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Climate change: A new threat to stability in West Africa? Evidence from Ghana and Burkina Faso[1]

Oli Brown and Alec Crawford*

Introduction: Climate change as the 'new' security threat

> Recent scientific evidence has ... given us a picture of the physical impacts on our world that we can expect as our climate changes. And those impacts go far beyond the environmental. Their consequences reach to the very heart of the security agenda.
>
> – Margaret Beckett, UK Foreign Secretary
> *UN Security Council debate in New York, 17 April 2007*

Over the past decades the way we talk about climate change has shifted dramatically. When scientists began to uncover worrying evidence of human-induced climate change in the

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1970s and 1980s, the emerging problem of 'global warming' was seen by policymakers, when not ignored altogether, as an environmental issue of peripheral concern. By the 1990s, as climate modelling grew more sophisticated, it became clear that reducing greenhouse gas emissions would have a dramatic impact on the way we produce power and transport ourselves. Given that doing so would necessitate drastic changes in our use of fossil fuels, climate change became an economic and energy policy issue.

More recently, analysts and campaigners have begun to view climate change as a major threat to international security. They argue that climate change, by redrawing the maps of water availability, food security, disease prevalence, coastal boundaries and population distribution, could exacerbate existing tensions and trigger new conflicts. Africa, though the least responsible for per capita greenhouse gas emissions, is seen as the continent most likely to suffer its worst consequences – a function of the continent's reliance on climate-dependent sectors (such as rain-fed agriculture) and its history of resource, ethnic and political conflict.

The security threat posed by climate change has become the subject of unprecedented international attention. In 2007 it was the focus of a dedicated UN Security Council debate in April and the grounds for the Nobel Peace Prize shared between Al Gore and the scientists of the Intergovernmental Panel on Climate Change (IPCC). Furthermore, the climate debate has taken on the language of a military threat assessment. At an African Union debate in early 2007 President Yoweri Museveni of Uganda called greenhouse gas emissions an 'act of aggression' by the developed world against the developing world. In April 2007 a group of retired US generals released a widely circulated report arguing that climate change will act as a 'threat multiplier' that will make existing concerns such as water scarcity and food insecurity more intractable (NPR 2007). At the April 2007 Security Council debate the Namibian representative, Kaire Mbuende, called greenhouse gas emissions tantamount to 'low intensity biological or chemical warfare' (UNSCDPI 2007).

In short, the security implications of climate change have caught the political imagination, generating a perceptible shift in the way decision-makers discuss the subject. There are perhaps two reasons for this. The first is self-evident: it is becoming increasingly clear that future climate change threatens to undermine development and to exacerbate existing drivers of conflict. Analysts have outlined five main dimensions that link climate change and conflict (Dupont & Pearman 2006).

- Volatile weather patterns, coupled with changes in rainfall and temperature, have the capacity to reshape the productive landscape of entire regions and exacerbate food, water and energy scarcities

- More frequent and intense natural disasters coupled with a greater burden of diseases such as malaria could stretch the coping capacity of developing countries. This could, in turn, tip poor countries into fragile states and fragile states into failed states

- Natural disasters and a changing landscape could contribute to destabilising and unregulated population movements (so-called 'climate refugees'). This would bring previously separate groups in competition for the same dwindling resources

- Receding sea and land ice could enable access to previously inaccessible resources such as oil and gas supplies in the Arctic and transit routes like the Northwest Passage, triggering dispute over their ownership and control

- Salinisation, rising sea levels and mega droughts could make entire areas uninhabitable. In the case of some small island states this presents perhaps the ultimate security threat, jeopardising the very existence of small low-lying countries

Climate change may already be playing a role in existing conflicts. A June 2007 report by the United Nations Environment Programme (UNEP) suggested that the conflict in Darfur had in part been driven by climate change and environmental degradation (UNEP 2007). Over the past 40 years rainfall in the region has decreased by 30 per cent and the Sahara has advanced by more than a mile every year. The report argues that the resulting tension between farmers and herders over disappearing pasture and declining waterholes partly explains the Darfur conflict (UNEP 2007). The UNEP report warned of a succession of new wars across Africa unless more is done to contain the damage of climate change, concluding that Darfur holds grim lessons for other countries at risk.

A second reason for the 'securitisation' of the climate change debate is more political; it is part of a clear move by some campaigners to invest the climate negotiations with a greater sense of urgency, to raise climate change to the realm of high politics and to create the political space for serious concessions on greenhouse gas emissions. Advocates hope it will help unite countries towards strong action on future mitigation and adaptation. As Jon Barnett pointed out in 2001: '[S]ecurity communicates a certain gravitas that is arguably necessary in climate change policy. In that climate change is a security problem for certain groups, identifying it as such suggests that it is an issue that warrants a policy response commensurate in effort if not in kind with war.'

