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Climate Change Adaptation in Africa

Scoping Paper for the Expert Group Meeting

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1. Executive summary

Adaptation is a process, beginning with understanding current vulnerability, building capacity to support adaptation planning and implementation, learning from pilot actions and deploying strategies and measures to operationalise climate change adaptation in vulnerable regions, sectors and populations. The assessment of current, urgent vulnerabilities has established country-driven priorities that are sufficient to invest in building capacity and pilot actions.

Adaptation efforts, globally and in Africa, are already occurring: it is necessary to move from reactive adaptation to proactive policies, strategies and plans. Actions are required to learn what works under which conditions and/or circumstances; implementation of NAPA projects are essential, as are an increased coverage of types of projects and sectors.

Financial support for climate change adaptation in Africa has been growing, from the initial funds for Least Developed Countries (LDCF) to major investments planned by bilateral donors. Increasing contributions are expected from foundations and the private sector. The estimates of the cost of adaptation in Africa are no more than 'thought experiments', and further studies within Africa are required. However, it appears that the capacity to utilize additional funding on climate adaptation over the next few years is about the same order of magnitude as the funding available. However, to achieve successful 'climate protection' will require effective delivery of increased development funding and full implementation of disaster risk reduction strategies, as well as significant funding for the additional burdens of climate change.

The most urgent needs at present, with immediate benefits, are to rapidly build the adaptive capacity in existing institutions in Africa, to develop a professional body of practitioners, and to implement pilot actions in every country and vulnerable sector. The ability to plan sound projects and to learn from what works is limited by the lack of institutional and professional capacity. Taking advantage of synergies with other resource management and risk reduction efforts (e.g., water, land degradation, biodiversity, coastal zones, health and disasters) is imperative.

2. Introduction

The 12th session of the African Ministerial Conference on the Environment (AMCEN), offers African Ministers a platform to discuss climate change adaptation. Ministers will also review progress made in the implementation of the action plan for the environment initiative of the New Partnership for Africa's Development (NEPAD). Dialogues on financing adaptation and environmental programmes will be one of the key areas of discussion.¹

UNEP tasked the Stockholm Environment Institute (SEI) and a group of experts from Africa (See Annex 2, list of authors) with producing a scoping paper on climate adaptation in Africa for the expert meeting of the 12th Session of AMCEN. Based on key messages from this paper, UNEP has prepared a separate discussion paper to facilitate minister's dialogue. Both papers aim to assist expert's and minister's discussion during AMCEN, and the output of these discussions will help plan adaptation activities in Africa and contribute to the current UNFCCC negotiations for a post 2012 agreement on climate change.

It is important to note that the paper does not focus on specific vulnerabilities, regions or populations-at-risk. The IPCC reports, including the chapter on Africa, provide ample discussion of potential future impacts in Africa, and the documents of National Adaptation Programmes of Action (NAPAs) and National Communications identify priorities for each country, including water, agriculture, health and coastal zones.

The presentation of policy and strategic issues for taking forward climate change adaptation follows a sequence:

- Vulnerability assessment: Awareness, monitoring and communicating present vulnerability (the development baseline) and monitoring trends in climate change and impacts for the future are necessary components of an adaptation strategy.
- Adaptation capacity: The human and institutional resources to monitor vulnerability and plan adaptation strategies and actions underpin implementation; institutional competence must be rapidly increased at all levels from African-wide centres and networks to local communities.
- Pilot actions are required to learn what works; implementation of NAPA projects is essential, as are an increased coverage of types of projects and sectors.
- Implementing operational climate adaptation in vulnerable sectors, regions and socio-economic groups is the ultimate goal; this should proceed from the competence of organisations to deliver effective responses and learning what works.

The conclusion summarises a recent review of climate change impacts and adaptation in a regional workshop in Africa organised by the IPCC. It indicates the urgent actions required in the next few years.

1 http://www.unep.org/roa/amcen/About_AMCEN/default.asp

	Vulnerability assessment	Capacity	Piloting adaptation	Operational
Types of adaptation:	<ul style="list-style-type: none"> ● Priority regions, sectors and socio-economic groups ● Multiple stresses ● Synergies 	<ul style="list-style-type: none"> ● Policy framework ● Organizational competence ● Staff and skill base ● Information 	<ul style="list-style-type: none"> ● Sectoral examples ● Agro-ecological zones ● Climatic hazards ● Monitoring and learning 	<ul style="list-style-type: none"> ● National to local coverage ● Technical support ● Priority sectors and regions covered
Awareness, information, early warning, communication	Build on NAPAs, existing platforms; link to multiple stresses, e.g., degradation and desertification, air pollution, water, health	Scale up existing organizations, networks; Centres of excellence	End-to-end coverage for priority hazards, regions, sectors; evaluate effect on poverty alleviation and development goals; assess costs of adaptation	Monitoring, learning from actions
Sustainable livelihoods	Social vulnerability assessment and analysis of special groups (e.g., women, marginalised societies)	Strengthen development planning and capacity	Test community based adaptation in cross section of agro-ecological zones and livelihood groups	Manage risks through portfolios of strategies and actions
Direct sectoral investment	Intervention models and pathways	Link national policy to sectoral organisations, e.g., line ministries, trade bodies	Focus on priority sectors in LDCs and key MDCs; collate lessons learned	Major cost for protection; develop standards of acceptable risk
Disaster risk reduction	Implement Hyogo framework	Prepare for trends and additional climate change risks	Case studies for key hazards (drought, floods, heat waves, coastal storms, ENSO fluctuations)	Ensure disasters do not trap people, economies and regions in poverty; reconstruction to higher standards of climate risk management
Insurance and regulation	Learn from case studies (some 20,000 worldwide); evaluate future climate change risk	Develop public-private partnerships	Explore regulation role in reducing future vulnerability; promote additional pilots for micro-finance (credit, insurance)	Increasingly important part of portfolio
Crisis management, large scale migration	Scoping potential 'hot spots'; understand pathways in multi-stressor context	Establish international capacity with national focal points	Develop potential intervention models and approaches	To be explored; requires major international strategies and Africa-wide initiative
Responses:				
Funding	Strong links to development funding; additional capacity for CCA	Strong links to development funding; additional capacity for CCA	CCA funds primary source; coordination with NGOs and private sector actions	Requires leveraging development and private sector funding, e.g. through new codes of practice for climate proofing
Lead actors	Multi-stakeholder; networks with research centres, local organisations and development community	National policy lead; civil society and NGOs;	Across all scales and sectors	Strong coordination and monitoring to ensure effectiveness; actors at all levels involved

Table 1: Planning investment in climate change adaptation

Red: Urgent now

Amber: Required within 5-10 years

Yellow: Priority for 10-20 years, early preparation essential

3. Vulnerability assessment: baseline and future impacts of climate change in Africa

This section briefly reviews material on vulnerability—as the present exposure to multiple stresses including climatic disasters and the longer term prospects of adverse impacts of climate change. Key messages concern filling gaps in knowledge, monitoring changes and linkages to other environmental stresses.

