

What Types of Information Are Needed for Climate Change Adaptation Decision Making in Africa?

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Question Six: What types of information are needed for adaptation decision making?

This paper describes some current initiatives in Africa to counter climate change before specifying the information needs required for responsive, proactive and robust policy making and planning for climate adaptation on the continent. The author also gives detailed examples of such practices from South Africa.

Introduction

Across the world every minute of every day, environmental decisions are being made.

We have all heard repeatedly that Africa is a region that is most vulnerable to climate change. International best practice articulates and advocates that only an immediate and concerted effort, approached in a systematic manner, across all levels of development planning (regional, sub-regional, national, sub-national, and local) is required if sustainable development in Africa is to be achieved. Developing countries, in particular the least developed countries (LDC's), have

needed (and continue to need) significant international assistance to improve their understanding of assessing impacts, vulnerability and adaptation and to make basic response decisions. This is due to the fact that in many African countries, international environmental information systems are weak or in some cases non-existent. Any decisions, actions and measures have to be based on sound scientific, technical and socio-economic data, taking into account a variety of local to global climate change scenarios.

Africa is also described as having a poor understanding and an ineffective regional strategy to tackle the effects of climate change. This view persists despite the efforts of some national states, the African Ministerial Conference on the Environment (AMCEN) and UN agencies such as the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and the Food and Agriculture Organisation (FAO), as well as international donor agencies.

Notwithstanding these challenges there have been some effective initiatives and interventions:

The African Ministerial Conference on the Environment, established in 1985, continues to provide a platform for environment Ministers to deliberate on substantive issues of importance to Africa, including climate change adaptation.

Another Africa-centred effort involved the UNFCCC introducing a LDCs work programme to prepare and implement national adaptation programmes of action (NAPA's) to assist these countries to identify priority activities that respond to urgent and immediate needs regarding adaptation to climate change response.

Others programmes include UNEP/DEWA supporting the development of National State of the Environment Reports and the development of National Atlases of Environmental Change. UNEP is also developing the Global Adaptation Network (GAN) to help build climate resilience of vulnerable human systems, ecosystems and economies through the mobilization of knowledge and technologies to support adaptation policy setting, planning and practices.

The UNDP too has made numerous contributions to the UNFCCC with regard to the African continent including a programme to support an integrated and comprehensive approach to climate change adaptation which targets 21 countries in an attempt to support their national development processes to incorporate climate change risks and adaptation opportunities. The UNDP reports that there are some African countries that have also identified key vulnerabilities and priority

adaptation measures, while others have initiated demonstration adaptation projects.

However, most African countries face a number of adaptation-related challenges which include:

1. Adaptation initiatives that are **limited in scope and scale**, and their impacts are **neither cohesive nor sustainable**;
2. **Institutional capacities, relationships, policies and practices** to assess and manage climate change risks that are **not developed** sufficiently to create an enabling environment, with corresponding political and social champions to support the formulation and implementation of efficient solutions to a problem that has complex multi-sector effects;
3. **Limited knowledge** of the most **appropriate adaptation policies and measures** hinders countries from preparing themselves with the necessary institutional capacities to support climate risk management;
4. **Limited financing options** to sustain scaled-up adaptation measures remain a constraint; and
5. It is **difficult** for countries to **learn from each other** about their experiences with such **different approaches** to adaptation being implemented.

There is overwhelming evidence from a variety of sources that climate exerts a strong influence daily on economic development in Africa, particularly in terms of water, food security, health, ecosystems and livelihoods. Africa must, as a matter of urgency, develop proactive early warning and disaster response systems as well as coherent long term national climate change strategies. With the continent's current situation in mind, the rest of this paper will attempt to answer the following questions from an Africa wide perspective looking at some national examples where appropriate.

1. Information Needs for Responsive Policy/planning

Many argue that climate change is happening now, and these changes take the form of weather related disasters such as floods and fires. Floods in Benin in the past year and floods in parts of South Africa (December 2010) are evidence of this. It is essential therefore to identify target groups and geographic "hotspots" for rapid data collection. Once all the necessary data is collected and verified it must be captured in appropriate Information Systems (GIS's, EIS's, and Early Warning Systems). Modelling and planning tools can be used to analyse the data to provide vital information on environmental trends and to facilitate scenario planning, early

warning systems and disaster risk management/emergency response and mitigation strategies.

