

# Tiempo

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Cover photograph: Rice planting, Burkina Faso

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**Woman milking, Guinea-Conakry**

# Global climate change

## **Gordon Conway** describes where we are with global climate change, with particular examples from Africa, and what it is we need to do

**T**he United Kingdom's G8 presidency has three key aims on climate change: to build a solid scientific understanding of the size and scope of the problem, and how to address it in the medium- to long-term; to reach agreement on a process to speed up the science, technology and other measures necessary to meet the threat; and, to engage countries outside the G8 on how to meet their growing energy needs sustainably, and how to adapt to climate change impacts.

### **Is global warming a reality?**

Evidence for global warming is clear. Current annual average increases in global temperature are unprecedented in their scale and persistence. The past decade has been the warmest since records began, and indeed, for the past 1000 years. While there are still many unanswered questions in the scientific community on the details of the Earth's changing

climate, the vast majority of scientists agree that climate change is happening and that it is a man-made problem.

The greenhouse effect – put very simply the warming of the Earth's surface by a 'blanket' of carbon dioxide – is a natural phenomenon, present long before humans existed. What we are now experiencing, as a result of the industrial revolution that began in the 18th century, is an enhanced greenhouse ef-

### **MAIN POINTS**

- **The United Kingdom** is using its presidencies of the European Union and the G8 to highlight two global challenges: Africa and the Millennium Development Goals, and global climate change.
- **Gordon Conway**

summarises the climate change challenge and what we need to do, providing many African examples.

- **He explains** how the global community must pull together to meet this challenge.

fect resulting from the production of carbon dioxide and other greenhouse gases. Since 1940 we have increased the annual contribution of fossil fuel derived carbon dioxide in the atmosphere from just less than two billion tonnes per annum to nearly 13 billion tonnes per annum. Over the same period the global surface temperature has grown by about 0.4 degrees Celsius. There is very strong evidence of cause and effect. Scientists have examined many possible causes including sunspot activity and the Earth's irregular orbit, but none stands up to scrutiny except our generation of carbon dioxide and other greenhouse gases.

The best estimates of climate experts in the United Kingdom and elsewhere (notably the members of the Intergovernmental Panel on Climate Change) is that according to current trends we will double levels of atmospheric carbon dioxide over the next 100 years. This alone will increase global average tempera-

tures by about one degree Celsius. However, carbon dioxide is not the only greenhouse gas – methane and chlorofluorocarbons are also significant gases. And, further complicating the picture, the global climate system contains many positive and negative feedbacks.

Positive feedback is where increasing A, increases B, which in turn further increases A. Negative feedback is where increasing A increases B, but that in turn decreases A. An example of this phenomenon is the production of water vapour. The greater the temperature the more evaporation and the more clouds are produced. More high clouds create a blanket effect so warming the planet – a positive feedback. But low clouds create greater reflectivity so cooling the planet – a negative feedback. Positive feedbacks outweigh negative feedbacks and as a result the increase may total some 2.5 degrees Celsius over the next century (estimates lie in the range of two to six degrees Celsius). Moreover, the recent conference at the Hadley Centre in the United Kingdom suggested that the above calculation underestimates the effects of positive feedback loops.

In some cases the increases will result in a ‘tipping point’ scenario where the positive feedback starts to generate new phenomena. For example, a breakdown of the North Atlantic Thermohaline Circulation, the disintegration of the West Antarctic ice sheet, or a shift in mean climate towards an El Niño like state.

For many people a rise of one degree Celsius or even 2.5 degrees Celsius does not seem

like very much. But we need to remember that the difference between the coldest period of an ice age and the warmest time of the subsequent interglacial period is only five to six degrees Celsius.

### **Near term effects**

First, average temperatures in many, if not most, parts of the world will increase. Second, precipitation will become greater or smaller. In southern Africa it will become hotter and drier, and in central Africa it is likely to be hotter and wetter. Third, sea levels will also rise. To date the global sea level has risen between one and two millimetres every year throughout the 20th century. Over the next 100 years the increases will be ten to 90 centimetres more. The largest contribution to this (about a third) comes from thermal expansion of ocean water. Ocean warming lags behind land warming, so sea levels will continue to rise in the next century even if global warming ceases. Finally, we can expect more frequent and more severe extreme events – hurricanes, tropical cyclones, floods and droughts.

### **Climate change impacts**

No country will escape the impacts of climate change. Increasing numbers of people will be affected by flooding. Already the number of people affected by floods annually has risen from seven million in the 1960s to 150 million now. If the sea level rise continues as predicted, hundreds of millions more people will

be at risk from flooding. As a consequence, millions of people could face being displaced from their homes – with all the political and social affects that that will entail.

Crop production will be seriously affected. While in some parts of Africa yields may rise, in most areas they will fall. The maize crop in southern Africa is already drought stressed nearly every year. This stress will grow.

Diseases, such as malaria, whose incidence is affected by temperature and precipitation, may become worse. Many vulnerable ecosystems, and the plants and animals they contain, will be adversely affected. People will lose their livelihoods and communities and whole countries will suffer economically.

It is widely accepted that climate change will hit developing countries hardest. These countries have contributed least to the problem, and are also the countries least able to cope with the impacts. Africa is especially at risk. It already has a highly variable and unpredictable climate, and many African systems already fail to respond to existing climate pressures.

Unless global warming is reduced, achievements in the fight against disease, hunger and poverty risk being unravelled. National and international investments in development and poverty reduction in these countries are also at risk. And of course investments that under-perform or that, in extreme cases, are destroyed will deepen existing poverty and set back development – particularly among the poorest and most vulnerable. Climate

variability and climate change are thus likely to significantly impact on the ability of African countries to achieve the Millennium Development Goals.

### What can be done?

Just as technological progress and human activity have helped to cause this problem, it is also within our power to lessen its impact and adapt to change. Science has alerted us to the dangers our planet faces and can help us meet these challenges. But we need to act now. Delay will only increase the seriousness of the problems we need to reverse. And it is the G8 countries that need to lead, not just because these countries currently account for 47 per cent of global carbon dioxide emissions, but also because G8 countries account for most global scientific effort: they are responsible for 70 per cent of the world's scientific papers and 75 per cent of science citations.

Global climate change affects us all. We are in this together and we therefore need to find solutions that are based on genuine partnerships. Our governments have to act together for several reasons. First, to improve the acquisition and interpretation of climatic data so that we can better predict what is happening. The African climate observing system is urgently in need of improvement. For certain regions, scientific understanding is reasonable, for other parts, such as the Congo basin, which is key to the global system, very little is known. Africans need to engage more fully, not only in global climate observations

and modelling but in smaller scale regional modelling that can provide better predictions of future scenarios for Africa.

Second, based on such predictions, there needs to be a better mapping of vulnerabilities. Which coastal areas are likely to suffer from sea level rises? Which crops and where are going to suffer from increased drought? Which diseases and where are going to become more prevalent?

Third, how can we improve our resilience to climate change? We may be able to resist change, but more likely we will have to find ways of recovering from the impacts. We need more resilient infrastructures, more resilient environments and, most important, more resilient livelihoods.

Finally, we need to invest in ways of producing energy without increasing the amounts of carbon dioxide we put into the atmosphere. We can do this, in part by energy conservation, and in part by developing forms of energy, such as renewable energy, that are low in their carbon dioxide emissions and are sustainable and inexpensive. We can also invest in systems that allow us to capture carbon and sequester it, reducing the amount that reaches the atmosphere.

In conclusion, there is no single 'silver bullet' that will solve the problem. Every member of the global community has a role to play – some doing big things, some doing small – but each contributing to the whole. We have to pull together otherwise all of us will suffer. ■

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## ABOUT THE AUTHOR



● **Gordon Conway** is Chief Scientific Adviser to the United Kingdom Department for International Development, and Professor of International Development at the Centre for Environmental Policy at Imperial College, London, United Kingdom.

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## FURTHER INFORMATION

● **In the Cyberlibrary:** The Tiempo Climate Cyberlibrary provides a listing of theme sites on climate change and Africa at [www.tiempocyberclimate.org/portal/t57web.htm](http://www.tiempocyberclimate.org/portal/t57web.htm).