3.1. Summary from IPCC

The Intergovernmental Panel on Climate Change produced the most authoritative assessment of climate change in Africa in its fourth assessment report (AR4). The key messages confirm earlier findings. Of particular note are recent assessments that place Africa as a priority for adaptation assistance due to the high number of least developed countries, fragile resources, variable climates and relatively weak institutions for managing the multiple stresses related to climate change vulnerability and Africa's large share of the world's drylands. Regional impacts of climate change in Africa are increasingly common, especially in melting glaciers (Kilimanjaro, Kenya, Ruwenzori), decreased river flows, and spread of vector-borne diseases.

	IPCC Working Group II
●	Africa is one of the most vulnerable continents to climate change and climate variability, a situation aggravated by the interaction of 'multiple stresses', occurring at various levels, and low adaptive capacity (high confidence). Africa's major economic sectors are vulnerable to current climate sensitivity, with huge economic impacts, and this vulnerability is exacerbated by existing developmental challenges such as endemic poverty, complex governance and institutional dimensions; limited access to capital, including markets, infrastructure and technology; ecosystem degradation; and complex disasters and conflicts. These in turn have contributed to Africa's weak adaptive capacity, increasing the continent's vulnerability to projected climate change. ²
●	By 2020, between 75 and 250 million of people are projected to be exposed to increased water stress due to climate change. In some countries, yields from rain-fed agriculture could be reduced by up to 50%. Agricultural production, including access to food, in many African countries is projected to be severely compromised. This would further adversely affect food security and exacerbate malnutrition. Towards the end of the 21st century, projected sea level rise will affect low-lying coastal areas with large populations. The cost of adaptation could amount to at least 5 to 10% of Gross Domestic Product (GDP). By 2080, an increase of 5 to 8% of arid and semi-arid land in Africa is projected under a range of climate scenarios. ³

3.2. Adaptation and mitigation

For the first time, in AR4 the IPCC included a chapter on linkages between adaptation and mitigation. This work established that there are many ways in which adaptation and mitigation are linked in decision making and in outcomes. Adaptation is not a surrogate for mitigation. Indeed, the limits to adaptation are obvious particularly in Africa, where large scale failure of agriculture, water systems and health may be accelerated by climate change. Synergies with

2 IPCC (2007) Climate Change 2007: Impacts, Adaptation and Vulnerability, Africa. Geneva: IPCC, page 435.

3 IPCC (2007) Climate Change 2007: Synthesis Report, Summary for Policymakers. Geneva: IPCC, page 11.

development planning and investment are particularly important in Africa, where many long-term investments will be forthcoming in the next few decades (e.g., major energy infrastructure, economic integration). Building capacity for climate adaptation should be closely linked to capacity for mitigation, with strong coordination at the national level, mechanisms for sharing experiences at the African level, and representation in international negotiations and policy.

Adaptation is not a substitute for mitigation⁴

- Effective climate policy aimed at reducing the risks of climate change to natural and human systems involves a portfolio of diverse adaptation and mitigation actions. Even the most stringent mitigation efforts cannot avoid further impacts of climate change in the next few decades, which makes adaptation unavoidable. However, without mitigation, a magnitude of climate change is likely to be reached that makes adaptation impossible for some natural systems, while for most human systems it would involve very high social and economic costs.
- Adaptation and mitigation actions include technological, institutional and behavioural options, the introduction of economic and policy instruments to encourage the use of these options, and research and development to reduce uncertainty and to enhance the options' effectiveness and efficiency. Opportunities exist to integrate adaptation and mitigation into broader development strategies and policies.
- Creating synergies between adaptation and mitigation can increase the cost-effectiveness of actions and make them more attractive to stakeholders, including potential funding agencies. Analysis of the inter-relationships between adaptation and mitigation may reveal ways to promote the effective implementation of adaptation and mitigation actions together. However, such synergies provide no guarantee that resources are used in the most efficient manner when seeking to reduce the risks to climate change. In addition, the absence of a relevant knowledge base and of human, institutional and organisational capacity can limit the ability to create synergies. Opportunities for synergies are greater in some sectors (e.g., agriculture and forestry, buildings and urban infrastructure) but are limited in others (e.g., coastal systems, energy, health).
- People's capacities to adapt and mitigate are driven by similar sets of factors. These factors represent a generalised response capacity that can be mobilised for both adaptation and mitigation. Response capacity, in turn, is dependent on the societal development path chosen. Enhancing society's response capacity through the pursuit of sustainable development is therefore one way of promoting both adaptation and mitigation. This would facilitate the effective implementation of both options, as well as their mainstreaming into sectoral planning and development. If climate policy and sustainable development are to be pursued in an integrated way, then it will be important not simply to evaluate specific policy options that might accomplish both goals but also to explore the determinants of response capacity that underlie those options as they relate to underlying socioeconomic and technological development paths.

3.3. Monitoring climate and environmental change

Monitoring of trends in climate and associated environmental changes underpins the identification of vulnerable regions, sectors and groups, and motivates taking climate change seriously. Relying solely on climate models (whether downscaled or at a regional level) is unlikely to lead to sound adaptation policies on its own. However, monitoring systems in Africa are incomplete and in many cases degrading through lack of investment.

⁴ From IPCC (2007) *Climate Change 2007: Impacts, Adaptation and Vulnerability, Inter-relationships between adaptation and mitigation*. Geneva: IPCC, page 747.