Responsive strategies require pre-disaster activities, typically based on risk analysis. This includes the development/enhancement of an overall preparedness strategy, policy, institutional structures, warning and forecasting capabilities, and plans that define measures geared to help at-risk communities safeguard their lives and assets by being aware of hazards and taking appropriate action when faced with an imminent threat or an actual disaster.

Early warning systems are a key component of responsive policy and planning solutions and include a chain of concerns, namely: understanding and mapping the hazard, monitoring and forecasting impending events, processing and disseminating understandable warnings to political authorities and the population, and undertaking appropriate and timely actions in response to the warnings.

The Wide Area Monitoring Information System (WAMIS) portal typifies this type of early warning system. It is a portal consisting of a collection of satellite-based information services providing near real-time monitoring and mapping capabilities of natural events such as fires, floods, and droughts within Southern Africa. The portal receives its data from the Terra and Aqua MODIS polar orbiting satellites as well as the geostationary Meteosat Second Generation (MSG) satellite which provide continuous data streams that are captured and processed by the Council for Scientific and Industrial Research (CSIR) Satellite Application Centre (SAC) at Hartbeeshoek, as well as by the CSIR Meraka Institute, in Pretoria. Advanced processing systems convert raw data to higher level products that are fed through the WAMIS information systems. The web portal is developed and maintained on a daily basis by the Meraka Institutes Remote Sensing Research Unit. This unit created in 2005, conducts basic and applied remote sensing research for the advancement of scientific knowledge about the environment which include activities in active fire, burn scar and fire risk mapping and modelling.

All information systems which are part of the WAMIS portal including WAMIS, the Advanced Fire Information System (AFIS) and the South Africa Fire Network (SAFNET) are available at no cost to the public. AFIS currently uses various means including TV, radio and printed media to advertise their service and to disseminate information to various stakeholders. This methodology will be replicated and implemented for the WAMIS site in 2010 as part of their national media launch.

This initiative is aligned with the [South African Earth Observation System](#) (SAEOS) and the [Global Earth Observation System of Systems](#) (GEOSS). The overall objective

is to maximise societal benefits derived from the large volumes of satellite data available every day.

In addition, in order to function effectively such early warning and response system(s) need to involve engagement of a multitude of key stakeholders (within government, civil society, business, and networking organisations) at both national and local levels.

The optimal responsive system would include local information (information from the smallest geographical unit of a particular country) on: a natural dimension (environmental information, topography and disasters); a social dimension (people: health status, social capital, education and awareness); an economic dimension (livelihoods: employment, income, assets etc.); a physical dimension (infrastructure: road network, warning system, housing and land use etc.) and an institutional dimension (organisations: institutional collaboration/coordination, external institutions, development plans etc).

Responsive planning and related systems therefore requires a wide diversity of information (as described above) to be effective. The more diverse the source of information (international, regional, national, sub-national, local) the better intelligence can be gathered. However, quality data and information always outweighs quantity therefore the best possible base data, through analysis, leads to the development of good information. Good decisions, it is said, can only be based on good information.

Given the multitude of uncertainties associated with climate change and the multidisciplinary, multi-scale and multi-stakeholder nature of disaster preparedness and early warning it is essential that dialogue between scientists and policymakers and between developers and users of scientific information and products are prioritised. It is also imperative that all appropriate stakeholders should be involved in determining information needed for responsive planning. This should, at the least, include local communities and the representatives of local government since local government is geographically closest to local communities. To fully empower those most at risk it is important that "people centred early warning systems" are developed which recognize human needs and human behaviour, and involve local participation from both women and men.

National government ultimately makes policies based on its national development agenda. Often these well intentioned policies are ineffective because of a lack of consultation at the grass roots level and are implemented with a top-down approach. The best responsive policies are "people-driven" and "people-centred".

A lack of funding is also a major constraint in many developing countries.

2. Information Needs for *Proactive* policymaking/planning

International literature suggests that the future impacts of climate change on development in Africa depend on four main, inter-linked bio-physical factors:

- (i) the extent of the warming;
- (ii) the changes in amount and variability of rainfall;
- (iii) the increase in extreme events; and
- (iv) the extent of sea-level rise.