In this approach, Africa is often portrayed as the 'canary in the mine' of climate security, the first continent to feel fully the effects of climate change on political and economic stability. As the IPCC notes in its Fourth Assessment Report (IPCC 2007a:13): 'Africa is one of the most vulnerable continents to climate change and climate variability, a situation aggravated by the interaction of "multiple stresses", occurring at various levels, and low adaptive capacity.' Cases such as Darfur are being held up as cautionary tales for the potential impact of climate change everywhere.

The scientific basis for climate change is becoming increasingly well established. There is considerable evidence of the physical impacts of climate change in terms of raised

sea levels, altered precipitation patterns and more frequent and fierce storms. However, there is comparatively little research on the empirical links between climate change and conflict.

There have been some attempts (CSIS 2007) to construct scenarios of the security implications of climate change at a global level, but few if any have focused on the country-level security impacts of climate change. Our research was an attempt to address this research gap, to test the links that have been hypothesised and to determine the extent to which they reflect a realistic future for different countries as the impacts of climate change gather pace.

Testing the links: The research methodology

The purpose of this research was to investigate the links between climate change and security in the case of two countries in West Africa: Ghana and Burkina Faso. Three questions drove the research:

- What do we know about the way that climate change is going to interact with existing tensions and create new ones?
- Do we know enough to use climate change projections to predict future conflict?
- To what extent will adaptation to climate change ward off instability and conflict?

There were three reasons for choosing Ghana and Burkina Faso as the subjects of our research.

- Ghana and Burkina Faso provide a study in contrast in the West African region. Anglophone, coastal Ghana is one of West Africa's wealthier countries, relatively speaking, whereas francophone, land-locked Burkina Faso is one of the world's poorest
- Despite their differences Ghana and Burkina Faso share many development challenges: a reliance on rain-fed agriculture; vulnerability to drought; and some unpredictable neighbours. They also have to contend with significant cross-border issues, principally the allocation of the waters of the Volta River Basin, growing economic integration and cross-border migration. But in a region that has witnessed half a dozen civil wars over the last 15 years both countries are notable for their relative stability
- They are both programme countries for Danida (the overseas development arm of the Danish foreign ministry), which is currently considering how best to support adaptation to the impact of climate change in the region

Both countries have worked hard to identify sectors and regions that might be vulnerable to climate change. In 2000 Ghana produced its first national communication on climate change, which identified several key vulnerable sectors. In 2007 Burkina Faso produced its first National Adaptation Programme of Action (NAPA), which detailed the current and future climate vulnerabilities facing the country. (The report was written in 2006 and endorsed by the president in November 2007 and is currently awaiting wider distribution.) Our objective for this project was not to repeat the excellent work already done or going on in either country. Rather, it was to determine whether and at what point these vulnerabilities are no longer a matter of *development* concern but have become a *security* issue.

We did not set out to either prove or disprove the link between climate change and violent conflict: our aim was to understand better the influence of climate change on the political and economic stability of Ghana and Burkina Faso, and through that to add some nuance to the wider debate on climate change as a security threat. To do so, we arranged scenario planning workshops in both countries, supplemented by individual meetings and consultations. We invited a wide range of local experts to each meeting, including agronomists, hydrologists, development specialists and security analysts. The purpose of each workshop was to facilitate a process by which local experts could identify specific vulnerabilities and 'hot spots' and to understand how domestic adaptation policies can be used to deal with anticipated problems (such as water allocation and disaster risk management).

We presented three scenarios (a best case, medium case and worst case), each of which described a different climate path for West Africa by 2100. These scenarios were drawn from the emissions scenarios of the IPCC and were expanded using additional information from the IPCC's Fourth Assessment Report and the Stern Review. The scenarios are highly speculative, but all fall within the meteorological bounds described by the IPCC. Each describes a future climate scenario, the likelihood of which depends on the complex interplay of factors such as total greenhouse gas emissions, the meteorological evolution of climate change, global population growth, energy use and international cooperation on mitigation and adaptation.

The projected impact of climate change on societies is, of course, one step *more uncertain* than the projected climate change itself, being a projection based on a projection. In addition, for West Africa as elsewhere, 'the discourse is further complicated by the near impossibility of disaggregating climatic from anthropogenic influences, as a whole range of variables other than climatic ones (for example demographic, political, economic, technical) are influencing land-use change throughout the Region' (CIFOR 2005:12). Nevertheless, to have any meaningful discussion on the social impact of climate change one has to define a starting point, albeit with sizeable built-in assumptions.