Climate and environmental monitoring needs urgent improvement

- Incomplete and degrading networks for monitoring climate and environmental changes need urgent strengthening. A priority is to implement action plans from the World Climate Observing System, Long-term Environmental Monitoring network, and regional action plans (such as the OSS-ROSSELT network monitoring desertification).
- Extending environmental monitoring systems to include human dimensions is essential in making the link to planning effective adaptation. A livelihood approach linked to broad agro-ecological zones is likely to be effective.

3.4. Detection of climate change impacts in Africa

The IPCC review of trends in climate change impacts shows only seven sites in Africa, mostly likely due to a lack of research rather than a lack of impacts. This gap in understanding what are urgent impacts, already occurring and directly related to climate change, may hinder planning longer term climate change adaptation strategies and actions. However, urgent needs are already well documented, related to the impacts of climatic hazards and existing climatic variability.

Monitoring current climatic impacts and trends related to climate change

- Monitoring current climatic hazards and their impacts is incomplete in Africa, and is required to establish the baseline of present vulnerability and anticipate future risks. Documenting emerging climate change impacts, on physical, biological and human-economic systems, is essential and will further bolster the case for specific adaptation actions.

3.5. Synergies with desertification and land degradation

Climate change adaptation cannot be 'solved' without first addressing land degradation in those areas at-risk, particularly in drylands. That is, reducing the impact of drought is not possible without increasing resilience to climatic fluctuations, which requires better management of environmental services. At the same time, mechanisms for climate adaptation, including vulnerability assessment, institutional capacity, monitoring and early warning systems, and action plans, have common elements and in many cases very similar processes as for combating desertification.

The implementation of any adaptation measures in drylands and in particular the National Adaptation Programmes of Action to adverse impact of climate change and the National Action Plans to fight against desertification provide a tremendous opportunity to create a real and effective synergy between climate change and desertification. Indeed, in countries affected by desertification, the need to engage in a joint work program to address issues related to sustainable livelihoods of populations in arid, semi-arid and dry sub-humid areas of developing regions, within the frameworks of the CCD and FCCC, is prompted by the fact that these two conventions are sustainable development-related and have great similarities. The livelihoods of people in these climatic regions and ecosystems are threatened by various calamities, including drought and desertification. Joint action is necessary in order to enable them to adapt and sustain themselves. The unity of purpose of the two conventions necessitates engagement in joint programs building on their respective common grounds. Hence, it is necessary to adopt a common approach for the two processes, which is the most rational way forward in addressing the common objectives of

the two conventions. This would facilitate pooling of the conventions' resources for a common course, thus facilitating efficient resource utilization for their implementation. Joint national efforts would also facilitate facing the challenges posed by the two conventions. Furthermore, this approach is consistent with relevant provisions of the FCCC and the CCD. Emphasis is placed on the specific concerns of developing country Parties, arising from the adverse effects of climate change and/or the impact of the implementation of response measures, especially on various categories of countries, including those in arid and semi-arid areas. The CCD seeks to address some of the adverse effects of climate change, such as drought and desertification, implying adaptation. This endeavor, coupled with the fact that both conventions have a special interest in sustainable development and food security, vis-à-vis developing countries, sufficiently justifies linkages, in the form of joint work programs, between the two sustainable development-related conventions.

Combating desertification and land degradation

- Climate change adaptation strategies and actions should include plans to combat desertification. Institutional synergies should be developed, including vulnerability assessment, monitoring, early warning, and interventions to promote resilient and sustainable livelihoods.
- Where possible, actions should link adaptation and fighting against desertification, rather than designing, implementing and managing climate policy separately from combating desertification; this makes sense for efficient resource management and mainstreaming adaptation throughout development planning. It is particularly true in countries with scarce financial and human resources.
- The interactions between soil, water and the atmosphere are still to be fully understood and assessed in a context of climate change. Shared resources, primarily land and water, are cardinal issues for any sustainable development policy within a scenario of changing ecosystems, climate variability and population dynamics. Ecological observation and monitoring is key to any adequate action to fight against desertification. This observation and monitoring complement climatic observation systems.

3.6.Synergies with biodiversity and forests

Forests play key roles in supporting national economic activities and providing livelihoods for many in Africa. They provide valuable ecosystem services like climate regulation, hazard protection, water conservation, and also affordable goods like fuelwood, foods and nutritional supplements, and medicinal products etc. most of which depend on biodiversity. They are at the frontline in reducing climate impacts on Africa by reducing exposures to scourging heat, dust storms and floods. Inarguably, forests should play major roles in national development strategies and be the entry point for climate change adaptation in Africa.

Linking biodiversity and forests to climate adaptation⁵

- Adaptation strategies should encourage the conservation of habitats and biodiversity (fauna and flora) that underlies livelihood adaptation especially in rural areas. Aforestation and reforestation programmes that are in compliance with climate, community and biodiversity standards should support landscape approaches in land use management to avoid maladaptation in other sectors and section of the communities.
- The identification and implementation of action for adaptation at the local level needs informed

5 See: IPCC (2002) Climate Change and Biodiversity, Technical Paper V. Geneva, IPCC. Secretariat of the Convention on Biological Diversity (2006) Global Biodiversity Outlook 2.

and connected actors, with flexible institutional environments to find local responses to climate change and to maintain resilience and enhance the adaptive capacity of actors and institutions in the governance structures. There is need to provide and support participatory and open multi-stakeholders discussion platform that encourages the integration of biodiversity conservation into mainstream climate change adaptation strategies, and beyond protected areas. It is essential to build the capacities of actors, sectors and institutions in their use and management of multiple forest resources across scales (local, national and regional) and over time in order to balance economic growth and livelihood adaptation while ensuring the resilience of the forest ecosystem to climate change. Implementing institutional arrangements and governance structures that promote synergy in the planning and implementation of agro-ecosystems and forestry programmes for mitigation and adaptation projects to derive maximum benefit to the environment as well as the local communities or economies.