Climate projections indicate that Africa is very likely to warm by 3- 4°C on average during this century, greater than the global average temperature increase. The effects of such changes for rural communities are likely to be severe, with reductions in crop yields and livestock productivity (and hence food security), shortages of drinking water, reduced potential for hydro-electric power generation, large-scale migration of 'climate change refugees' and potential civil conflicts and unrest.

Predictions of rainfall changes in Africa while generally less consistent than those for temperature indicate that widespread reductions are likely. In regions where increases in rainfall are predicted (e.g., equatorial Africa), this will be offset by warming and the loss of water via evapo-transpiration. Agriculture in particular will be hard hit.

The International Panel on Climate Change (IPCC) predicts a sea level rise of 21-48 cm. With 40 percent of West Africa's population living in coastal cities (more than 50 million will live along the 500 km coastline between Accra, Ghana, and the Niger delta by 2020), sea-level rise is expected to have a significant impact. Other impacts include: loss of mangroves, estuaries and coral reefs, which are critical for tourism and fishing industries; flooding of coastal infrastructure; and loss of coastal plantations of palm oil, coconuts, mangoes, and cashew nuts. These climate change risks are additional to, and are likely to compound, existing socio-economic development challenges.

Very few African countries have addressed proactive policy making and information needs around the four bio-physical factors described above. South Africa, and a few other countries like Uganda and Kenya, has recognised the risk from a wide range of natural, technological and environmental hazards that could, if left unchecked, lead to disasters. South Africa, which has been exposed to

disasters that have included droughts, floods, major fires, tornadoes, major oil spills and even earthquakes, has in the past pursued various strategies to counter the effects of these disasters.

South Africa Action

However, after the June 1994 floods on the Cape flats, the South African Cabinet resolved that the country's ability to deal with risk reduction and Disaster Management should be re-assessed to provide a clear, coherent and proactive policy on risk reduction and disaster management. This resulted in a review of disaster management structures and approaches in government and ultimately led to the promulgation of the Disaster Management Act, 2002 (Act No. 57 of 2002) which provided for (amongst other issues):

- An integrated and co-ordinated disaster management policy that focussed on preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery;
- The establishment of national, provincial and municipal disaster management centres.

This Act also involved collaboration amongst other Ministries such as the Department of Local and Provincial Government which led Integrated Development Plans (IDP's) to be drafted. IDPs are a participatory planning process aimed at integrating sectoral strategies in order to support the optimal allocation of scarce resources between sectors, geographic areas and the population, in a way that promotes sustainable growth and equitable development and the empowerment of the poor and marginalized. The IDP is a principal strategic planning instrument that guides and informs all planning, budgeting, management, investment and development, and implementation decisions and actions at a local municipal level. All South African municipalities are required to incorporate a disaster risk reduction component into each initiative undertaken in terms of their IDPs.

South Africa also took an important step with the release of the National Climate Change Response Green Paper by the Ministry of Water and Environmental Affairs. The Green Paper is a draft of the country's climate change policy. The final climate change White Paper is expected to be published by mid-2011. This document would then inform the country's climate change policy, and the department has indicated that it would have a legislative, regulatory and fiscal package dealing with climate change by 2012. The Green Paper outlines that government believes that climate change, if unmitigated, has the potential to undermine positive advances made in

meeting South Africa's development goals and the Millennium Development Goals. The Green Paper states that South Africa will require the mandatory submission of greenhouse gas (GHG) emission data to the National Atmospheric Emission Inventory by all significant emitters and compilers of such data by 2013. The Department of Environmental Affairs stated that an effective response to climate change requires national policy to ensure a coordinated, coherent, efficient and effective approach.

Other significant aspects of the Green paper includes addressing disaster risk management and the natural resources sectors, which require mainly information on adaptation responses.

The South African experience identifies the following types of climatic and non-climatic information sets as necessary for preparing for future likely changes:

- terrestrial biodiversity,
- marine biodiversity,
- commercial forestry and fisheries;
- human society,
- livelihoods and services,
- human settlements, infrastructure and the built environment;
- the education sector;
- the banking and insurance sector;
- rural livelihoods; and
- waste.

In addition to these information sets, geospatial (earth observation and geographic), environmental, socio-economic and demographic information is vital for proactive policies from the local to national level. In most cases Earth observation data (satellites, in-situ sensors etc.) will provide the base data needed to derive thematic climate change analysis.