Our scenarios stretched from a conservative 'best case' to a conservative 'worst case' scenario. The best case scenario is based on the B1 'storyline' of the Special Report on Emission

Scenarios (SRES), which describes a world whose population peaks mid-century at around nine billion and declines thereafter to seven billion. States move rapidly towards service and information economies, and there is a reduction in the material intensity of economic growth and an introduction of clean and resource-efficient technologies (Houghton et al 2001). Atmospheric concentrations of CO_2 would stabilise at around 600 ppm by the end of the century, leading to a global temperature rise of about 1,8 °C and a sea level rise of 18 cm to 38 cm over the next 100 years. The temperature rise would lead to a 20 to 30 per cent decrease in water availability in some vulnerable regions of the world. Crop yields would decline across tropical regions and would fall by 5 to 10 per cent in Africa. Further diverging from the SRES scenario, which does not factor in the impact of international action, this scenario imagines that there is widespread international support for climate change adaptation.

Our medium case scenario uses the SRES A1B storyline as its starting point. A1B envisages the same population curve as B1 and predicts a world of rapid economic growth with the swift uptake of new and more efficient technologies. By contrast to our best case scenario, the world's energy is sourced from a balanced mix of fossil-intensive and non-fossil energy sources (Houghton et al 2001). By 2100, atmospheric concentrations of CO_2 grow to 850 ppm, three times pre-industrial levels. As a result, temperatures increase over the same period by approximately 2,4 °C (within a range of 1,7 °C to 4,4 °C). Sea levels rise between 21 cm and 48 cm and the resultant coastal flooding would affect between 11 and 170 million additional people every year. Precipitation in sub-tropical areas would fall by up to 20 per cent. Internationally, some effort and funds are invested in adaptation, but not a great deal.

Our worst case scenario is built around the A1F1 storyline. This SRES scenario differs from the A1B scenario in that it forecasts a continued dependence on fossil fuels for the world's energy needs – a 'business as usual' scenario. Following this trend, atmospheric concentrations of CO_2 would be 1 550 ppm by 2100, five times higher than pre-industrial levels and four times higher than current levels. This concentration would result in a global temperature increase of 4 °C (with a likely range of 2,4 °C to 6,4 °C) and a corresponding sea level rise of between 29 cm and 59 cm. According to the Stern Review, a warming of 4 °C would result in a 30 to 50 per cent decrease in water availability in southern Africa and a decrease of 15 to 35 per cent in agricultural yields across the continent (Stern 2006). With high climate sensitivity, the number of people exposed to flooding per year could be as high as 160 million by 2050 and 420 million by 2100. Under this final scenario no serious support is given to climate change adaptation.

The terms 'security' and 'conflict' are loaded and general concepts, open to misinterpretation. Consequently we made a conscious decision to frame our discussions in terms of the impact of climate change on *economic* and *political stability*, rather than outright violent conflict. This provided more scope for debate, enabling discussion across the spectrum of the possible impact of climate change. Using these three scenarios as a basis for discussion, we asked participants to discuss the implications of each scenario across six different sectors: agriculture and food security; productive systems and exports; water; natural disasters and risk management; migration; and health. We asked the group to identify the negative consequences and positive opportunities for political and economic stability in each country with regard to each scenario. Scenario planning, by its very nature, becomes less precise the longer it is projected into the future. Consequently, the discussions were limited to impacts on economic and political stability between the present day and 2050.

We then followed up specific themes and issues in a series of individual meetings and consultations in each country. This information was combined with the available literature to come to seven broad findings on the future impact of climate change on political and economic stability in both countries. These findings are the subject of the next section.

Main findings

Key point 1: Ghana and Burkina Faso already face considerable development challenges from existing economic, population and environmental stresses

Burkina Faso is one of the poorest countries in the world, occupying the second-lowest position on the 2007 Human Development Index (176 of 177). Ghana, by contrast, is categorised as a country of 'medium human development' by the UNDP (position 135). The per capita gross domestic product (GDP) is higher in Ghana (US$485 in 2005) than Burkina Faso (US$391), but foreign aid still constitutes more than a tenth of GDP in both countries: In 2005 it was amounted to 10,4 per cent of Ghanaian and 12,8 per cent of Burkinabe GDP (UNDP 2007).