- Regional institutional capacity and decision-support systems for managing transboundary resources are required, to ensure quality, regulation capacity and demand in the use of resources. Planning management strategies that are long-term and dynamic, and which encourage the sharing of information, intelligence and experiences in tracking natural resource flow across territorial boundaries in curbing illegal trade and practices that affect biodiversity conservation and adaptation.

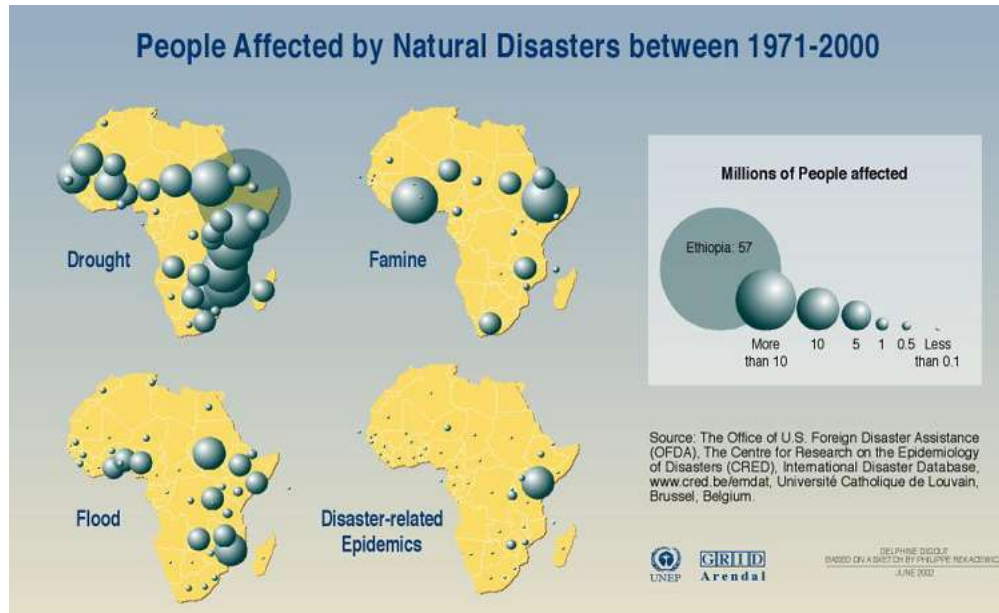
3.7. Humanitarian crises, displaced populations and disaster risk reduction

There is a growing recognition that environmental degradation and climate change hold the potential to result in significant population displacement, which the world is presently ill-equipped to prevent or respond to in an effective manner. Africa will be at the forefront of many of these concerns.

Both gradual processes and extreme environmental events can cause migration. Yet current policy responses tend to focus on how to deal with the impacts of sudden natural disasters rather than with the consequences of longer-term environmental degradation. While migration is a coping mechanism and survival strategy for those who move, increased migration may itself contribute to further environmental degradation and socio-economic stress.

This practical but highly complex and chronic issue has been largely ignored (it is not covered in any detail by the IPCC AR4). The complexity of this topic and the difficulty to predict the magnitude of environmentally induced migration have in some respects worked against building awareness and momentum for practical action. However, all evidence points towards climate and environmentally induced migration becoming one of the major policy challenges of this century. Adequately planning for and managing environmentally induced migration will be critical for human security.

Numerous types of disaster risk reduction have been adopted in response to natural hazards but their scope is often short term. Even though such systems offer people safety, they do not help to protect them from the middle to long term threats to food security and health, economic decline, inundation of coastal areas, and degradation of land and fresh water resources and even conflict associated with natural disasters. The interplay of environmental and socio-economic stresses has often induced migration as an adaptation strategy.



Source: UNEP/GRID Arendal. 2002. *Vital climate graphics Africa*.

Humanitarian crises, forced migration and disaster risk reduction

- Migration is a coping strategy for current climatic stresses (e.g., drought) and should be encouraged as a managed adaptation to risk. Long-term outmigration may be necessary for some regions; adaptation strategies and action plans may need to be pro-active in anticipating voluntary displacement.
- The linkage between climate change, environmental degradation and forced migration is a major issue that needs to be addressed through a combination of research, awareness raising, policy development and practical action. International collaboration, including a proposed Migration and Environment Alliance, representations to the UNFCCC bodies and regional action within Africa are first steps.⁶
- Full implementation of the Hyogo framework for natural disaster risk reduction is an essential step for adapting to climate change in the short term. Early warning systems and contingency planning should be based on sound preparedness and longer-term development to support resilient livelihoods and disaster-proof infrastructure. Fast track funds for recovery and rehabilitation should ensure rapid replacement of economically important infrastructure.

⁶ Material in this section is primarily from UNEP and Institute of Migration. (2008) *Climate change, environmental degradation and migration: The UNEP and IOM perspective*. Geneva: UNEP and IOM (manuscript by Andrew Morton, Philippe Boncour, Frank Laczko, Jobst Koehler and Alina Narusova).

Climate uncertainty should not hinder planning adaptation

Much of the scientific assessment of climate change has focused on climate model uncertainty, assuming that uncertainty in the climate would translate directly to uncertainty in impacts and hence be a constraint in climate change adaptation decisions. In many cases, impacts may integrate different aspects of climate, potentially decreasing the uncertainty in the impact. For instance, changes in water resources in a catchment integrates changes in temperature, radiation, rainfall and land cover, which may result in more consistent results than if just rainfall is considered.

Most of the critical impact analyses (changes in flooding, agricultural productivity, stream flow) have yet to be undertaken for most of Africa, especially utilising newer, improved downscaled climate scenarios that are only now becoming available, analyzing robustness in results and evaluating envelopes of climate adaptation strategies (see the annex on the weADAPT/CSAG approach).

The time evolution of adaptation decisions at different points in the future depends on when different aspects of climate will change in the future, pathways for underlying social and economic vulnerability and decision points for effective responses. It is therefore important to quantify when different aspects of climate are expected to reach a critical stage, e.g. temperature is changing now but rainfall may only change substantially in several decades time.

Methods for developing robust adaptation options, in light of the range of potential changes in climate, resources and socio-economic vulnerability at different points in the future, should be pursued. Assessments should make use of scenarios from multiple climate models supported by evaluation of pathways of vulnerability and adaptive competence; otherwise risk of future changes may be ignored and opportunities for action missed.

