Africa's climate challenge

In the world's poorest inhabited continent, climate change poses a potentially devastating threat. The specific climate issues facing Africa will demand focused solutions if the continent is to provide a prosperous future for its people

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Since historical times, Africa has felt the detrimental effects of variations in the Earth's climate. There are a number of factors specific to the continent that act individually or collectively to increase its exposure to climate variability and extremes, increase its disaster risk and reduce its ability to cope with the adverse physical, human and socio-economic consequences of climate change.

Efforts to shed light on current or future climate change impacts on the continent should examine the connections between climate change and issues such as resource governance, population growth, poverty and conflicts. This article examines both climatic and some of these non-climatic stresses, their resulting impacts and proposed response measures.

Inadequate infrastructure

Much of Africa suffers from poor energy systems, transport, and water and health services, all of which can constrain efforts to adapt to climate change. For example, frequent droughts can cause more damage to countries with poor water management and storage capacities than those with efficient systems. Limited energy infrastructure constrains Africa's development and increases its vulnerability. According to the International Energy Agency, sub-Saharan Africa energy investment needs to increase to $3 trillion by 2040, equivalent to $110 billion a year.

Population pressures

Africa's population is growing at an annual rate of 2.4 per cent with wide variations in population density between regions. Accelerating rates of population growth coupled with imbalanced distribution will put greater pressures on national governments to satisfy growing demands for food, energy and housing, all of which are usually produced through more extraction of natural resources and more land-use conversions. The pressure on food production will be compounded by projected reductions of up to 22 per cent in production of coarse grains in Africa in the near future.

◀ Turkana by a fishing camp on the shores of Lake Turkana, near the Kenya-Ethiopia border. Food scarcity, resulting from recurring droughts and overfishing, has intensified their conflict with the Ethiopian indigenous Dhaasanac

Chronic poverty

Poverty is one of the major non-climate factors contributing to Africa's vulnerability. Increasing poverty rates and high dependence on natural resources limit livelihood options for African people and force them to expand their agricultural production into forests and woodland. This will ultimately result in loss of biodiversity, land degradation and desertification. In many cases people are left with no option but to migrate in search of alternative livelihoods or employment opportunities. The current news reports about thousands of migrants fleeing poverty in Africa to Europe is clear evidence of the huge and complex impacts of the problem on the continent's human resources.

The links between poverty, conflicts and migration are well established. There are numerous articles about Africa's brain drain and the emigration of young people desperate to find a living in the 'dreamlands' of Europe. Unless we address Africa's chronic poverty, many of its other problems will likely remain unsolved.

Conflicts and political instability

Conflicts in Africa are generally triggered by climatic factors and aggravated by a number of other drivers, including population pressure, competition over resources, land degradation and failing governments. Resource-based conflicts pose serious threats to human security in Africa, sparking mass migration, loss of safety nets and social disintegration. This is a typical ongoing scenario in many of the continent's conflict-ridden regions, such as Darfur and the Horn of Africa.

Climate-related vulnerability and impacts

Africa is living the reality of climate change on a daily basis. This is demonstrated by the more frequent, intensified and extended drought cycles in eastern Africa; unprecedented floods in parts of western and southern Africa; declining water levels in Lake Chad; inundation and salinisation of the fertile delta in Egypt; the shrinking ice caps in Kilimanjaro and the Kenya Mountains – the list goes on.

The high potential for climate change and variability to negatively impact Africa's human livelihood, development and economic growth has been emphasised in the recent Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), as well as by a number of other scientific papers and technical reports.

The projections suggest that Africa will face more climate challenges in the future, which vary across the sub-regions. Eastern Africa, for example, is projected to get wetter, while northern and much of southern Africa will get drier and hotter. The mean annual temperature rise across Africa, relative to that of the late 20th century, is likely to exceed 2°C by 2100, with land temperatures over Africa rising faster than the global land average. Extreme weather events are projected to increase in terms of frequency, intensity and duration.