The two countries share many development challenges. They have rapidly growing populations: Ghana's population is 22,5 million and rising at a rate of 1,9 per cent a year, whereas that of Burkina Faso is 13,9 million and rising even faster (at 2,8 per cent). Their urban populations are growing at a tremendous pace (4,2 per cent in Ghana and 4,8 per cent in Burkina Faso), stretching the capacity of government to provide basic urban services (UNDP 2007).

Ghana and Burkina Faso are both vulnerable to changes in temperature and rainfall. Both rely on rain-fed agriculture for their food security and for their agricultural exports (particularly cocoa in Ghana and cotton in Burkina Faso). Consequently drought is the top natural disaster risk in both countries (EM-DAT 2008a, b). Fifty-five per cent of the Ghanaian labour force works in agriculture which, in 2006, accounted for 35,8 per cent of GDP. Land degradation and deforestation are serious problems in both countries (MECV & SP/CONEDD 2006).

Both countries have been affected by episodes of violent conflict domestically and in neighbouring countries. According to the UN Office for the Coordination of Humanitarian Affairs (OCHA) the civil war and anti-foreigner policies in Côte d'Ivoire have led to the return of at least 365 000 Burkinabes since 1998. Others argue this estimate might be too low. According to the former UN Resident Coordinator in Burkina Faso, George Charpentier, over one million have been forced to return since 1998, placing considerable stress on employment opportunities, livelihoods and public services (Kress 2006). Northern Ghana, meanwhile, saw episodic large-scale ethnic violence between 1980 and 2002, culminating in the 1994–1995 conflict that cost several thousand lives and displaced many thousands more (Jönsson 2007:2).

Key point 2: Climate change is not new to West Africa

A changing climate has been a feature of life in West Africa for thousands of years. Just 10 000 years ago the Sahara was a landscape of lakes, savannah and open woodland. After a period of generally drier conditions, the monsoon collapsed across much of what is now the Sahara. Pastoral cattle herding emerged in the region as an adaptive response to the more unpredictable climate.

West Africa in general and the Sahelian region in particular are still characterised by some of the most variable climates on the planet, and this variability increases as one moves north through the sub-humid and semi-arid zones (CIFOR 2005:7). Ghanaians and Burkinabes have not been passive recipients of climate change in the past and have developed many ingenious ways of adapting to their climate. Some analysts suggest that the inherent adaptability of the Sahelian peoples is one of their greatest assets. Nevertheless, this adaptability has been severely tested in the last few decades.

Climate variability seems to have become particularly pronounced in the 20th century. There was a period of unusually high rainfall from the 1930s to the 1950s. At the same time, many African nations were in a transition period to independence (Ghana attained independence in 1957 and Burkina Faso in 1960). Nick Brooks (2006) suggests that, 'the coincidence of this period of political and economic transitions, when considerations of environmental variability and sustainability were minimal, with increased rainfall, resulted in the northward expansion of agriculture in the Sahel into historically marginal areas, with profound implications for the vulnerability of agriculturalists and pastoralists alike'.

The high rainfall period was followed by an extended drought which lasted for much of the latter half of the 20th century. Over a 30-year period, from the 1960s to 1990s, temperatures rose by around 1 °C (EPA 2000:5). Mean annual rainfall and runoff dropped by as much as 30 per cent with devastating effects on local populations and livelihoods, resulting in what Hulme (2001:19) refers to as the 'most dramatic example of multi-decadal climate variability that has been quantitatively and directly measured'.

An estimated 500 000 people died across the Sahel (CIFOR 2005:10) and as many as one million left Burkina Faso during the droughts, most of them settling in the urban areas of other West African countries, principally Côte d'Ivoire (Niamir-Fuller & Mann 2007:4).

Annual rainfall has since partly recovered and has contributed to the recent 'greening' of the Sahel: vegetation cover across the region increased significantly in the 1994–2003 period when compared to the 1982–1993 period (Anyamba & Tucker 2005). Within Burkina Faso, an increase in 'greenness' has been seen on the central plateau; however, more has occurred than can be explained by the increase in rainfall alone. Land use change is believed to be responsible in part for the reversal of the trend towards desertification; in some parts of the country a return to traditional water and soil conservation strategies (such as contour bunding and Zäi cultivation) has helped farmers reclaim some soil fertility and improve their crop yields. Whether the greening of the Sahel represents a return to normal rainfall levels or a more encompassing trend towards wetter conditions in the face of anthropogenic climate change remains to be seen.