# Indigenous adaptation

**Ben Twinomugisha** discusses the merits of indigenous versus scientific adaptation, and the best strategies for community participation in Uganda

**W**hile scientists around the globe agree that climate change is already occurring, indigenous communities in Uganda have not yet taken into account the hardships likely to emerge as a result. Most indigenous local Ugandans remain unaware of scientific adaptation strategies for coping with climate change. They have, however, braved the adversity associated with climate variability, and anticipated and responded informally to the direct and indirect effects of climate variability, albeit in an ad hoc manner, for centuries.

In rural Ugandan communities, indigenous knowledge is an integral part of poor people's lives. It is the basis for decision-making regarding food security, human and animal health, and natural resource management. Local coping strategies provide the foundation for people's own ideas on how to

survive during harsh times. Any adaptation to climate change that is occurring is based on past experiences, which are passed on from one generation to another. Strategies to cope with climate change should therefore build on traditions and societal norms, which can be adapted to local cultures and changes in the environment and can be redefined to meet new challenges.

## MAIN POINTS

- **Ben Twinomugisha** explains how Ugandans have been adapting to climate variability and change for many years.
- **He describes** how government approaches to adaptation are based on top-down development models, which often have little relevance for local Ugandans.
- **Drawing comparisons** with the agricultural sector, he explains how conventional scientific knowledge systems need to incorporate indigenous knowledge on adaptation.

Nevertheless, the forces of globalization in operation today are affecting Ugandan communities and have already destabilized many cultural patterns. Whilst indigenous knowledge has its merits, we cannot ignore the fact that we seem to live in a global village and cannot fence our local communities off from global influences. But we can strive to connect them to these influences so that local traditions are not lost, but rather become a point of reference within a broader system.

Mainstreaming adaptation to climate change is important to Uganda. The government of Uganda has therefore ratified numerous international climate change commitments. Uganda has adopted its National Adaptation Programme of Action, as determined by the seventh Conference of Parties to the United Nations Framework Convention on Climate Change. Limited vulnerability assessments have been conducted in sectors such as agriculture, water resources and for-



estry. Some effort has also been made at the policy level to communicate the urgent and immediate adaptation interventions needed to alleviate the adverse effects of climate change.

The issue of popular participation remains open to question. What is the extent to which information about adaptation, and information about climate change adaptation programmes and legislative and policy developments, should be communicated to all stakeholders? Consultation where all stakeholders, especially the vulnerable poor, are offered opportunities to express their views and provide feedback on proposals is required. There is an alarming gap between need and reality regarding providing vulnerable people with the power to choose between courses of action, and providing them with the assurance that decisions made regarding adaptation strategies will be implemented. The lack of meaningful community participation in decision-making regarding appropriate adaptation has made it difficult to incorporate indigenous knowledge into conventional knowledge systems.

Interest in the potential contribution of indigenous knowledge to human development is growing, perhaps due to the lack of success demonstrated by many current development models. But marginalized people throughout Uganda are still being excluded from mainstream development activities. Local poor people have benefited little from adaptation efforts, most of which are based on top-down



**Woman peeling mangoes to extract seeds for planting, central Uganda** Photo: Ben Twinomugisha

development models. Climate change adaptation in the context of government policies seems distant from local realities.

The agricultural sector demonstrates this well, and provides a useful analogy when looking at government policy regarding adaptation to climate change. Food security is of great concern to the people of Uganda, especially those in north and east. Uganda's economy depends heavily on agriculture, and 90 per cent or more of farm produce is from indigenous crops and animals. The Plan for

Modernization of Agriculture (PMA) policy contains significant content on adaptation to climate change, including the development of drought resistant cultivars, provision of water for production, agricultural information dissemination, training and research. The PMA sectoral programmes, such as the National Agricultural Advisory Service, are top-down in design. This and similar policies have faced challenges during the implementation stage. The results of these policies have been of little use to poor people who

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## “When scientific technology and traditional knowledge come into contact with each other, traditional knowledge is typically swept aside”

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lack good land, adequate access to irrigation facilities, financial means or high literacy.

For many years Ugandans have depended on indigenous seeds for subsistence and commercial production. However, recent trends have encouraged the use of imported Genetically Modified Organisms (GMOs) despite the controversies that surround them. They may not be appropriate to the local context, and they have the potential to negatively impact human health, for example through the transfer of antibiotic resistance markers. They may also negatively affect the environment, for example through the unintended transfer of genes through cross-pollination, unknown effects on other organisms such as soil microorganisms, and loss of local floral and faunal biodiversity.

When scientific technology and traditional knowledge come into contact with each other, traditional knowledge is typically swept aside. The GMO example above illustrates this. The degradation of indigenous seed stocks traditionally used by poor Ugandans has increased dependence on foreign seeds. Access and intellectual property rights have also been threatened. This will increase the likelihood of high-income countries dominating world food production and practicing bio-piracy (the foreign

exploitation of local natural resources).

Indigenous knowledge and local intellectual property rights in the farming sector are vital for food security. Indigenous farming occurs in the context of local realities, and dynamic homegrown intellectual sovereignty is essential for sustainable development and empowerment. Regardless of local opposition, the government of Uganda, through the PMA, rates imported seeds more highly than improved indigenous seeds. This is because GMOs take less time to mature and have greater yields and stress tolerance.

Adaptation interventions in Uganda are traveling down a similar route. They are failing to secure the participation of poor people because of the absence of instruments and mechanisms that enable poor people to use their own knowledge. Greater emphasis on how people use their own locally generated knowledge to change and to improve their lives is required. More effort is needed to strengthen the capacity of local people to develop their own knowledge and to develop techniques that involve both scientific and traditional knowledge. Recognition that these two types of knowledge are linked and not necessarily mutually exclusive is needed. ■

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### ABOUT THE AUTHOR



● **Ben Twinomugisha** is a Networking and Research Officer at the Development Network of Indigenous Voluntary Association (DENIVA) in Uganda. He is also a fellow of the Capacity Strengthening in the Least Developed Countries for Adaptation to Climate Change (CLACC) project.

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### FURTHER INFORMATION

● **On the Web:** For more information on DENIVA, visit [www.deniva.or.ug](http://www.deniva.or.ug).  
● **In the Cyberlibrary:** The Tiempo Climate Cyberlibrary provides a listing of theme sites on climate change and Africa at [www.tiempocyberclimate.org/portal/t57web.htm](http://www.tiempocyberclimate.org/portal/t57web.htm).



# Impacts on small-scale farmers

## Mubanga Kasakula describes the impact of climate change on small-scale farmers in Zambia

Zambia has a total population of over ten million. Some 60 per cent of these people are engaged in agricultural activities, most of whom are women. Zambia has three seasons: hot and dry (between August and October), rainy (between November and April) and cool and dry (between April and July). Most farming activities occur in the rainy season. This is unlike nearby countries such as Kenya and Uganda, which have two wet seasons.

### Climate change has reduced yields

Small-scale farmers in Zambia have noticed several changes in recent years. There has been a shift in when the rainy season has started. Rains do not begin until December and have often ended by early March. The rain, when it comes, is interspersed with dry spells. Most crops grown by small-scale farmers, like local varieties of maize and sorghum, mature late. Yields are therefore falling due to a lack of

rain. This has precipitated a critical situation: Zambia's food deficit for 2005 is currently 85,000 metric tonnes (food production in 2004 was 1.2 million metric tonnes, but this year it will be only 866,000 metric tonnes).

### Impacts

The reduction in food supply affects household incomes for families that depend on agriculture. These families can no longer send their children to school because there is

no money for fees, and the attention span of children who can afford schooling is reduced because they are sent to school hungry. Malnutrition is on the increase and susceptibility to diseases is greater. Those suffering from HIV/AIDS have lower survival rates. Women and girls are walking longer distances in search of water for their animals and for domestic use, which is tiring.