4. Adaptation capacity

Given adequate (for building strategies and actions) understanding of present vulnerability, trends in climatic conditions and risks and long-term prospects, the next step is to build capacity, to continue monitoring changes, to use climate information in sound ways, and to develop effective projects. A key element of adaptive capacity is engaging in international negotiations and assessment of the costs of adaptation. Our view, as indicated in the introduction, is that adaptation is a social and institutional process.

Indeed, communities are already adapting. Some studies indicated that African communities are adapting to reduce risks in a harsh, variable and changing environment.⁷ The adaptations are not driven by climate change. But they are, nonetheless, building resilience to climate change. The measures being adopted in many African countries include water harvesting and cultivation of drought resistant varieties, expanding food storage facilities, managing natural resources, establishing and maintaining shelter belts, planting of backyard farms to supplement family food supply and income, supplying micro-credit and energy saving stoves and forming and training of community groups to implement and maintain various sustainable livelihood measures.

4.1. Organisational capacity and African institutional development

There are strong synergies between climate adaptation, disaster risk reduction, natural resource management and governance, in Africa as elsewhere. Capacity to plan adaptation is not independent of good governance, development planning and sound resource management. In some places, these prerequisites need to be bolstered, climate adaptation activities will not be successful otherwise.

Common recommendations for establishing the enabling conditions for climate adaptation include: strengthen national and regional (SADC, COMESA, ECOWAS) policies to promote environmental well-being; increase awareness of the value of the physical environment and risk to ecosystems through public campaigns; mainstream environmental concerns in all government policies; strengthen government and CSO capacity in environmental management; and promote the collection and valorization of indigenous/traditional knowledge. This paper *assumes* these strategies are agreed and covered in detail in other planning documents.

In building organisational capacity in Africa, lessons should be drawn from development planning and other environmental agreements (e.g., desertification), as well as national climate adaptation programmes elsewhere. The role of multi-stakeholder processes, research supporting action, science-policy linkages (see section below), and social learning (drawing in community based organisations and social entrepreneurs).

Building organisational capacity

- All reviews of African organisations with interests in climate adaptation indicate the wealth of experience matched against the diversity of needs. For rapidly progressing organisational capacity for climate adaptation, the urgent priority is to promote and develop existing organisations and networks focussed on specific sectors, regions, stresses and vulnerable groups.

7 Osman-Elasha, B. et al. (2006) Adaptation strategies to increase human resilience against climate variability and change: Lessons from the arid regions of Sudan. AIACC project working paper. See www.aiaccproject.org for additional papers on African adaptation.

- Regional and African wide centres of excellence will take time to establish, but are required to support adaptation planning in the medium to long term. Such centres should establish long term training programmes, regular courses for users and facilitators, networks with experts and stakeholders. The urgent need is to establish a network of such prospective centres within Africa.
- The baseline assessment of organisational competence for climate adaptation has not been established. Developing metrics for adaptation processes in Africa should be promoted, drawing upon experiences in disaster risk reduction and capacity assessment (e.g., extending the UNDP Capacity Assessment Tool to climate issues).
- Specific actions are urgent to provide resources for Africa organisations (especially research groups, community organisations, regional NGOs and private sector representatives) to develop capacity on adaptation to climate change, including linkages to renewable energy (such as mini-hydro, solar and wind), biofuels, climate proofing technologies, governance and environmental stewardship, ecological monitoring and environmental services, and sectoral responses for priority sectors.
- A regional capacity to support assessments of vulnerability, impacts and adaptation is required. An African bureau (similar to the working group technical support units) for the IPCC would be helpful. An IPCC process focussing just on LDCs would address capacity gaps while providing information on adaptation at a local scale.

4.2. Using climate information

Stakeholders are often expected to translate generic output (e.g. a 2 ° C increase in global temperature) or broad regional conclusions (e.g., Africa will experience more drought) into meaningful terms for their sector, locale or vulnerable group. This approach may obscure the strengths and (more importantly) the weaknesses of information on projected climate change, leading to inappropriate interpretations and adaptation strategies and actions. Boundary organisations and individuals are required to provide a human interface—listening and learning between climate experts at global and regional levels and stakeholders at all levels of decision making.

Linking stakeholders and experts in using climate information

- Building capacity—in regional centres of excellence, in existing nodes in research and applications networks and in individuals—to translate climate science for stakeholders is an urgent need. Such user-oriented experts or linking stakeholders require knowledge in more than one domain, skills in handling climate data and more importantly, ability to communicate across disciplines and with a variety of users. Highly targeted training, based on real examples, will refine what users understand of their common future and assist the climate community to provide useful information.
- Existing initiatives should be a critical priority, including development of regional climate information centres in Africa, the weADAPT platform at the University of Cape Town, the many topical networks (such as the OSS's desertification network and regional food security groups).

4.3. Bali Action Plan and adaptation in the post-2012 international regime

The Bali Action Plan, Nairobi Work Programme on Impacts, Vulnerability and Adaptation (NWP) and the board of the Adaptation Fund (AF) (and later the fund management) are mechanisms for African countries and experts to get involved at the international level. African representation appears to be adequate and effective in the BAP (co-chair of the Ad-hoc Working

Group on Long-term Cooperative Action) and AF (chair of the board and additional members). However, funding for participation in the NWP has not developed into long-term contributions from a wide range of African organisations (as yet).

The NWP and BAP cover most of the issues related to adaptation in a post-2012 international regime (which focuses primarily on commitments for reducing GHG emissions). Priorities for Africa should be to establish a successful track record for the Adaptation Fund. Longer term issues on legal instruments for adaptation, covering rights and accumulated deficits, liability for adverse impacts and obligations of parties) will be in common with LDCs and G77 negotiations but not unique to Africa.