Key point 3: Future climate change is likely to make many current development challenges more complex and urgent

There is broad agreement that temperatures in West Africa will rise. But there is little consensus among the regional climate models on what will happen to rainfall in the region. Since 2001 an increasing amount of research has pointed to an increased rainfall in the Sahel being more likely than initially considered. The key factors seem to be that increased temperature and CO_2 concentrations could cause a northward shift of the West African monsoon, which would increase vegetative production, in turn setting up a positive feedback loop between increased vegetative cover and precipitation (though this additional precipitation would be at least partially offset by a faster rate of evapo-transpiration) (CIFOR 2005:21). The rising rainfall of the 1990s seems to support these models.

Both Ghana and Burkina Faso have put considerable effort into assessing the possible impact of climate change. In 2000 Ghana produced its first (and only) national communication on the subject, identifying three main aspects that might be affected:

- *Water:* Simulations using projected climate change scenarios suggested reduction in flows of between 15 and 20 per cent and 30 and 40 per cent for the year 2020 and 2050 respectively in all river basins

- *Agricultural crops:* Projections indicated that the average maximum temperature for the Sudanian savannah zone is expected to increase by 3 °C by 2100, with a 2,5 °C increase in all other agro-climatic zones. They estimated that yields of maize would decrease by 6,9 per cent by 2020 but that the yield of millet, a more drought-tolerant crop, would not be affected

- *Coastal zones:* With a quarter of the population living below the 30 metre level, an estimated sea level rise of 1 metre by 2100 could inundate 1 120 square kilometres of land and put 132 000 people at risk. The cost of protecting all densely populated shorelines at risk with seawalls was estimated at US$1,14 billion, while protecting only the 'important areas' would reduce the cost to US$590 million (EPA 2000)

In 2007, using historical data from the end of 20th century, the Ghanaian Environmental Protection Agency (EPA) projected a steady rise in temperature and reduction in rainfall over the next decades. 'Historical data across the country from the year 1960 to 2000 show a progressive and discernible rise in temperature and a concomitant decrease in rainfall in all agro-ecological zones in the country.' Based on these data, they estimate an average temperature rise of 0,6 °C, 2,0 °C and 3,9 °C; a rainfall decrease of 2,8 per cent, 10,9 per cent and 18,6 per cent; and a rise in the sea level of 5,8, 16,5 and 34,5 centimetres by 2020, 2050 and 2080 respectively (EPA 2007:7–8). The EPA listed ten areas vulnerable to climate change: water resources, agriculture and food security, biodiversity, human health, coastal zones, land management, national revenue, hydropower production, tourism, and women and the poor (EPA 2007:6–8).

The 2007 National Adaptation Programme of Action (NAPA) for Burkina Faso identified four sectors as particularly vulnerable to climate change: water, agriculture, stockbreeding and forestry/fisheries. These four sectors form the basis of the Burkinabe economy and are vulnerable to four aspects of climate change: decline and variability in rainfall, heavy rainfall/flooding, rising temperatures and increased wind speeds.

- *Water:* A projected increase in the frequency of heavy rains and flooding is expected to lead to widespread erosion and siltation along each of Burkina Fasa's four basin slopes. When combined with projected decreases in overall rainfall, the NAPA authors anticipate this will result in reduced run-offs by 2050, ranging from 29,9 per cent for the Nakanbé basin to 73 per cent for the Mouhoun basin

- *Agriculture:* The NAPA for Burkina Faso predicts that average annual rainfall will drop by 3,4 per cent by 2025 and 7,3 per cent by 2050. For an economy heavily dependent on rain-fed agriculture, such a drop will have significant implications for crops and planting cycles across the country, and there have already been declines in cotton, maize and yams production in the south as a result of drought

- *Stockbreeding:* An expected rise in temperature of 1,7 °C by the middle of the century will combine with decreased rainfall to reduce the drinking points open to stockbreeders. Floods are expected to compound these threats by killing livestock

- *Forestry/ fisheries:* Increased erosion and siltation are expected to damage land and water ecosystems, while land clearing, in part a reaction to rainfall pressures, is expected to continue apace. Forestry biomass is predicted to decrease from 200 million cubic metres in 1999 to little more than 110 million cubic metres by 2050 (MECV & SP/ CONEDD 2007)

It is important to note that not all the assessments predict universally negative impacts. Burkina Faso's 2001 national communication to the United Nations Framework Convention on Climate Change (UNFCCC) suggests that both cotton production and the forestry sector would benefit if climate change led to higher levels of rainfall (in contrast to their 2007 NAPA, which projects decreases in forestry biomass). However, the national communication was produced six years before the NAPA (CIFOR 2005:27). A 2002 study undertaken by the International Institute for Applied Systems Analysis predicts that the potential for cereal production could increase in Ghana, but decrease in Burkina Faso (Fischer et al 2002). According to some analyses, the carbon fertilisation effect could lead to a potential increase of vegetative cover and one 2003 study estimated that the potential increase could be as much as 10 per cent of the Saharan land area per decade (Claussen et al 2003).