### Support needed

The capacity of the Zambian Meteorological Agency needs to be enhanced in order to give accurate, timely information on likely weather and rainfall patterns. Funding is needed for small-scale irrigation schemes, which are affordable for poorer farmers. For example, investment in treadle pumps can lead to almost a doubling in production. Funding is also needed to help develop early maturing and drought tolerant crop varieties through farmer led research. Farmers need

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### MAIN POINTS

- **Mubanga Kasakula** describes the impact of climate change on small-scale farming in Zambia.

- **He highlights** the affects of these impacts on the livelihoods, education,

- health, nutrition and welfare of families relying on small-scale agriculture.

- **He discusses** the support needed by small farmers to help them adapt to climate change impacts.



**Abraham, in southern Zambia, shows how poor his crop is this year** Source: Crispin Hughes

encouragement to grow drought resistant crops such as cassava and sorghum, instead of the hybrid maize currently favoured. Support for appropriate farming is needed, not just more food aid.

The way in which support is given is also important. More resources to and investment in the agricultural sector are required, as is transparency in the allocation of these re-



**Treadle pumps can almost double production** Source: Crispin Hughes

sources. Improvement of rural infrastructure relevant to poorer people will facilitate the development of income generating activities by providing access to water and electricity. Farmers need to be provided with both the space and capacity to engage in policy issues, from the local level up to the international level. ■

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## ABOUT THE AUTHOR



● **Mubanga Kasakula** is a subsistence farmer from the Mwembeshi Settlement, Kafue District, about 45 kilometres from Lusaka. He is married with six children and grows maize, groundnuts, beans, vegetables and cash crops (mainly cotton) on four hectares of land. Mubanga is a leader of the Zambia Small-scale Farmers' Forum, which has members in all nine Zambian provinces, and aims to empower small-scale farmers to influence policies and decision-making regarding their livelihoods.

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## FURTHER INFORMATION

● **On the Web:** This article is based on a presentation made at the Global Warming 8, or GW8, held on 5 July 2005 in Edinburgh, UK, to coincide with the G8. The audio version can be downloaded here: [www.indymedia.org.uk/en/2005/07/317152.html](http://www.indymedia.org.uk/en/2005/07/317152.html). For more information about the GW8 and Practical Action activities on climate change please see: [www.practicalaction.org](http://www.practicalaction.org).

## ASIA PACIFIC

**Up to 10,000 people a year in the Asia-Pacific region could be dying as a result of impacts related to global warming, according to a WHO expert, and the number could increase over the next 50 to 100 years.**

Hisashi Ogawa, regional environmental adviser to the WHO, warned that “we need to adapt ourselves or our way of living ... to the changing climate. The number of deaths due to various natural disasters – droughts, floods, storms – has increased [by] about 30 to 40 per cent” between the early 1980s and late 1990s, he said.

*Read more:*  
[www.tiempocyberclimate.org/newswatch/arnews05.htm#051002](http://www.tiempocyberclimate.org/newswatch/arnews05.htm#051002)

## NEW PARTNERSHIP

**Australia, China, India, Japan, the Republic of Korea and the US have agreed a partnership intended to tackle climate change, energy security and air pollution.**

The Asia-Pacific Partnership on Clean Development and Climate will “explore ways to reduce the greenhouse intensity of our economies; build human and institutional capacity to strengthen cooperative efforts; and seek ways to engage the private sector.” The partnership is “a complement not an alternative” to the Kyoto Protocol, according to US Deputy Secretary of State Robert Zoellick. Regardless, the initiative has angered many.

*Read more:*  
[www.tiempocyberclimate.org/newswatch/arnews05.htm#050807](http://www.tiempocyberclimate.org/newswatch/arnews05.htm#050807)

## HURRICANE STUDY

**A new study shows a worldwide trend towards a greater number of the most powerful hurricanes and typhoons and claims that this might be the result of global warming.**

“... the increase in intensity is probably accounted for by the increase in sea surface temperature ... probably the sea surface temperature increase is a manifestation of global warming,” reported project leader Peter Webster of the Georgia Institute of Technology, Atlanta, United States. The proportion of hurricanes reaching categories four or five increased from 20% in the 1970s to 35% over the past decade.

*Read more:*  
[www.tiempocyberclimate.org/newswatch/arnews05.htm#050925](http://www.tiempocyberclimate.org/newswatch/arnews05.htm#050925)

## SATELLITE DATA

**A new study of temperature data from satellites and weather balloons confirms that the tropical atmosphere has warmed since 1979.**

The study addresses the apparent contradiction between tropical temperature trends derived from previous analyses of satellite data, surface observations and model predictions of the effects of global warming. The outcome “strongly suggests that there is no longer any fundamental discrepancy between modeled and observed temperature trends in the tropical atmosphere,” said Benjamin Santer, a scientist at the Lawrence Livermore National Laboratory.

*Read more:*  
[www.tiempocyberclimate.org/newswatch/arnews05.htm#050821](http://www.tiempocyberclimate.org/newswatch/arnews05.htm#050821)

## PERMAFROST

**An area of permafrost covering a million square kilometres has begun to melt for the first time since its formation 11,000 years ago.**

Sergei Kirpotin of Tomsk State University and Judith Marquand of Oxford University report that the whole western Siberian sub-Arctic region has started to thaw. According to Kirpotin, the situation is “... probably irreversible and is undoubtedly connected to global warming.” As permafrost melts, methane is released into the atmosphere. Larry Smith of the University of California, reckons that the west Siberian peat bog could hold around 70 billion tonnes of methane.

*Read more:*  
[www.tiempocyberclimate.org/newswatch/arnews05.htm#050821](http://www.tiempocyberclimate.org/newswatch/arnews05.htm#050821)

# Africa and climate change

**Camilla Toulmin** describes the climate change challenge in Africa, emphasizing the need for both economic development and environmental security

**A**frica has experienced huge shifts in climate over past millennia, but the likely changes in the next few decades may present some of the greatest challenges this troubled continent has seen. According to the Intergovernmental Panel on Climate Change, the interior of the vast African continent will suffer greater increases in temperature than the average warming elsewhere. And while some of Africa's drylands may get higher rainfall, such increases are likely to come in heavier torrential downpours, which risk carrying away soils and vegetation. Higher temperatures will also increase evaporation of whatever moisture is left in the soil. Sea-level rise threatens many coastal cities with flooding, while changes to rainfall and temperature will shift disease patterns, wildlife habitat and river flows.

Agriculture and natural resources provide livelihoods for some 70 to 80 per cent of peo-

ple in sub-Saharan Africa, 30 per cent of Gross Domestic Product, and 40 per cent of export revenue. African countries are already viewed as being substantially off-track in terms of meeting the Millennium Development Goals. Yet many of these goals will become yet more distant dreams as climate change bites.

People often talk of 'environment' as an optional extra once economic growth has been achieved. As John Ashton and Tom Burke

## MAIN POINTS

- **Camilla Toulmin** explains why Africa is particularly at risk from climate change.
- **She describes** impacts observed in Sahelian countries, and how governments there have hindered adaptation activities.
- **She stresses** the need to integrate both economic development and environmental security into policies and actions, and provides seven recommendations for the United Kingdom Government's presidency of the G8.

rightly note, environmental concerns tend to be delegated to the minister for the environment, usually a lowly post with few resources and little political weight. Yet for climate change in Africa, the dichotomy between environment and economic development is particularly false. There is and will be no durable economic development unless it is based on sustainable management of Africa's land, soils, forests and water.

The report of the Commission for Africa disappoints in this respect. In a text of some 400 pages, 'environment' gets slightly less than one page and climate change a mere paragraph. Written by and for the economics profession, it blurs the central challenges.

## Adapting to climate change

The west African Sahel, a belt of semi-arid land lying along the southern edge of the Sahara desert, shows what adaptation means in practice. Since the late 1960s, the Sahel

has experienced a 25 per cent fall in rainfall compared to the previous period, combined with several harsh drought years.

In response, farmers have shifted to shorter cycle varieties of millet and maize, and abandoned crops like groundnuts that need higher rainfall. Livestock has been herded further south, away from the desert margins and into settled, cultivated areas, where a new accommodation between animals and crops must be sought. Wells have been dug and small dams built to provide for gardens of onions, tomatoes and mangoes for sale. Many farmers have also moved southward, seeking land in better-watered areas. Since the late 1960s, five million people from Burkina Faso and Mali have migrated south to neighbouring Côte d'Ivoire. Much of the civil strife there today stems from the uneasy relations between incomers and local people, and the growing shortage of land in a region where it had formerly been considered to be in endless supply.