Linking to international climate change processes

- The Tunis Action Plan should be implemented, with support for African experts to participate in the NWP and to engage in issues relevant to the BAP and AF.
- African capacity building, such as networks supported through the ecbi and CLACC projects⁸, as well as support for centres in other developing countries, such as the proposal for a research centre on vulnerability and adaptation proposed by the Maldives, should be strengthened.
- African countries must be well prepared to engage in the second review of the Kyoto Protocol and ensure that the regions main issues of concern are well articulated and reflected in the post-2012 negotiations and conclusions. These concerns includes: the development agenda; funding and capacity building for the implementation of the Convention and Protocol; the continuity and equity of the flexible mechanisms (especially CDM); technology development and transfer; and commitments under the Protocol (especially capping of emissions by developed countries).⁹

4.4. International finance

According to the UNFCCC Article 4, "... The developed country Parties ... shall ... assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects." However whether the developed countries have been able to assist adequately remains highly contested. The current adaptation financial instruments available to developing countries from the UNFCCC processes include:¹⁰

- Special Climate Change Fund (SCCF): US\$ 90 million pledged, US\$ 36 million allocated (as of 4 March 2008). Finance for the special needs of developing countries, primarily for adaptation (almost half of the pledges) and technology transfer. Working on a project by project basis as funds become available (the difference between pledges and delivered funds).
- Least Developed Countries Fund (LDCF): About US\$ 180 million pledged, US\$ 14 million allocated (as of 4 March 2008). Support for NAPA projects in LDCs (two-thirds of the 50 LDCs are in Africa), on an equal access basis. For the 49 LDCs, this is some

8 European Capacity Building Initiative, which supports regional workshops in Africa for negotiators. Capacity strengthening in the Least developed countries (LDCs) for Adaptation to Climate Change links regional NGOs with development practitioners in LDCs.

9 UN Economic Commission for Africa and African Union Commission. (2008) Climate Change: African Perspectives for a Post-2012 Agreement. First Joint Annual Meetings of the AU Conference of Ministers of Economy and Finance and ECA Conference of African Ministers of Finance, Planning and Economic Development, March 2008.

10 Information updated by Lars Christiansen, GEF Secretariat, World Bank, Washington.

US\$ 3.7 million per country at present.

- Strategic Priority “Piloting an Operational Approach to Adaptation” under GEF Trust Fund (SPA). Approximately US\$ 50 million initially, mostly all allocated. To implement concrete adaptation projects in particularly vulnerable countries. Replenishment of the fund will be considered by the GEF Council.
- Small Grants Programme under GEF Trust Fund (SGP). Support to community based adaptation.
- Adaptation Fund under the Kyoto Protocol: Funded by a 2% levy on Clean Development Mechanism (CDM) proceeds. A board has been appointed but the fund is not yet operational. The size of the AF is uncertain; projections are on the order of US\$ 80-300 million per year for the period 2008–2012. Assuming that contributions from the CDM stay at 2%, the fund would receive \$100-500m/year in 2030 if demand for carbon credits is low, and \$1-5bn/year in 2030 if demand is high.¹¹

Funding for disaster risk reduction is also relevant: The Global Facility for Disaster Reduction and Recovery (GFDRR) has been established as part of the International Strategy for Disaster Reduction. Funding for Track II (DRR in selected countries) for FY2008 is on the order of US\$ 23 million (perhaps up to half of this funding would be expected for Africa).

A range of bilateral donors and foundations have pledged support for climate adaptation and often with a special focus on Africa. A full accounting of plans has not been developed, but indicative initiatives include:

- French Global Environment Facility, above commitments to development assistance.
- Canadian and UK cooperation for the Climate Change Adaptation in Africa (CCAA) programme, with a budget for 2006-2011 of some US\$ 60 million.
- USA collaboration on technology with South Africa (and other developing countries).
- The G8, including the UK as a leader, have pledged at least US\$ 1.5 billion, although this may include loans rather than direct grants.
- Rockefeller Foundation programme on climate adaptation for agriculture in Africa (with support planned with Shell and Gates Foundations), in the region of US\$ 100 million.¹²

Within Africa, the African Development Bank leads investments that will include climate adaptation. NEPAD and regional bodies (such as ECOWAS) are building programmes on adaptation, primarily funded by external donors. The private sector is also active in Africa, through direct investment, mechanisms such as the Investment Climate Facility for Africa, and individual efforts.

It is not possible at this stage to identify the total finance available for climate change adaptation and related activities in Africa. A conservative estimate suggests funding on the order of US\$ 200 million is currently available (this is a programmatic total, not per year). This is expected to rise rapidly, with the AF coming on-line in a year or two and as major donor initiatives are implemented. By 2010 or so, the funding available for Africa could well be US\$ 1 billion (again, as a total, not per year).

¹¹ Joel Smith (2007) Preliminary estimates of additional investment and financial flows needed for adaptation in 2030. Presented to the Dialogue on Long-Term Cooperative Action, Vienna –August 28, 2007. See also the report by Joel Smith to the UNFCCC Secretariat.

¹² Ziervogel, G., et al. (2008) Climate change and adaptation in African agriculture. Oxford, SEI.

Finance for climate adaptation

- There is need for coordination among donors working in Africa on climate adaptation. This could be a straightforward as sharing plans and ensuring wide access to finance by the many organisations in Africa. Or, a more concerted approach with a shared secretariat in Africa may be warranted.
- As finance for climate adaptation will come from many sources, there should be greater clarity as to their purpose, rules for establishing common baselines (e.g., project plans without additional climate adaptation activities), collaboration to target assistance on vulnerable regions, sectors and populations, and collecting and sharing lessons learned.
- Funding should be widely available for all of the actors involved in climate adaptation. Supporting national and African-wide capacity is urgent; enabling other actors to take responsibility for implementing adaptation is essential.

4.5. Cost of climate change adaptation in Africa

Much is still unknown about climate change in Africa; not least the economic assessment of climate change impacts and the costs of adaptation. The lack of global methodologies and reliable estimates of the cost of adaptation, including financing modes, ability of African economies and institution to absorb new investment, and evaluation of the effectiveness of adaptation investments all constrain developing reliable estimates.

There are very few studies that estimate the costs and the value of the climate change damages avoided (i.e. benefits) of projects and policies that directly or indirectly have the potential to adapt to climate change in Africa or for that matter any place else in the world.¹³ Estimating the costs and benefits of projects and policies to adapt to climate change is important because it will allow multi- and bi-lateral donors and national governments to compare projects and policies for adapting to climate change on their economic grounds.