The level and type of impacts resulting from climate change will also vary between the sub-regions depending on each region's level of vulnerability and adaptive capacity. High vulnerability is usually associated with the presence of multiple socio-economic constraints and development deficits typical to many African countries, particularly the least developed countries (LDCs). The survival and livelihoods of millions of people in sub-Saharan Africa are threatened by land degradation and resource-based conflict that will be much aggravated by increasing climate variability and extreme events. The numbers of people at risk of increased water stress in Africa is projected to be 75-250 million by the 2020s and 350-600 million by the 2050s.

Important ecosystems such as terrestrial, fresh water and coastal are likely to be severely impacted by projected changes in temperature and precipitation and will have significant implications on human livelihoods and economic development. Low-lying

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▲ A fisherman tends his nets by Lake Tanganyika, where the fish stocks have declined 30 per cent over the past 80 years, due to climate change

islands and coastal and deltaic regions are at very high risk of flooding and sea-level rise. The Sahel will continue to face the negative impacts of climate variability and extremes, including drought, heatwaves, dust storms and flash floods. A number of studies in the water-stressed North Africa region indicated that the rain-fed agriculture, which is highly dependent on winter rainfall, will be severely impacted by the projected reduction in the amount, distribution and frequency of precipitation in the region.

Parts of Africa, particularly the Sahel region, will face a very high risk of heat stress by the end of the century, to the extent that it may constrain people's ability to practise any agricultural activities in their farms. If this occurs, it will further impoverish African small-scale farmers, breaking down national economies and ultimately undermining countries' efforts to achieve poverty reduction and future prosperity.

Ecosystems and livelihood changes

Ecosystem services are crucial for economies and livelihoods in Africa. Changes in species' composition, distributions and ranges have already been observed in many parts of Africa. In East Africa, for example, more frequent fires on Mount Kilimanjaro, attributed to increasing temperature, have resulted in a nine per cent reduction in montane forests, and an 83 per cent reduction in subalpine forests. Rain-fed agriculture is extremely vulnerable to the slightest change in temperature and precipitation, yet is crucial to the African economy, providing more than 20 per cent of GDP and 70 per cent of employment opportunities. Coupled with increasing population, this encroachment of rain-fed agriculture into savannah has resulted in a 16 per cent reduction of forest cover in sub-Saharan Africa. It has also impaired the free migration routes for wildlife such as zebras and elephants, as well as interrupting the movement of nomadic tribes, triggering tribal conflicts.

Faced with a food security crisis, rural households in many parts of Africa have started to rely more on wild fruits and game animal, imposing additional pressures on already fragile ecosystems. Although game can bolster household food security as an affordable source of protein, in some cases it has posed health problems through transmission of dangerous diseases. For example, fruit bats are thought to be the source of the ongoing outbreak of Ebola in West Africa.[1]

Other observed shifts in African ecosystems include the southwards progress of the Gum Arabic (Acacia Senegal) Belt in Sudan and the polewards shift of some South African bird species. Substantial decreases in tree densities have been observed in the Western Sahel and the dry region of North Africa during the last few decades. Other changes include the shrinking number of fruit-bearing trees in the Sahel.

The potential climate change impacts in Africa may be complicated by the trans-boundary nature of water resources. Ninety per cent of all Africa's surface freshwater resources are located in river basins and lakes that are shared between two or more countries. The Nile Basin is of particular concern, given its geopolitical and socio-economic importance. Reduced

flows in the Blue Nile have been reported during the last century and are attributed mainly to a mixture of climate change and upstream water development for irrigation and hydropower. The fish resources in the Great Rift Valley lakes of East Africa (lakes Malawi, Tanganyika and Victoria) are declining in terms of productivity and diversity due to rising average temperatures. A 30 per cent decline in Lake Tanganyika fish stocks has been witnessed over the past 80 years as a result of climate change and variability. This may eventually force fishermen to look for alternative livelihoods such as farming, which could in turn increase competition for land and create tensions and conflicts.