The experience of the Sahel shows that people adapt to changes in climate, but the process is not cost-free. Governments can help or hinder such adaptation. In theory, they can enable movement across national frontiers. They can strengthen local institutions. They can install more transparent systems for outsiders to gain access to land. They can encourage technical and financial support for small-scale irrigation activities. They can provide reliable channels for migrants' remittances, which have become key



**Overgrazing causes land degradation, which amplifies climate change impacts. Ironically, many rural people keep large herds to cope with climate change variability**

Photo: Pablo Tittonell

to the livelihoods of many families.

But overall in the Sahel, in practice, governments have played little role in making adaptation possible. Rather, it has been people, their families, communities and local institutions, which have found innovative ways of dealing with difficult times.

### **The G8 agenda and beyond**

The second half of 2005 provides the United Kingdom government with an unrivalled opportunity to lever major change, from the G8 summit in Gleneagles from 6–8 July to the climate change conference in Montreal in

November/December. Here are seven recommendations for action.

First, those of us in Britain and other wealthy countries must recognise our responsibility for climate change. We must help address problems of adaptation, particularly for African nations. Africa is likely to suffer some of the greatest impacts of climate change despite its people having contributed among the least to the human impact on climate.

Admitting our responsibility for global warming means we can no longer adopt the 'lady bountiful' approach of charitable gestures towards those suffering from global

## CLIMATE CHANGE VULNERABILITY IN AFRICA



Source: UNEP/GRID Arendal/Anna Balance 2002

warming. Instead, there are strong grounds for payment of reparations.

Giving small amounts of aid is the preferred course for most rich country governments. This gives them a warm glow of self-righteousness, while avoiding the much more difficult task of undertaking domestic measures which could lose votes, or damage the interests of powerful groups. As for trade and agricultural policy, so also for climate change – our governments provide fine words but little action, preferring to wait, establish a new commission to prepare a report, or set a deadline ten years hence.

Second, we need to learn more about what ‘adaptation’ means, and how to strengthen local capacity to cope in ways that bring positive rewards to local people. It is vital to recognise much of what is already being done by local people and organizations, rather than thinking that government should make such changes happen. Non-government organizations and other civil society groups can play a major role in supporting local action.

Third, climate change resilience needs to be built systematically into new projects and policies. To date, climate change is almost never used as the template within which to make choices between options. Yet, whether it is design of river basin management, new irrigation systems, or urban planning, impacts and implications for climate change need to be at the forefront.

Fourth, strengthening local land rights and encouraging investment in sustain-



able management will help farmers adapt to change. In many cases, this means improving local technologies for soil management, like the extraordinary spread of simple terracing methods that have transformed the central plateau of Burkina Faso. Governments also need to provide incentives for collective management of common resources – water, grazing, woodlands – through joint management, legislation and local by-laws.

Fifth, much is to be gained from monitoring and lesson-learning across the continent, seeing how local experience with adaptation can benefit those elsewhere. The Kyoto Protocol offers one very powerful opportunity for combining climate mitigation measures with socially beneficial outcomes, to get a ‘development dividend’ on activities funded through the Clean Development Mechanism. Help to encourage south-south learning on resilience and adaptation has much to offer.

Sixth, invest in design of new and better energy systems in Africa, through decentralized power generation, use of biofuels, and improvements in solar technology. Support for such technical innovation needs to be seen as a high priority challenge.

Seventh, the rapid growth in African urban centres needs clever thinking to provide institutional and technical innovations for better energy, shelter and transport systems. Twinning G8 and African mega-cities offers mutual gains in learning how to cope. The great G8 cities – London, Moscow, Los Angeles, Tokyo – face huge challenges in becoming

more climate-friendly, requiring a systems shift in thinking. Lets see how – together with Lagos, Nairobi, Johannesburg and Accra – we can get smart ideas into urban design to make our cities liveable for the future.

### Seize the day

The United Kingdom government has an unrivalled opportunity to take the lead on climate change and Africa. But this great chance demands more than fine words. Visionary language needs to be backed up by actions.

Can Tony Blair, the British Prime Minister, do the job? Given the scale of the challenge and foot-dragging by the current United States administration, Europe must take the lead. Why then has this government not yet contributed to the Least Developed Countries Fund for adaptation to climate change? And why is the United Kingdom government arguing about the levels set by the European Commission for its participation in the Emissions Trading Scheme? Tony Blair tells us that only those nations with the most innovative, carbon-friendly industries will be the leaders of the future. So let us set ourselves a high standard and reap the longer-term benefits.

Large-scale, disruptive climate change threatens to be the ultimate weapon of mass destruction for us all. There is serious evidence for it, collected by inspectors over more than a decade. We have a common interest in climate stability, and a common responsibility for making progress. Let us not miss this chance. ■

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## ABOUT THE AUTHOR



● **Camilla Toulmin** is an economist by training. She has worked mainly in franco-phone West Africa, on agricultural, pastoral and tenure issues. She is now Director of the International Institute for Environment and Development, which she joined in 1987 to set up a Drylands Programme.

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## CONTACT

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## FURTHER INFORMATION

● **On the Web:** This article first appeared on the openDemocracy website, along with several other articles on the politics of climate change: [www.opendemocracy.net/climate\\_change/index.jsp](http://www.opendemocracy.net/climate_change/index.jsp). For more information about the International Institute for Environment and Development Climate Change Group, visit [www.iied.org/climate\\_change/index.html](http://www.iied.org/climate_change/index.html).

● **In the Cyberlibrary:** The Tiempo Climate Cyberlibrary provides a listing of theme sites on climate change and Africa at [www.tiempocyberclimate.org/portal/t57web.htm](http://www.tiempocyberclimate.org/portal/t57web.htm).

# CONFERENCES

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## Climate or Development? Hamburg, Germany 28-10-2005 to 29-10-2005

Organized by the Hamburg Institute of International Economics (HWWA). The programme will look at the issue of poverty reduction under the Millennium Development Goals and within the context of the Clean Development Mechanism. Questions to be discussed include whether the CDM in its current practice really fosters development; how can adaptation reach the poor; and, what interests are involved.

*Details: Suenje Callsen, HWWA, Research Programme on International Climate Policy, Neuer Jungfernstieg 21, 20347 Hamburg, Germany.*  
*Fax: +49-40-42834451.*  
*Email: suenje.callsen@hwwa.de*  
*On the Web: www.hwwa.de*

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## Greenhouse 2005: Action on Climate Change Melbourne, Australia 13-11-2005 to 17-11-2005

Conference aimed at all representatives from research and development organizations, government, industry and the community. Discussion will be multidisciplinary and broad in its focus on climate change and the need for all levels of government, industry and scientists to work together. Main themes will cover likely impacts of climate change, adaptation strategies and approaches to reducing atmospheric greenhouse gas concentrations.

*Details: Paul Holper, Greenhouse 2005, CSIRO, Private Bag 1, Aspendale, VIC 3195, Australia.*  
*Fax: +61-3-92394444. Email: info@greenhouse2005.com*  
*On the Web: www.greenhouse2005.com.au*

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## International Central Asian Conference on Renewable Energy Karaganda, Kazakhstan 14-11-2005 to 16-11-2005

Co-organized by INFORSE-Europe and the Renewable Energy Agency of the Ukraine. No further details on the conference agenda are available at present.

*Details: Julia Kalmykova, Karaganda Ecological Museum, Bukhar Zhyrau prospekt 47, 470000 Karaganda, Kazakhstan.*  
*Email: bc\_conference@nursat.kz*  
*On the Web: www.ecomuseum.freenet.kz*

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## Green Power Mediterranean: The Sustainable Meeting Place Rome, Italy 15-11-2005 to 16-11-2005

Intended to create a focused venue for networking and knowledge transfer to further the adoption of renewable energy systems and energy efficiency programmes in the Mediterranean region. Forum topics include: sustainable energy financing; regional emissions trading; regional interconnection and transmission; renewable islands; progressive policy and regulation; and presentation of a

number of successful renewable energy systems case studies.