The UNFCCC estimate that the additional global investment and financial flows needed for adaptation in 2030 are:

- US\$ 14 billion for forestry, fisheries and agriculture
- US\$ 11 billion for water supply infrastructure (85% in non-annex 1)
- US\$ 5 billion for treating diarrheal diseases, malnutrition and malaria
- US\$ 11 billion for beach nourishment and dykes (c. 50% in non-annex 1)
- US\$ 8-130 billion to adapt new infrastructure vulnerable to climate change

Which is a total of US\$ 48-175 billion.

13 See John M. Callaway, Daniël B. Louw, Jabavu C. Nkomo, Molly E. Hellmuth and Debbie A. Sparks . 2008. Chapter 3: Benefits and costs of adapting water planning and management to climate change and water demand growth in the Western Cape of South Africa. In Neil Leary, Cecilia Conde, Jyoti Kulkarni, Anthony Nyong and Juan Pulhin (eds.). *Climate Change and Vulnerability and Adaptation*, Earthscan Books, London UK, pp. 53-70. See Momodou Njie, John M. Callaway, Bernard E. Gomez, Molly E. Hellmuth, Bubu P. Jallow, and Peter Droogers. 2008. Chapter 7: Making economic sense of adaptation in upland cereal production systems in the Gambia. In Neil Leary, Cecilia Conde, Jyoti Kulkarni, Anthony Nyong and Juan Pulhin (eds.). *Climate Change and Vulnerability and Adaptation*, Earthscan Books, London, UK, pp. 131-146.

As a simple framing exercise, we provide two rough estimates of the cost of adaptation in Africa.

The first takes as a point of departure the process of adaptation, from assessing current vulnerability to rolling out large scale interventions (see the table in the introduction). This is a bottom-up approach, cognizant of the ability to absorb funds in the short term and building on development efforts:

- **Assessing vulnerability:** much of the urgent needs are well established, through the NAPAs and National Communications. However, regional, transboundary issues and African-wide syntheses are lacking. Continued monitoring of trends and emerging vulnerabilities are essential. A minimum programme of US\$ 2 million for each of some 50 countries would be desirable, with regional activities of the same order, say 5 regions at US\$ 2 million each. Total present need: US\$ 110 million per year. This level of funding might increase modestly in the future, to broaden the coverage of assessments, provide greater detail at the local level, and focus on synergies and multiple stresses. The need in 2030 might be twice the current level: US\$ 220 million per year.
- **Building capacity:** this is much harder to estimate. Where basic institutional capacity is lacking, additional investment for climate adaptation will not have great benefits. However, funding development planning, providing sound governance and increasing fundamental skills is beyond the remit of climate change adaptation financing. A range of urgent needs would be for national programmes on the order of US\$ 4 million each per year, with an annual budget for African-wide and regional centres of excellence and supporting networks of US\$ 150 million. Thus, urgent funding is on the order of US\$ 350 million per year, and this may be the limit that can be utilized effectively in the near term. However, beyond 2012 and certainly by 2030, demands for implementing adaptation will require an expanded cadre of professionals, better information systems and enduring multi-stakeholder processes. Finance in the next decade or two could easily be required on the level of US\$ 500 million per year.
- **Piloting adaptation:** the initial portfolios of adaptation projects might include a sample across regions, sectors and hazards, perhaps 500 projects each requiring US\$ 0.5 million per year. Total: US\$ 250 million per year in the near term. This stage of learning by doing, continues as projects change, but would be taken up in the operational funding. Beyond 2012, this stream of funding should diminish.
- **Operational adaptation:** this is the hardest category to place a value on. Much will be learned in the coming years regarding the most cost-effective ways to cope with new conditions and hazards. Rolling out operational programmes should not be taken up lightly, and may not be possible for some years. For urgent regions, sectors, hazards and populations, a modest programme in the near term would be US\$ 100 million per year (that is fully implement the NAPAs in each LDC in Africa, plus equivalent efforts in other countries). However, certainly by 2012 (and possibly much sooner) the apparent needs and intervention strategies should be clear. A rough estimate would be to aim to cover 5 priority sectors in some 50 countries, with a minimum investment of US\$ 2 million each. This would be an urgent short term need of US\$ 100 million per year, quickly rising to at least US\$ 500 million per year by say 2012 and perhaps four times that level by 2030. Again, these are rough calculations of the prospective need and should not be taken as sound estimates.

Thus, a rough, bottom up total would be:

- Urgent needs in the short term: a minimum of US\$ 810 million per year
- Possible, minimum level of needs by 2012 to 2030: a minimum of US\$ 1,220 million per year, with US\$ 2,720 million not being unrealistic.

A second approach extends the UNFCCC estimates. This is more of a top-down accounting: assuming the global factors are reasonable for priority sectors, the demand that would arise from Africa can be related to estimates of official development assistance. This analysis can result in a wide range of estimates, depending on assumed climate adaptation ratios and rates of growth in development investment (see table below):

- The estimates are based on projected ODA to Africa. A continuation of current trends in ODA suggests investment rising by 4-5% per year. However, the G8 have promised a rapid increase in ODA for Africa, promising a doubling of investment by 2010 and perhaps 5% per year increases to 2030. These two projections are plausible brackets for the level of investment in Africa that will need 'climate protection'.
- The UNFCCC estimates that the cost of adaptation will be between 0.5 and 2% of investment. The estimates are differentiated by sector and to some extent region; at this stage we use the global average. A spreadsheet of ODA by country and sector is available and could be used to extend the exercise.
- A low estimate of climate adaptation costs in 2030, based on lower estimates of projected ODA and 0.5% additional costs, is US\$ 284 million per year. This is almost certainly a minimum expectation.
- The high estimate from this bracketing exercise, based on the G8 obligations for increased ODA and an additional cost for climate adaptation at 2%, is US\$ 2,163 million per year.

Note that the Stern report (2006) and the UNDP Human Development Report (2007) provide somewhat higher estimates of the cost of adaptation. The HDR suggests global adaptation costs would be 5-20% of ODA (following Stern's assessment). The global cost based on ODA in 2005 would be US\$ 1-7 billion per year. For 2030, our high estimate would then be 10-fold larger.