South Africa is among 22 African countries who are members of the Group on Earth Observation which will give this country the benefit of access to data from many different sources, at various scales and over a variety of temporal periods on both the natural environment and human infrastructure. In-situ measurements, aerial and satellite remote sensing, and predictive modelling, all integrated into decision support and response systems, can provide timely and accurate information needed by decision makers and the public.

It is important for African governments to join, participate in and leverage the GEO network and thereby gain access to vital data and more importantly derived

information sets. Joining GEO will ensure being part of a better coordinated observation system of systems that could save lives, protect biota and preserve resources. The future sustainability of the earth will demand predictive systems that could optimally warn and inform decision-makers and the public, and reduce the chance of hazards becoming disasters.

Key stakeholders in addressing proactive information and policy can range from policymakers at different levels (e.g. for raising awareness on issues related to adaptation in order to achieve better policy integration), international organisations (i.e. UNFCCC, UNEP, UNDP, FAO, WMO, Group on Earth Observation), environmental management practitioners, vulnerable groups, including indigenous communities, women and children, as well as academia and business leaders. Regional and local organizations and networks have an important role to play in determining the key information required for proactive planning.

3. Information Needs for Robust Policymaking/planning

So we know that our climate is changing but we know very little about the timing, magnitude and locations that will be most affected. We are informed that the frequency of climate-related disasters is rising and therefore climate change warnings are a legitimate concern. The possibility of catastrophes and societal disruption on unprecedented scales is real. However for decision-makers, especially from developing countries, climate change represents uncertainty and therefore will require robust planning.

According to the IPCC, very few regional to sub-regional climate change scenarios using regional climate models or empirical downscaling have been constructed in Africa, mainly due to restricted computational and analytical facilities and the limited availability of technical expertise, as well as insufficient climate data.

Under the medium-high IPCC emissions scenario the best available climate projections forecast that mean annual rainfall is very likely to decrease along the Mediterranean coast (by 20%) and in much of southern Africa, but is likely to increase in tropical and eastern Africa. For the western Sahel, there are still discrepancies between the climate models: some project a significant drying and others a progressive wetting with an expansion of vegetation into the Sahara.

A key risk associated with the high climate uncertainty in Africa could be to undersize or oversize adaptation efforts. In some cases, the mal-adaptation costs resulting from sunk-costs or costs of delayed decisions could exceed the direct costs of global warming.

The National Communications developed under the UNFCCC and the National Adaptation Programmes of Action (NAPAs) supported by the Global Environment Facility have endeavoured to lay the foundations for prospective exercises to address climate risks. However, they have been hampered by the lack of data and limited technical capacity to apply appropriate planning tools. They have also typically focused on short-term threats in two or three key sectors with less emphasis on resilience of long-lived investment in the context of climate uncertainty.

Identifying and reducing risks in a rational, flexible and iterative manner, taking into account uncertainties associated with climate-related hazards – including droughts, floods, cyclones, sea-level rise and extreme temperatures – can help to protect people, livelihoods and assets, thereby promoting the achievement of development goals.

Conclusion

Broadly speaking, a comprehensive and coherent participatory national strategy (local to national) on Disaster Management and Climate Change Risk, Mitigation and Adaptation, Monitoring and Evaluation that engages key stakeholders (international, regional, national and sub-national) throughout the planning, policy development and implementation phases can have the necessary ingredients to address a variety of adaptation strategies, policies and measures. In my opinion, the foundational data and information needed for rapid response to long term projected impacts are essentially the same. Environmental monitoring and information systems can with the necessary in-situ and other relevant sensors perform tasks to undertake rapid early warning and disaster management tasks for responsive planning as well as provide the base data from which long term projections, analysis and adaptation strategies can be derived that incorporate a variety of scenarios. Local environmental monitoring systems data can be aggregated upward to provide, national, sub-regional, regional and ultimately global indicators.

While several factors constrain the design and implementation of an optimum mix of adaptation strategies, policies and measures to systematically mainstream climate risks into national and local development processes, there are just as many opportunities - such as the UNEP, UNDP and GEO initiatives - to fast track Africa's effort. African nations have to grasp these opportunities immediately or they will continue to participate at international climate change fora from a position of weakness and scientific ignorance. More importantly they need to recognise the

types of information and systems required to develop responsive, proactive and robust policies that will ultimately lead to the development of their people.

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