*Details: Green Power does not provide mailing or fax contact details.*

*Email: info@greenpowerconferences.com*  
*On the Web: www.greenpowerconferences.com/events/GreenPowerMed.htm*

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## One-third of Our Planet: What can Asia & Europe do for Sustainable Development?

### Jakarta, Indonesia 23-11-2005 to 25-11-2005

Co-organized by Pelangi Indonesia and the Hamburg Institute for International Economics. Workshop intends that participants will discuss the Clean Development Mechanism, its potential, its progress and the way ahead. Focus will be on how the CDM can support sustainable development whilst addressing the challenges of climate change, who are the key players and what are the markets?

*Details: Asia-Europe Foundation, 31 Heng Mui Keng Terrace, Singapore 119595.*

*Fax: +65-68721206.*  
*Email: info@asef.org*  
*On the Web: www.env.asef.org*

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## Eleventh Session of the Conference of the Parties to the UNFCCC

### Montreal, Canada 28-11-2005 to 09-12-2005

Agenda and main issues for discussion are not available at this stage.

Check UNFCCC website for updates and information.

*Details: UNFCCC Secretariat, PO Box 260 124, D-53153 Bonn, Germany.*

*Fax: +49-228-8151999.*  
*Email: secretariat@unfccc.int*  
*On the Web: www.unfccc.int*

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## International Symposium on Sea Ice

### Dunedin, New Zealand 05-12-2005 to 09-12-2005

Main aim of the Symposium is to promote interdisciplinary discussion of the geophysics of sea ice and its interactions with the ocean, atmosphere and biosphere. Topics include: sea ice and climate; sea ice ecology and habitat; sea ice modelling; large scale sea ice morphology; atmosphere-ice-ocean interactions; and, sea ice morphology, motion and deformation.

*Details: Sea Ice Symposium Organizer, International Glaciological Society, Scott Polar Research Institute, Lensfield Road, Cambridge CB2 1ER, UK.*  
*Fax: +44-(0)1223-354931.*  
*Email: igsoc@igsoc.org*  
*On the Web: www.igsoc.org/symposia/*

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## Workshop on Meteorology & Climate over South China

### Hong Kong, PR China 05-12-2005 to 07-12-2005

Organized by the City University of Hong Kong. Participants will present and discuss latest research results on meteorology and climate over the South China region. Main topics include: tropical cyclones affecting

South China; monsoons (summer and winter) over South China; climate change (macro to micro); meso-scale convective systems and heavy rain over South China.

*Details: Johnny Chan, Laboratory for Atmospheric Research, City University of Hong Kong, Tat Chee Ave, Kowloon, Hong Kong, PR China.*

*Fax: +852-27887830.*

*Email: weather.sc@cityu.edu.hk*

*On the Web: www.ap.cityu.edu.hk/weather-sc/Workshop.htm*

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### **Climate-Society Interactions – Case Studies from Africa**

#### **Paris, France**

**09-01-2006 to 12-01-2006**

Objective to bring together young interdisciplinary researchers, primarily from the UK, France and Africa, to meet in an informal atmosphere, present their own research and learn more about the nature of climate-society interactions. For final-year PhD students, post-docs and recently-appointed lecturers/professors. Deadline for applications is November 4th 2005.

*Details: Declan Conway, School of Development Studies, University of East Anglia, Norwich NR4 7TJ, UK.*

*Email: d.conway@uea.ac.uk.*

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### **2nd Scientific Conference on Environmental Sustainability in Tanzania**

**Moshi Town, Kilimanjaro: Tanzania**

**23-01-2006 to 26-01-2006**

Forum for exchange of experience and/or research findings and predictions of climate change and analysis of how this work can be used within Tanzania to achieve sustainable development and poverty reduction, focusing on how climate change affects and will continue to affect the livelihoods of ordinary Tanzanians. *Details: Scientific Conference on Environmental Sustainability in Tanzania Secretariat, National Environment Management Council, Tancot House, 3rd Floor, Sokoine Drive, PO Box 63154, Dar-es-Salaam, Tanzania.*

*Fax: +22-211-1579.*

*Email: nemccconference@yahoo.com.*

*Web: www.nemctan.org.*

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### **17th Global Warming International Conference & Expo (GW17)**

#### **Miami, USA**

**20-04-2006 to 21-04-2006**

Will include a wide range of oral and poster presentations as well as the Expo. Main themes for presentation and discussion include: sustainable environment and health for the 21st century; remote sensing and global surveillance; extreme events and impacts assessment; clean energy technology; greenhouse gas and ecosystems; global warming and the oceans; education - global change and sustainable development.

*Details: GWXV11 Secretariat, PO Box 50303, Palo Alto CA 94303, USA.*

*Fax: +1-630-9101561.*

*Email: gw17@globalwarming.net*

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### **6th International Conference on Urban Climate**

#### **Goteborg, Sweden**

**12-06-2006 to 16-06-2006**

Co-sponsored by the International Association for Urban Climate, WMO and Goteborg University. Conference will provide an international forum for the world's urban climatologists to meet and discuss current research developments as well as the application of climatic knowledge in the design of better cities. Will cater to meteorologists, hydrologists, climatologists, ecologists, engineers, architects, planners and other interested individuals.

*Details: Urban Climate Group, Physical Geography, Goteborg University, Box 460 SE-405 30, Goteborg, Sweden.*

*Fax: +46-31-7731986.*

*Email: icuc6@gvc.gu.se*

*On the Web: www.gvc.gu.se/icuc6/index.htm*

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### **Third World Congress of Environmental & Resource Economists**

#### **Kyoto, Japan**

**03-07-2006 to 07-07-2006**

Organized by the Society of Environmental Economics and Policy Studies and the European Association of Environmental and Resource Economists amongst others. Main themes for presentation of papers and sessions include: climate change impacts/costs; air pollution; environmental taxation; emissions permits; and, pollution regulation.

*Details: Takamitsu Sawa, Chair of Organizing Committee, Institute of Economic Research, Kyoto University, Sakyo-san, Kyoto, Japan.*

*Email: wc3-info@congre.co.jp*

*On the Web: www.worldcongress3.org/*

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### **World Renewable Energy Congress IX & Exhibition**

#### **Florence, Italy**

**19-08-2006 to 25-08-2006**

Theme for this years Congress is "Energy/Water and Cleaner Environment". Hosted by the University of Florence Centro ABITA and organized by the World Renewable Energy Congress. Will act as a forum for networking for such interested parties as policy makers, researchers, manufacturers, economists, environmentalists and sociologists. Opportunities for presentation of ideas and views plus formal and informal discussions.

*Details: Ali Sayigh, PO Box 362, Brighton BN2 1YH, UK.*

*Fax: +44-1273-625768.*

*Email: asayigh@netcomuk.co.*

# Sustainable development

## Balgis Osman Elasha describes the links between climate change and sustainable development in Africa, with illustrations from research in Sudan

**A**frica's vulnerability to climate change is due to its direct physical exposure to climate related hazards and its limited adaptive capacity. The size of its vulnerability is primarily influenced by the fact that a large share of its economy is in climate sensitive sectors, levels of human and financial resources are low, and institutional and technological capacities are limited. Climate change is projected to exacerbate Africa's existing climatic variability, thus increasing the frequency and extremity of environmental hazards. More frequent droughts and more serious and prolonged floods will negatively impact agriculture, health and infrastructure. This will threaten both developmental efforts to date and the continent's future. Recent human development index estimates (see the map on page 19) show that almost all African countries are classified as being in the low human development category. The

process of adapting to global climate change offers new potential development pathways. This article attempts to address issues related to the impacts of climate change on Africa, and the need for sustainable development to overcome the multiple stresses Africa faces.