Box 1 National communications and NAPA in West Africa

All parties to UNFCCC are required to prepare a national communications document in which they report on the steps they have taken or plan to undertake to implement the NAPA Convention. On 8 January 2007 Sierra Leone submitted its first national communication, leaving Liberia as the only nation in West Africa yet to complete the exercise.

NAPAs, also prepared under the UNFCCC, are designed to allow least developed countries (LDCs) to 'identify priority activities that respond to their urgent and immediate needs with regard to adaptation to climate change'. By identifying existing coping strategies through the NAPA process, LDCs can prioritise those grassroots activities which require further support and enhancement, and areas where more investment must be made in adaptive capacity. Instead of focusing on future vulnerabilities through forecasting and scenarios, NAPAs focus on the needs of today, where 'further delay could increase vulnerability or lead to increased costs at a later stage'. Once identified, priority projects are presented to the Global Environment Facility for funding.

Most West African nations have prepared or are preparing their NAPAs. Reports have been submitted by Guinea, Mali, Mauritania, Niger and Senegal; Benin, Burkina Faso, Cape Verde, the Gambia, Guinea-Bissau, Liberia, Sierra Leone and Togo are in the process of finalising theirs (UNFCCC 2007).

Key point 4: There are links between climate change and security in the region

There is some anecdotal evidence that climate change in West Africa might already be associated with conflict. According to Anthony Nyong and his colleagues (2006:235) there is a correlation between reports of conflict and periods of drought in northern Nigeria. They also noticed that communities in northern Nigeria had successfully evolved traditional systems to manage new types of conflict, including those that result from climate-related events. Nick Brooks (2006) suggests that drought helped to trigger conflict in some Sahelian areas. An example of such a conflict is the Tuareg rebellion in

Mali 1990. Although the conflict is primarily regarded as an attempt by various Tuareg groups in Niger and Mali to secure an autonomous Tuareg state, it began amid famine and widespread political repression.

However, there is little research that has managed to construct an *empirical* link between climate change and conflict in West Africa (or anywhere else for that matter). That is not to say that such a link might not appear in future, but the drivers of conflict and instability are complex. Simple models of causation are inappropriate. Barnett and Adger (2007:644) argue '[it] is necessary to be cautious about the links between climate change and conflict. Much of the analogous literature on environmental conflicts is more theoretically than empirically driven and motivated by Northern theoretical and strategic interests rather than informed by solid empirical research.'

Key point 5: Climate change could exacerbate existing, latent tensions in Ghana and Burkina Faso

Ghana

Our research (workshop, literature and subsequent interviews) in Ghana identified five challenges and concerns:

- *Managing the north–south divide:* Ghana is characterised by a pronounced social divide. Poverty is concentrated in the rural north, which is not as well serviced as the south across the full range of government services. Historically the rural north has suffered the most variable climate and demand for water is rapidly rising with population growth. Ghana's national communication estimated that demand for irrigation water in the dry northern savannah could increase twelve-fold by 2050 as a result of climate change and population growth. How the government manages development in the north in the context of an increasingly changeable climate will be an acute challenge in the coming years

- *The division of water between energy in the south and agriculture in the north:* The north–south divide is played out in the sphere of resource allocation between the different regions. One critical issue is the trade-off between water for agriculture in the north and water for the production of hydro-energy in the south. Just before the floods of August and September 2007, the level of water in the Akosombo Dam had fallen to critically low levels, leading to an energy crisis across the country (Addax 2007)

- *The management of regional water sources:* On a regional scale the sharing of water between Burkina Faso and Ghana will likely be a delicate issue in coming years, especially if climate change leads to significantly lower rainfall and run-off. Together Ghana and Burkina Faso constitute 85 per cent of the Volta River Basin and much of the Volta River's flow travels through Burkina Faso before reaching Ghana. Only recently have the six riparian countries of the Volta come together to create a mechanism to govern the management of the basin (see Box 2). The floods that displaced an estimated 285 000 people in Ghana in September 2007 are an example of why such mechanisms might become more important in future; despite two weeks' warning, the opening of the floodgates of the Burkinabe Bagré Dam to release excess water led to widespread flooding in northern Ghana and a certain amount of bad feeling (though the consequences of a ruptured dam would have been far more serious)

- *Instability on borders:* A further concern that was expressed, albeit vaguely, was the ramifications of conflict elsewhere caused by climate change impact and what that might mean in terms of flows of refugees, potentially hostile neighbours and regional economic disruption

