

Adaptation occurs at both institutional and household levels. Institutional adaptation in most of Africa will be hindered by lack of financial capital, weak governance, reduced institutional capacity, diminished co-ordination and lack of relevant expertise. Widespread maladaptation, including solutions that compound other problems or limit future adaptation strategies, is possible. Poverty and reduced opportunities will preclude effective adaptation for millions of households. Many will be unable to secure adaptive measures that the wealthy take for granted, including ready access to clean water, adequate sewage disposal systems, refrigeration and air-conditioning. In Africa, as in the rest of the world, the mirage of a planet well adapted to climate change should not distract from the primary challenge of mitigation.

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