### Climate change impacts in Africa

Despite the fact that Africa's greenhouse gas

#### MAIN POINTS

- **Balgis Osman Elasha describes** some of the impacts of climate change in Africa, highlighting the multiple stressors that increase Africa's vulnerability.
- **Following examples from research** in Sudan, she stresses the need for sus-

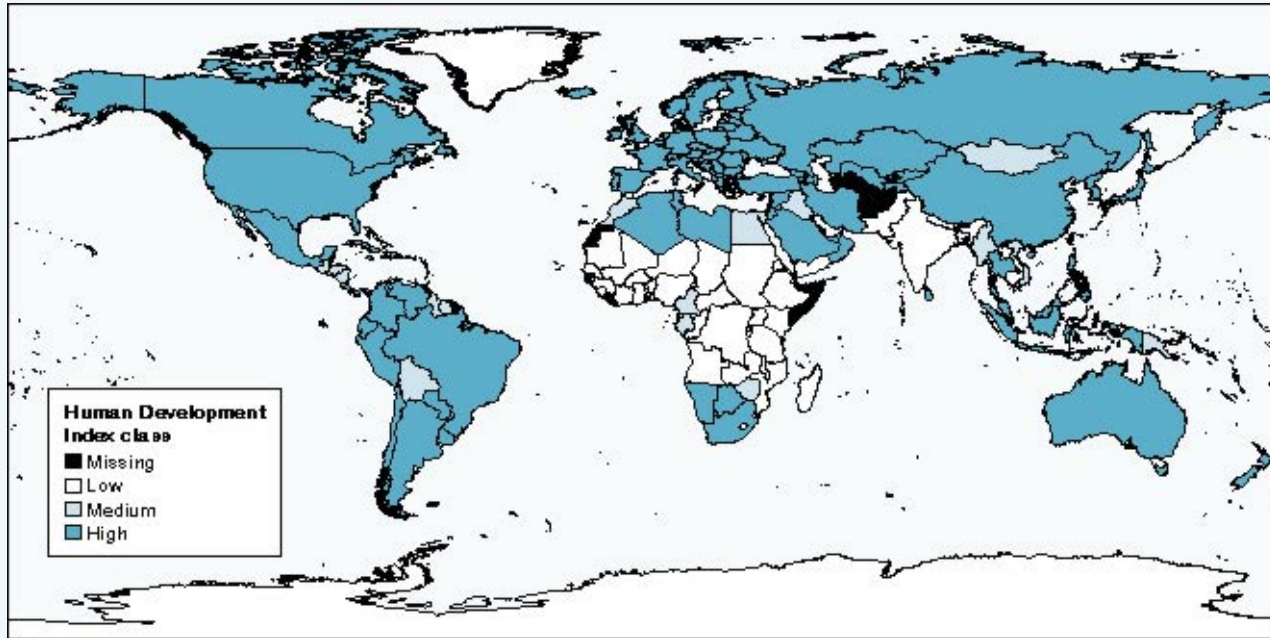
tainable development to overcome these multiple stresses.

- **She highlights** the importance of mainstreaming adaptation into development planning and lists important factors contributing to the sustainability of adaptation measures.

emissions are of little importance on a global scale, and have contributed only a negligible amount to the accumulation of atmospheric greenhouse gases, climate change is likely to seriously affect Africa. According to the Intergovernmental Panel on Climate Change, Africa's interior will suffer greater temperature increases than average warming elsewhere. While some of Africa's drylands may get more rainfall, this is likely to come in the form of heavier torrential rainfall, which can wash away fertile topsoils and vegetation. The African Sahelian region already has great inter-annual rainfall variability, but rapid recent changes have also been observed. For example, it has experienced an average decrease of 25 per cent in rainfall over the last 30 years.

Climate-related impacts, especially those associated with extreme climate events, are of particular concern to Africa as they affect water resources, food production, human health

## HUMAN DEVELOPMENT INDEX



Source: United Nations Development Programme, 2004

and cause coastal erosion and degradation. The recently released *Millennium Ecosystem Assessment* highlighted that desertification is spreading because of climate change and population growth, both of which have increased pressure on resources. Moreover, a

recent 2005 report by the Commission for Africa called *Our Common Interest* has highlighted the concern that climate change is causing increasingly volatile weather in Africa; rains seem to be failing more frequently, sea levels are rising, and coastal areas are eroding and

experiencing saltwater intrusion and flooding. In Tanzania alone, a sea level rise of half a metre could inundate over 2000 square kilometres of land. Climate-induced impacts will certainly undermine Africa's ability to develop.

## Multiple stressors leading to vulnerability

Climate change is expected to have different impacts on different African regions and sectors, depending on the characteristics of local resources, infrastructure, technology, institutions etc. This in turn is expected to lead to variation in the sensitivity and coping capacity of the different regions. According to the Intergovernmental Panel on Climate Change, Africa as a region is most vulnerable to climate change, due to the extreme poverty of many Africans, frequent natural disasters such as droughts and floods, and agricultural systems that are heavily dependent on rainfall. However, Africa's vulnerability is not only linked to climate variability and change. Several other factors contribute to Africa's low adaptive capacity and heightened vulnerability. In conjunction with climate change, many of these factors could greatly constrain development efforts. Examples of these stressors include heavy

tion (experienced by nearly half of Africans), insufficient technological development and inadequate institutional and legal frameworks to grapple with environmental degradation. Competition for declining natural resources often leads to tribal conflicts, such as those seen in the Darfur Region of Sudan. This can cause displacement, property loss, famine and many deaths.

*Our Common Interest* highlights Africa's growing environmental degradation over recent decades. Issues include deforestation, desertification, declining soil productivity, biodiversity loss and fresh water depletion, all of which will affect sustainable economic growth. Poverty is another major obstacle to sustainable development in Africa. Poor people have very limited choices and tend to rely heavily on natural resources, which are seriously threatened by climate variability and change. More frequent droughts and more serious floods will severely undermine efforts to tackle Africa's poverty. Political instability

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**“Africa ... is most vulnerable to climate change, due to the extreme poverty of many Africans, frequent natural disasters ... and agricultural systems that are heavily dependent on rainfall”**

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debt, structural adjustment policies, trade liberalization, globalization, conflicts, other governance issues, malnutrition, poverty, a high disease burden – particularly malaria and HIV/AIDS, inadequate access to sanita-

and tribal conflicts can also increase poverty, with the loss of livelihood assets and the disintegration of social support networks that help Africans cope with harsh unpredictable conditions over time. The ongoing crisis in

Niger provides one example of how climatic events (drought) coupled with low coping capacity have led to disastrous impacts on poor people (widespread famine and thousands of deaths).

## Sustainable development and adaptation

The term ‘sustainable development’ was brought into use by the World Commission on Environment and Development – the Brundtland Commission – in 1987. It calls for development that meets the needs and aspirations of the present generation without compromising those of future generations. African cultural heritage and tradition acts as a reminder that resources must be regarded as a sacred trust given to Africans by their ancestors; these resources must be handed to future generations intact or improved. Sustainable development is also based on the recognition that a nation cannot reach its economic goals without also achieving its social and environmental goals (see the table on page 21). These include universal education and employment opportunities, universal health and reproductive care, equitable access to and distribution of resources, stable populations, and a sustained natural resource base. Climate change will make it very difficult to achieve these objectives in Africa.

The United Nations World Summit on Sustainable Development in 2002 reaffirmed sustainable development as a central ele-



## SUSTAINABLE DEVELOPMENT INDICATORS

<p><b>Economic</b></p> <ul style="list-style-type: none"> <li>• Gross Domestic Product growth</li> <li>• Sectoral development</li> <li>• Employment</li> <li>• Foreign exchange</li> <li>• Investments</li> <li>• Regional structure</li> </ul>	<p><b>Human</b></p> <ul style="list-style-type: none"> <li>• Education</li> <li>• Health</li> <li>• Capabilities: freedom, wellbeing, living standards</li> </ul>
<p><b>Environment</b></p> <ul style="list-style-type: none"> <li>• Air pollution</li> <li>• Water pollution</li> <li>• Waste discharge</li> <li>• Exhaustible resources</li> <li>• Biodiversity</li> </ul>	<p><b>Social</b></p> <ul style="list-style-type: none"> <li>• Local participation and sharing of benefits</li> <li>• Income distribution</li> <li>• Information sharing systems</li> <li>• Institutional capacity building</li> </ul>

Source: The World Resources Institute's 1992–93 Guide to Global Environment

ment of the international agenda and gave new impetus to global action to fight poverty and protect the environment. Africa is struggling to cope with existing climate variability, but future climate change is expected to affect its key drivers of development. Hence combating climate change will be vital to the pursuit of Africa's sustainable development; equally the pursuit of sustainable development is integral to lasting climate change mitigation. The *Africa Environment Outlook*, published in 2002 by the United Nations Development Programme, identifies the "endorsement and promotion of the principles of sustainable development" as a major action to reduce poverty and protect the environment. *Sustainable development in Africa: is the climate right?* – a 2005 position paper by the International Research Institute

for Climate Prediction, proposes that much better management of climate variability is essential if sustainable development is to be achieved in Africa.