- *Economic stability and the structure of the economy:* Some analysts predict that by 2080 Ghana's climate may be unsuitable for the cultivation of cocoa (EPA 2007). This has led to concerns that the impact of climate change will fundamentally alter Ghana's economy, with unforeseen consequences for economic stability

Box 2 The Volta Basin Authority

The Volta Basin Authority (VBA) was established in 2007 to coordinate water management policies for the six riparian countries of the Volta River Basin (Ghana, Burkina Faso, Togo, Mali, Benin and Côte d'Ivoire). The Economic Community of West African States (ECOWAS), believing that there might be future conflicts in the region over the sharing of water resources, initiated the formation of the VBA (Ghanaweb 2007). For years, the 400 000 square kilometre Volta Basin had been one of the few transboundary basins in Africa which had no formal agreement in place for cross-border cooperation and management.

Ghana and Burkina Faso together use 85 per cent of the basin's water.

The VBA is administered by a Ghanaian deputy out of offices in Ouagadougou, Burkina Faso, with input from the other four riparian countries. In addition to integrating the Volta water management policies across the six states, the VBA will establish an observation post to monitor trends in the basin, enhancing its ability to act as an early warning system should water issues arise.

The VBA, having been established only recently, is not yet fully operational. However, should it grow into an effective institution with an appropriate level of influence over Volta water management decisions, it will have implications for water consumption for the basin's 20 million inhabitants, for agricultural decisions, for ecosystem conservation and for hydropower generation (Boakye 2006).

Burkina Faso

Local experts in Burkina Faso suggested four main areas of concern:

- *Water availability:* Water is a contentious resource. Siltation, erosion and variable and declining rainfall are expected to reduce water availability and quality. Our interviewees stressed that, given this threat and a growing population, a careful

balance must be struck between consumption and production, crops and livestock, and upstream, domestic use and use by Burkina's downstream neighbours

- *Relations between pastoralist and agricultural communities:* The expansion of farming and population growth is combining with drought and desertification to constrict the range and resources to which Burkina Faso's pastoralist community has access. In addition, farmers are diversifying into stockbreeding. As a result, they rely less on the mutually beneficial relationships previously established with pastoralists for agricultural inputs such as compost and fertiliser, while increasingly competing with them in the marketplace. As productive systems evolve, so do social relationships (Reysset 2007)

- *Migration:* Longer dry seasons are driving farmers to migrate from northern and central parts of the country into the fertile east and west, bringing them into contact with settled farmers in these richer areas. Greater populations congregating in smaller fertile areas may increase competition for valuable lands and accelerate environmental degradation (MECV & SP/CONEDD 2006)

- *Food security:* Food security was deemed a concern across all three scenarios. Unpredictable, declining rainfall and expected increases in the frequency and gravity of floods and droughts have many worried about the capacity of the country to maintain its agricultural production. Richer countries can buy 'virtual water' in the form of food imports, but this is not feasible for Burkina Faso on a large scale, leaving the country in a precarious position

Key point 6: Only in the extreme scenarios does climate change begin to be a deterministic factor in future economic and political instability

Climate change in the region is clearly one of many serious development issues. It is straightforward to see how climate change might be a (somewhat amorphous) *contributory* factor that exacerbates a number of existing problems such as land degradation, urban migration, food insecurity, power brown-outs and the like. Under specific external conditions (poor governance, recession, ethnic tensions and so on) these problems could undermine economic and political stability.

When discussing best case and medium case scenarios, the experts at the workshops and interviewees generally agreed that climate change could move from being a development problem to becoming a security issue, but that this jump depends on non-climate drivers, which are mostly external conditions such as governance and regional relations. It is, for example, population growth, income distribution and government policy that push people to live on marginal lands in the first place. In other words, a community's vulnerability to climate conflict is not a constant – it can increase or

decrease for reasons that have nothing to do with greenhouse gas emissions (Pielke et al 2007:597).

Generally, it was not until we started discussing the worst case scenarios that the experts in our workshops and interviewees felt that the impacts of climate change themselves could be *deterministic* factors in serious future economic and political instability, or indeed in violent conflict. This may be a partial consequence of what one interviewee termed the 'plausibility structure' of the people we spoke to – the difficulty of imagining conflict breaking out in two stable countries with relatively peaceful histories over the past decade. However, our worst case scenario presents so many challenges to the environment and development that, in one sense, 'all bets are off'. The context becomes harder to recognise as being 'Ghanaian' or 'Burkinabe' – and so predictions become more tenuous.

