

Harnessing new technologies to manage climate change

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Nowhere in the world is the interaction between climate change and agriculture as vivid as it is in Africa. Africa's agriculture and other economic activities depend heavily on water, a climate-sensitive, non-renewable resource, which affects the biodiversity and natural resources on which all living beings depend for their survival. Agriculture, which employs at least 30% of the continent's population, is a rain-fed industry. Other economic activities, such as tourism and fisheries, are also affected by weather conditions. This makes the continent's economies particularly vulnerable to climate change.

Socio-economic context

Africa is perhaps the region in the world that is most vulnerable to the impacts of climate change and environmental degradation. Extreme weather conditions are causing arid regions to become even more arid, leading to a decline in agricultural production. According to a recent article by Temesgen Deressa (2014), a guest scholar at the Brookings Africa Growth Initiative, climate change-related phenomena – particularly droughts and floods – have caused a significant economic slowdown in Africa.

Floods and sporadic rainfall, for example, have reduced the growth in Mozambique's gross domestic product (GDP) by more than 1% per year, and have cost Zambia US\$4.3 billion in GDP over ten years (Deressa, 2014). There has also been an increase in the number of undernourished people by approximately 20% in Eastern Africa and 2% in Southern Africa according to the Food and Agriculture Organisation (FAO) of the United Nations (FAO, 2015). In addition to malnutrition, the people of Africa are becoming more exposed to diseases such as malaria, which kills millions of inhabitants every year.

Food insecurity increases vulnerability to HIV and Aids. In a paper presented at the FAO's International Workshop in Tivoli, Italy,

in September 2003, Loevinsohn and Gillespie (2003) list factors that affect susceptibility to HIV. This includes malnutrition, which increases the likelihood of infection, lack of food or access to food, which increases the probability of women being forced to engage in commercial sex to feed their families, and the search for food, which leads to migration to urban areas, increasing exposure to HIV.

Climate change will also have an irreversible impact on Africa's natural assets

and infrastructure. A rise in the sea level will erode mangrove forests and destroy infrastructure in coastal cities such as Cape Town, Dakar, Dar es Salaam, Maputo and Mombasa. The economic and social costs of such impacts are likely to be huge.

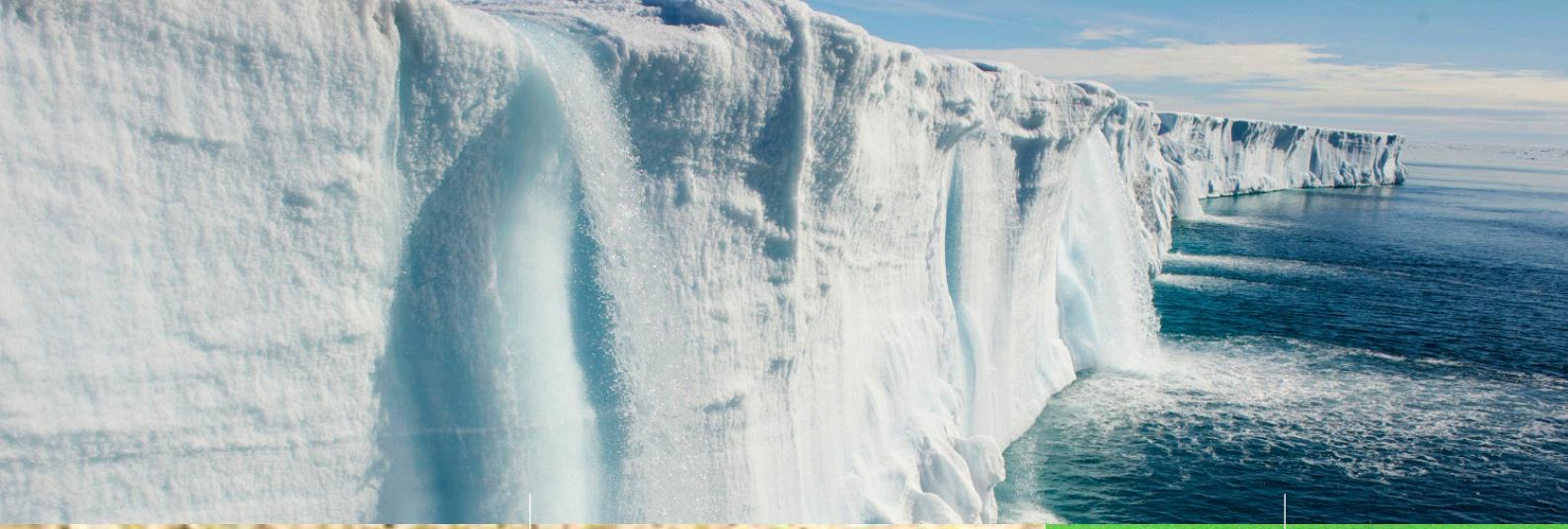
Conventional approaches

Governments in most African countries have adopted strategies for climate change adaptation and food security. In South Africa, the National Development Plan 2030 (NDP) (National Planning Commission, 2013) outlines a number of actions to address climate change and improve food security, including the expanded use of irrigation. The NDP recognises the roles that science, technology and innovation can play in climate change mitigation and adaptation, as well as in increasing agricultural productivity for food security. It emphasises the need to increase the investment of government and the private sector in low-carbon energy technologies and irrigation.



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anticipation of foreign funding. The emphasis on external financing is often based on the premise that industrialised countries contribute more to the emission of greenhouse gases and climate change in general, and thus have an obligation to provide resources to African countries. African countries are thus becoming more dependent on external sources of funding, foreign technology transfer and food aid to address the challenges of climate change and food insecurity. Most countries have relatively weak endogenous scientific and technological capabilities to effectively engage in climate change mitigation and adaptation. Dealing with climate change and building food security will require policy measures to enable countries to grow appropriate and capable research and innovation systems.

Taking technology policy considerations

African countries will be participating in the 21st Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris, France, in December 2015. They have a rare opportunity to shift their emphasis from seeking external funding and technology transfer to building international partnerships that will enable them to grow their national systems of research and innovation in climate change.

There are three technological policy issues on which African countries should focus



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and possibly negotiate at the COP. The first is international support for national innovation and technology policy design and implementation. Most countries on the continent have limited capacity for technology policy analysis and development. In order to address this challenge, it is crucial that the UNFCCC's technology mechanism supports training in innovation and technology policy at the request of African governments. The COP will need to allocate resources to the technology mechanism for it to address the African demand for building policy analysis capacity.

The second issue pertains to strengthening national capacity for technology needs assessment and technology road-mapping. Conducting a technology needs assessment and developing related technology roadmaps are vital for appropriate national research and development, and innovation policy. Countries that are unable to undertake technology needs assessments and to develop roadmaps will experience difficulties in developing and/or procuring climate change, agriculture-friendly technologies in cost-effective ways.

By 2013, 36 African countries had technology needs assessment reports. Most of these countries' reports are outdated and tend to have a narrow focus on energy technologies. They are also not backed by appropriate technology roadmaps that are essential for technology prospecting.

Technology prospecting is the process of searching for, identifying, choosing and acquiring specific technologies. It is usually based on a technology needs assessment and technology roadmaps.

In order to effectively engage in climate change mitigation and adaptation, and to address challenges related to food insecurity, African countries need well-configured institutional arrangements that harness and use technical skills at universities and in industry. The links in most countries between universities and industry are weak. Without university-industry collaboration, innovation chasms will persist and countries will be denied the opportunity of generating knowledge and using skills to develop climate change technologies that have greater agricultural applicability. ●

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