Adaptation also requires human capital development, institutional strengthening and sound management of public finances and natural resources. Such processes build community resilience and are development practices in themselves.

Factors that influence the ability of humans to cope with climate variability and change include the level of development, available technology, wealth, human skills and level of education. Most Africans are not strong on these factors and consequently suffer from poor adaptive capacity in the face of a changing climate. Moreover, there is a lack of commitment to climate change adaptation

in Africa, where governments feel they must address many more urgent needs. These facts highlight the importance of mainstreaming adaptation into development planning. This would also help integrate efforts across sectors.

Experience with the Assessment of Impacts and Adaptation to Climate Change in Multiple Regions and Sectors (AIACC) Project, suggests that this integration is often most evident at local levels. This is because local livelihoods are naturally cross-sectoral. Adaptation strategies should thus be viewed as a set of locally driven continuing processes that can be integrated into the overall rural development strategy.

### Sustainable development in Sudan

Like most African countries, Sudan is vulnerable to climate variability and change. Drought is one of the most important challenges. The most vulnerable people are the farmers in the traditional rain-fed sector of western, central and eastern Sudan, where the severity of drought depends on the variability in amount, distribution and frequency of rainfall.

Three case studies were conducted in Sudan as part of the AIACC Project. They examined the condition of available livelihood assets (natural, physical, financial, human and social) before and after the application of specific sustainable livelihood environmental management strategies, in order to assess the capacity of communities to adapt

to future climate variability and change. The sustainable livelihood assessment approach was used to measure the impact of these sustainable livelihood environmental management strategies on a community's coping/adaptive capacity.

Different types of adaptation were covered by the case studies; some were considered as developing spontaneously, or autonomously, as a regular part of ongoing resource and risk management, and others were consciously and specifically planned for in view of specific climate related risks. An example of the first type is the development of the terus water harvesting technique in Darfur. This was a community driven adaptation measure taken in response to a scarcity of irrigation water. An example of the second type is the planting of shelterbelts in arid parts of Bara Province, Kordofan. These were introduced through a United Nations De-

velopment Programme/Global Environment Facility funded project in response to the soil erosion and land degradation resulting from frequent drought. assess how measures for increasing resilience to current climate variability have worked across these five livelihood capitals, assessments of four dimensions were made: productivity, sustainability, equity, and risks and uncertainty encountered – for example, what barriers did the implementation of these measures actually face or expect to face? By looking at these four dimensions, the study tried to identify whether or not these adaptations have effectively reduced vulnerability to current climatic variability and whether they will reduce potential future impacts of climate change. It was assumed that for adaptation to be sustainable, efforts must anticipate potential socioeconomic and environmental changes and pursue options that build resilience to the stresses resulting from these changes. The study gave rise to many valuable conclusions, including identifying important factors that contribute to the sus-

- Skills acquired and capacities developed and maintained by different stakeholder groups.
- Key to sustainability is the availability and timely dissemination of information on temperature, rainfall, new production inputs, prices etc.
- Supportive government policies for developing and encouraging income generating activities.
- Two-way communication between project management planners and communities such that basic community needs are addressed. This may include initiating and/or strengthening community health and education services.
- Using appropriate techniques and technologies in different farming practices.

These practices are viable adaptation measures, which help build community coping capacity and contribute to rural development.

The study also noted that different government and non-governmental organizations employ measures that could be adopted to alleviate current and expected adverse impacts. Most of these measures focus on short-term relief, which the Arbaat community in Eastern Sudan said was unsustainable and created a relief dependent farming community. Such approaches should be avoided. The alternative is a 'risk reduction' or risk management culture, providing coordinated social protection, preventative measures, carefully targeted relief, and promoting in-

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**“The study gave rise to many valuable conclusions, including identifying important factors that contribute to the sustainability of adaptation measures”**

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velopment Programme/Global Environment Facility funded project in response to the soil erosion and land degradation resulting from frequent drought.

Adaptation options were put into five (often interdependent) groups: financial, physical, natural, social and human capitals. To

tainability of adaptation measures. Some of these factors follow.

- The effectiveness and sustainability of local institutions created by the project, like community development committees, non-governmental organizations, farmers unions etc.

creased resilience through access to markets and income generating opportunities.

It is also important that sectoral and other development plans enforce rather than undermine community coping capacity. Sometimes a lack of integrated planning can lead to development in one sector at the expense of others. For example, at Arbaat in eastern Sudan, in its effort to address water shortages in Port Sudan (the capital city of the Red Sea State) and to improve its water supply, the government proposed heightening of a dam on a stream called Khor Arbaat, which local communities depended on for their livelihood. This plan would negatively impact the local community upstream, as it would reduce the area available for cultivation and could pose a real threat if long-term population increases occur. The local committee has proposed mitigation measures to the state authorities, including: digging wells to compensate people for lost water and provide permanent supplies to farms and home gardens; guaranteeing the farmers an agreed amount of water from the Khor Arbaat; and, compensating the region by providing social and economic services.

### Priorities for African development

Some of the priorities for African development identified by the AIACC project are listed below.

- Development plans must be in tune with Africa's real needs and priorities.
- Win-win options are needed, which sup-

port both adaptation and development objectives.

- All major stakeholders must engage in national development planning processes using a combination of top-down and bottom-up approaches.
- Improved communication and awareness among various stakeholders and encouraged cross-sectoral thinking to avoid conflicting development policies and plans.

The *Africa Environment Outlook, 2002*, also identifies a number of actions to reduce poverty and protect the environment. These include the improvement of infrastructure and sustainable human settlements, and the improvement of scientific and technological information. The strategic plan for capacity building drawn up by the New Partnership for Africa's Development also identifies the following priority areas:

- promotion of good governance;
- promotion of community-based natural resource management;
- prevention and management of conflicts; and,
- promotion of integrated management of natural and man-made disasters and movement towards sustainable development. ■

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## ABOUT THE AUTHOR



### ● Balgis Osman Elasha

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Assessment of Impacts and Adaptation to Climate Change in Multiple Regions and Sectors (AIACC) / Sudan Project.

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## CONTACT

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## FURTHER INFORMATION

● **On the Web:** For more information on the Millennium Ecosystem Assessment visit [www.millenniumassessment.org/en/index.aspx](http://www.millenniumassessment.org/en/index.aspx). To view the Commission for Africa Report, *Our Common Interest*, 2005, visit [www.commissionforafrica.org/english/report/introduction.html](http://www.commissionforafrica.org/english/report/introduction.html). To view the 2005 position paper *Sustainable development in Africa: is the climate right?* by the International Research Institute for Climate Prediction, visit <http://iri.columbia.edu/africa/whatisnew/SusDevAfricafinal.pdf>. To view the *Africa Environment Outlook, 2002*, visit [www.unep.org/dewa/Africa/publications/AEO-1/](http://www.unep.org/dewa/Africa/publications/AEO-1/). For more information on the AIACC project, visit [www.aiaccproject.org/](http://www.aiaccproject.org/).