Increased malaria transmission is reported in the Kenyan highlands. This is due to warmer temperatures that create the optimum conditions for mosquitoes to breed. In Mali, the projected temperature increase, coupled with less precipitation, is expected to enforce a shift by farmers from rain-fed millet and sorghum to semi-arid, predominantly livestock subsistence. Millions of people are expected to face the tragedy of livelihood loss, hunger and famine.

Climate models project a similar scenario for many other marginal agricultural lands in Africa. Pastoral farmers in the Horn of Africa, particularly on the Ethiopia–Kenya–Somalia border, are continuously witnessing loss of their livestock due to frequent droughts and expanding desertification. Tens of millions of people are reported to have been impacted during the last few decades, forced into mass migration out of drought-affected areas in search of new livelihoods elsewhere. This scenario is projected to continue into the future and may be aggravated by the ongoing conflicts and volatile geo-political conditions that dominate the region.

The tools to adapt

Making the least contribution to global greenhouse gas emissions but suffering the highest levels of impacts and vulnerability, Africa's first priority is adaptation. Because of the multiplicity of stresses to which Africa is exposed, any measures to address climate change impacts should be responsive to a broad spectrum of institutional, social, physical, financial, capacity and infrastructure needs. They should also take into consideration the continent's high dependence on natural resources and ecosystems. Emerging evidence from the IPCC AR5 reports identify ecosystem and community-based measures as a potential future pathway for a more sustainable approach to adaptation. Compared to hard-engineered solutions, maintaining the services of a healthy ecosystem is considered as a more cost-effective option.

All African LDCs have already prepared National Adaptation Programs of Action in which they recognised their urgent adaptation needs that should be addressed in the short term. Currently, all developing countries are in the process of creating National Adaptation Plans, which are meant to address medium- and long-term adaptation needs. However, implementation has always been a challenge, given limited available funding. In spite of the large number of climate finance avenues created to support adaptation efforts, the amounts disbursed remain small compared with the total need, particularly in sub-Saharan Africa.

Development of an early-warning system is critical to the timely preparedness and disaster risk management at different levels. It is particularly useful for planning and implementing effective adaptation measures for shared resources and trans-boundary ecosystems such as river basins, open pastures and woodlands, coastal zones and protected areas. Both African governments and development agencies have acknowledged the contribution of watershed management, including dams and water facilities, to environment and infrastructure sustainability.

Towards improving Africa's resilience to climate change

Insufficient finance is one of the main constraints impairing efforts to implement climate change adaptation in Africa. The Green Climate Fund was established to provide for future climate financing to support developing countries in their efforts to pursue adaptation and low-carbon-resilient development. According to the African Group of Negotiators, African countries would like to see a fund that provides simplified and improved access to funding and adopts a country-driven approach for channelling resources. It is also important to mainstream climate change adaptation into national development planning and to make sure that national priorities such as poverty reduction and sustainable development are part of the global negotiation agenda.

Regional and international cooperation are crucial for supporting national mainstreaming efforts, capacity building, technology transfer and monitoring and evaluation of adaptation initiatives. ●

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Several sustainable land management (SLM) approaches are practised in sub-Saharan Africa in response to the ongoing land degradation and desertification. Farmers in the Ethiopian highlands, for example, see investment in soil and water conservation as the best adaptation option in the face of declining rainfall. Others have identified livelihood diversification away from a heavy dependency on natural resources as another adaptation option. However, the adoption of SLM techniques is still confined to a small percentage of agricultural land, signifying the need for more serious efforts to upscale SLM practice into larger areas.

1 Gatherer, D. (2014). The 2014 Ebola virus disease outbreak in West Africa. Journal of General Virology, Vol. 95, August 2014, p.1619. doi: 10.1099/vir.0.067199-0