Conclusions

Our research challenges an overly deterministic approach to climate change as a security issue. There are plenty of well-intentioned reports aimed at increasing awareness of greenhouse gas emissions by asserting a particular outcome. These tend to present a worst case scenario where drought is either assumed, or the possibility of increased rainfall is indicated only in terms of 'devastating floods' and 'the spread of disease', rather than in terms of increased agricultural yields or natural re-vegetation of desertified areas (CIFOR 2005:46).

But while it may be effective as a campaigning strategy, it is not a solid foundation for appropriate policy. At times it obscures the fact that in regions like West Africa, sustained attention (and funding) is still required to deal with the impacts of more predictable trends: malnutrition, poor land management, bad governance, inequitable trade, lack of basic services and so on. The danger of course is that inappropriate policies are generated as a result and that key underlying issues are overlooked. This leads us to our seventh and final point.

Key point 7: Adaptation needs to focus on the full range of development problems affecting countries

'Adaptation' to climate change and the 'climate proofing' of development aid have become the latest mantras of the development community. The first is about helping communities manage the effects of a changing climate (for example training farmers in water conservation practices). The second is about protecting development investments against the impacts of climate change (such as digging deeper wells) and ensuring that development projects do not unintentionally make people more vulnerable (by, for example, encouraging dependence on a drought-prone crop).

Good adaptation is good development, insofar as it helps to support livelihoods and build resilient infrastructures and communities. Clearly, healthy, well-educated communities with diversified sources of income will be better able to cope with the impacts of climate change. As McGray and his partners (2007:2) note: 'A significant area of overlap between adaptation and development is methodological. Rarely do adaptation efforts entail activities not found in the development "toolbox".'

This seems to be the case in Burkina Faso and Ghana, where at least some of the adaptive responses that are being presented at the moment have been around for years. Many were promoted when there was a great deal of public awareness in the 1970s and 1980s about the fight against desertification. They were later sidelined when donor interests moved elsewhere. One example is cultivation of Zäi cultivation, a traditional form of agriculture in Burkina Faso and Mali that involves planting crops in small, circular pits perpendicular to the slope to capture rainwater and retain soil moisture. One interviewee remarked dryly that it is only now, after years of being ignored, that such techniques and projects are again becoming 'fundable'.

It is widely agreed that adaptation needs to help countries adapt to the full range of development problems that they face, not just those that arise as a result of anthropogenic climate change. Certainly Ghana and Burkina Faso are facing a number of pressing challenges that are only tangentially related to climate change, if at all, including growing populations, rapid urbanisation and the need to adjust to a swiftly globalising world. Burkina Faso, for example, has the lowest adult literacy rate among the 177 countries on the Human Development Index, a statistic that is devastating to its economic prospects. Meanwhile, population growth in Ghana, at just below 2 per cent per year, is reducing the quantity of agricultural land available per person far faster than even the most aggressive climate change scenarios could project.

On the one hand, a focus on adaptation is encouraging, introducing as it does a much needed temporal dimension into development planning (that is, thinking about how the resource base and the environment will change over time and planning development interventions accordingly). If designed and implemented carefully, adaptation could help to address some of the key natural resource issues that could become contentious as a result of climate change (food security, water allocation and so on). In the case of Ghana, we see two priorities for adaptation from a conflict-prevention perspective: explicitly addressing the north-south divide by supporting rural livelihoods in the north and reducing economic reliance on the cocoa sector in the south. In Burkina Faso we see food security throughout the country (but particularly in the north) as a priority area for adaptation. In addition, formalised, peaceful dispute resolution procedures between agricultural and pastoral communities may become increasingly important. At a regional level, 'conflict-prevention adaptation' should support the new and largely untested regional mechanisms for resource allocation and dispute resolution, such as the Volta Basin Authority.

On the other hand, we are concerned that some key development priorities might be forgotten in the donor rush to 'do something' about climate change adaptation. A donor budget can be a 'zero-sum' game, where the institutional priorities are set centrally and money used for one objective becomes unavailable elsewhere. Universal primary education, for example, is rarely seen as a priority for adaptation. But education levels in Burkina Faso may well be a more important determinant of the future well-being in the country than anthropogenic climate change.

Adaptation to climate change clearly needs to be integrated into wider plans for development assistance, and the additional costs for that adaptation need to be funded with 'new money' so as not to undercut development priorities elsewhere. In short, the projected impact of climate change has to be examined in the context of other factors within the region. Two key questions need to be borne in mind. First, to what extent will other forces of change (those apart from climate change) affect natural and human systems in West Africa in the 21st century? And second, how do their projected impacts compare, qualitatively and quantitatively, with those of climate change?

Note

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