# Agriculture, food and poverty

NEWS

## THE SAHEL

### **Serigne Kandji describes the implications of climate change for agriculture, food security and poverty in the Sahel region of Africa.**

Achieving food security and reducing poverty in the Sahel has been a major challenge for both governments and development agencies. Per capita food production has declined over the last two decades, exposing an increasingly high number of people to food insecurity and income poverty. Currently, 40 per cent of people in the Sahel region are considered food insecure. This unfortunate situation is the result of many factors, some of which include:

1. the inherently poor nature of soils (most soils are sandy, low in carbon and poor in nutrients);
2. the rapid population growth (three per cent per annum) that has led to continuous cropping, expansion of agriculture into marginal areas, and overgrazing;
3. the minimal use of technologies, such as improved varieties, fertilisers, mechanisa-

tion and irrigation, that have stimulated agricultural development elsewhere in the world; and,

4. the absence of adequate technologies and policies that take into account the specific needs of small-scale farmers in Africa.

The Sahel region is particularly vulnerable to climate change because of its geographic location at the southern edge of the Sahara Desert, its fragile ecosystems and the high dependence of its population on rainfed agriculture and livestock. The agricultural sector employs between 75 and 90 per cent of the active population (depending on the country), and provides nearly 35 per cent of the Gross Domestic Product for the region. Yet agriculture in semi-arid regions is a highly risky enterprise due to unreliable and variable rainfall. Farmers often struggle to produce enough food for their own subsistence, let alone generating any kind of income from farming activities.

The recurrent droughts of the 1970s and 1980s (known as the 'desiccation') were a particularly difficult time for Sahelian countries. Massive shortfalls in agricultural and livestock production caused malnutrition,

disease and significant losses of human life. Environmental refugees were common and national economies collapsed.

Some climate models predict that the Sahel region will be drier in the 21st century. Others show slight increases in rainfall during the coming decades. However, the National Communications of the Sahelian countries to the United Nations Framework Convention on Climate Change suggest that even slight increases in rainfall will do nothing to reverse the drying out of the region, because a hotter climate will mean that evapotranspiration will be more intense. This will exacerbate already arid conditions.

Long-term changes in climate can be dealt with quite successfully with the right crop varieties and cropping techniques. Of greater concern in the Sahel is a possible increase in the frequency and intensity of climatic extremes such as droughts and floods. If action to tackle this is not taken immediately, food deficits will become more pronounced, aggravating an already worrying food and nutritional situation. Indeed, climate change is likely to become the greatest obstacle to achieving food security, poverty reduction

and other objectives under the Millennium Development Goals to which the Sahelian countries have subscribed.

Addressing the interlinked issues of food insecurity, poverty and environmental degradation in the Sahel is a matter of great urgency, especially with the prospect of climate change. One salient aspect of climate change, however, is that nobody knows the exact magnitude (and sometimes direction) of possible changes in climate variables, especially precipitation. Climate models are based on scenarios and can, at best, give a range of possible (sometimes conflicting) outcomes. This can make designing adaptive options for the future a difficult task. The focus, therefore, should be on how to develop a mix of 'no-regret' technology options and policies geared at promoting the emergence of productive, sustainable and flexible agricultural systems that can demonstrate resilience regardless of the direction and magnitude of climate change.

One key question is how effective adaptive strategies that are used now to cope with current stresses will be with the occurrence of climate change. Modelling exercises have improved our understanding of the likely behaviour of cereals and other crops under various different future climate change scenarios, but there has been little emphasis on tree-based systems.

Agroforestry provides a rich set of promising technologies that can (biophysically and economically) act as a buffer against current



**Precarious living conditions: the overwhelming majority of poor people in rural Sahelian areas live in huts like these**

Photo: Andre Bationo

climate variability and the ensuing risks to food and income. But little is known about the possible impacts of higher temperatures, increased atmospheric carbon dioxide levels and shifts in rainfall patterns on agroforestry tree species or indeed on the interactions of such tree species with food crops. For example, in a drier or warmer climate, competition for water between trees and crops could intensify. But knowledge on what trade-offs exist between this type of effect and positive impacts related to the microclimate or soil protection is minimal. The research community together with policy-

makers and development agencies should start to focus more on these kinds of issues. Otherwise, there is a high risk that gains made from agricultural climate change research could be lost. The lives of millions of people are at stake and because research is a medium- to long-term process, we cannot afford to adopt a 'wait and see' attitude.

● **Further information:** Serigne Kandji works as an Associate Scientist, specialized in tropical ecology, at the World Agroforestry Centre (ICRAF) in Nairobi, Kenya. He can be contacted at [s.kandji@cgiar.org](mailto:s.kandji@cgiar.org)

# Municipal water resources

## SOUTH AFRICA

### **Pierre Mukheibir describes strategies for small municipal water resource management in South Africa in the context of climate change.**

Water scarcity is a problem in much of southern Africa. Frequent droughts, floods, pollution and poor water resource distribution have led to hardship for many people, particularly subsistence farmers and the poor. During the past 20 years, most of Africa has experienced extensive droughts, the last two of which (in 1986/88 and 1991/92) were due to El Niño. Climate variability in southern Africa will probably affect current hydrological resources and reduce the adaptability of future water resources. More frequent droughts will significantly impact water resources and thus agriculture.

South Africa is a water-stressed country with an average annual rainfall of 500 mm. Only a narrow region along the southeastern coastline receives good rainfall, while most of the interior and western parts of the country are arid or semi-arid. Some 65 per cent of

South Africa receives less than 500 mm per year, which is usually regarded as the minimum for dryland farming. Some 21 per cent receives less than 200 mm per year.

Based on climate model projections, the most severe impacts are likely to occur in the west of South Africa where small towns and subsistence farmers are most vulnerable. Current observations include the systematic dewatering of groundwater aquifers due to demand outstripping supply and poor water resources management. This bodes badly for future water resource management under increasingly frequent drought conditions.

Research suggests that water resource planners should account for climate change when planning how to meet South Africa's development objectives. But climate change is not currently recognized as an important threat to available water resources, and strategies have not been developed to adapt to projected impacts.

Current water management mechanisms and policies have been developed to ensure that existing water supplies meet growing demands. Some of these mechanisms, if implemented sustainably, could help peo-

ple cope with future drought related water shortages due to climate variation. These include groundwater recharge, rainwater harvesting, block tariffs, dual flush toilets, grey water systems, education programmes, water resource management systems, leak repair programmes, groundwater monitoring systems such as telemetry, and water restrictions. However, robust long-term strategies are required to ensure water demand matches supply, even when availability is reduced. With projected climate change impacts, some measures may be needed sooner than originally planned.

The capacity that small towns and communities have to adapt to climate variability, specifically drought, needs investigation. Policy and planning recommendations for national and local water resource planning and management are needed to secure water provision in the context of climate change.

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# Environment – the basis of livelihoods

**A**frica's social and economic development is now in even more danger because climate change threatens to undermine the integrity of the continent's rich but fragile ecosystems. In Africa, these natural systems provide the foundation to most countries' economies, and form the base upon which the majority of the population derives its livelihoods.

Africa contains about 20 per cent of all known species of plants, mammals and birds, as well as one sixth of amphibian and reptile species. Biodiversity in Africa, which principally occurs outside formally conserved areas, is under threat from climate change and other stresses. Savannahs, tropical forests, coral reef marine habitats, freshwater habitats, wetlands and East African montane ecosystems are all at risk.

Poor people in Africa, especially those living in marginal environments and in areas

with low agricultural productivity, depend directly on genetic, species and ecosystem diversity to support their way of life. As a result of this dependency, any impact that climate change has on natural systems will threaten the livelihoods, food intake and health of the population.

## THE FINAL WORD

**Tony Nyong describes how the impact of climate change on the environment should not be neglected, because natural systems provide the foundation for many livelihoods.**

With the extinction of plant species used in traditional medicines in Africa, it is expected that climate change will affect people's ability to cope with illness.

The World Health Organization estimates that 80 per cent of the world's population in developing countries relies on these plants for primary health care. In Mali, traditional medicines have declined because many medicinal plants have been wiped out by constant drought.

Livelihoods built for generations on particular patterns of farming may also quickly become unviable. If left unaddressed, the Intergovernmental Panel on Climate Change

estimates that climate change will place an additional 80 to 120 million people at risk of hunger. Some 70 to 80 per cent of these will be in Africa. With increasing temperatures and extreme weather events, climate change will further erode the quality of the natural resource base, thereby reinforcing conditions of poverty.



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