To highlight the uncertainty of these estimates, and the lack of an agreed method, consider the case just of future water scarcity. A plausible estimate of the number of additional people subject to water scarcity in the future in Africa is 75-250 million. If the cost of meeting the extra resources (or demand management) is in the range of US\$ 100 to US\$ 1000 per person, then climate adaptation costs for water scarcity would be in the range of US\$ 7.5 to 250 billion.

The estimates ought to take account of the many forms of investment. The example above is just ODA, private and foreign direct investment flows are much larger (particularly for wealthier countries).

The estimates for 2030 from these two exercises are not dissimilar: an upper expectation of additional investment on the order of US\$ 1 to 2 billion per year should be considered a minimum level of investment. However, there are many caveats to these crude estimates. They are provided simply to illustrate the kinds of calculation possible at present, and to bolster support for more comprehensive and authoritative analyses as a basis for moving forward in planning financial needs for adaptation in Africa!

Reference ODA in 2030: Required for climate adaptation:	Low estimate		Higher estimate	
	0.5%	2%	0.5%	2%
SOCIAL, made up of:	96	386	398	1,591
Education	28	111	284	1,135
Health	13	52	96	386
population/ reproductive	18	72	28	111
Water supply and sanitation	12	49	13	52
Gov and civil society	19	76	18	72
Other social infrastructure and services	7	27	12	49
ECONOMIC, made up of:	18	70	19	76
Transport and communications	5	22	7	27
Energy	6	24	18	70
Banking, business, other services	6	25	5	22
PRODUCTION, made up of:	14	56	6	24
Agriculture, forest and fishing	11	42	6	25
Industry mining and construction	2	8	14	56
Trade and tourism	1	6	11	42
MULTISECTOR	13	51	2	8
GENERAL PROGRAMME AID	24	95	1	6
DEBT	78	312	13	51
EMERGENCY	37	146	24	95
OTHERS	5	18	78	312
TOTAL, AFRICA	284	1,135	541	2,163

Table 2: Range of estimates of the cost of adaptation in Africa, US\$ million in 2030

Estimating the demand for adaptation funding in Africa	
•	The capacity to estimate the costs and benefits of adaptation projects and policies and the portion of projects with climate-related benefits of development projects is quite limited in Africa. Projects to conduct such assessments and strengthen this capacity are urgent. ¹⁴ Donors and international partners should provide greater support to African organisations to develop their capacity to a) estimate the economic costs and benefits of projects and policies that have the potential to contribute to climate change adaptation by reducing climate change damages and b) to use these models to make integrated policy decisions about how to cope with economic development pressure, climate change, local environmental degradation to improve the wellbeing of all Africans.
•	The international climate change community should seek to establish a collective target for financing adaptation in Africa, based on realistic processes for effective adaptation investment and acknowledging the many modes for financial assistance and implementation. This 'entitlement' should be used to bolster confidence by all stakeholders that responses to climate change will be considered, and included in ongoing development planning and resource management.

14 The World Bank, DFID, CCAA and EC/UNEP/SEI have proposed projects in this area. CCAA project, managing climate risk for agriculture and water resources development in South Africa, is a pioneer.

5. Adaptation practice: from pilot actions to operational coverage

The practice of adaptation is the essential outcome! National programmes are starting already, based on work in National Communications and NAPAs. A wide range of projects are possible, with urgent needs likely to focus on resilience livelihoods and sectoral investment. Technology transfer and disaster risk reduction are clear priorities, and plans are well developed to rapidly implement good projects in these areas. Going beyond pilot projects, learning by doing, to full 'climate protection' is the final stage, but difficult to judge what are urgent needs at present.

5.1. National policy and programmes

NAPAs have progressed, but have not fully met their objectives (see table below); although some 29 NAPA documents have been submitted on UNFCCC web site, few projects have been funded and implementation begun. In any case, the funds available from the LDCF are much less than the identified needs in Africa (e.g., more than US\$ 50 million for Mali). NAPAs are not sufficient to address future climate impacts in LDCs; there is a need to support enhanced, programmatic efforts through expanded National Adaptation Programmes of Action, National Communications and similar efforts.

	Developing national programmes that target urgent needs
●	Further support for national adaptation programmes, learning from the initial NAPA experiences, is necessary.
●	National programmes should focus on the most vulnerable countries and populations (country-driven). Assessment of the use of vulnerability indices should continue (as proposed by the Maldives on behalf of LDCs). Concepts of entitlement to adaptation should be pursued, based on agreed responsibilities, polluter pays principles, and ability to pay. ¹⁵

5.2. Types of adaptation projects

A full range of adaptation projects is possible, and desirable, including:

- Awareness: designed to raise general awareness of climate change, often working with stakeholders.
- Information and research: going beyond awareness to develop the research base for taking action, including monitoring systems, working with climate scenarios and baseline vulnerability assessments.
- Capacity building and early warning systems: a more organised approach to information, linking specifically to end users and specific actions.
- Mainstreaming and planning: working with specific planning processes, such as five-year development plans, to include climate risk management.

¹⁵ See for instance, the Green Development Rights approach, www.ecoequity.org/docs/TheGDRsFramework.pdf.

CHALLENGE	MEASURE OF SUCCESS	PROGRESS
Identify urgent needs and priorities in LDC countries	All LDCs submit high quality NAPA documents that identify agreed vulnerabilities	75 per cent: most LDCs have started NAPAs and are able to identify urgent needs
Identify priority projects for urgent action	All LDCs that undertake a NAPA process submit high quality projects for implementation	25 per cent: some countries have developed projects from initial profiles and these are now in the GEF pipeline
Learning by doing: implementing adaptation projects	All submitted projects are successfully implemented; reviews of good practice achieved	10 per cent: early stage of implementation; few if any independent reviews; substantial capacity is planned
Mainstream adaptation planning	All countries have effective institutional mechanisms for developing climate adaptation policy and strategy and good practice in integrating climate adaptation into relevant planning processes	10 per cent: some 30 countries (not only LDCs) have established national programmes
Climate adaptation beyond local and national action	Regional and international mechanisms through investment banks, transboundary resource management organizations, finance and risk management	10 per cent: high awareness at many levels, but not yet translated into institutional capacity

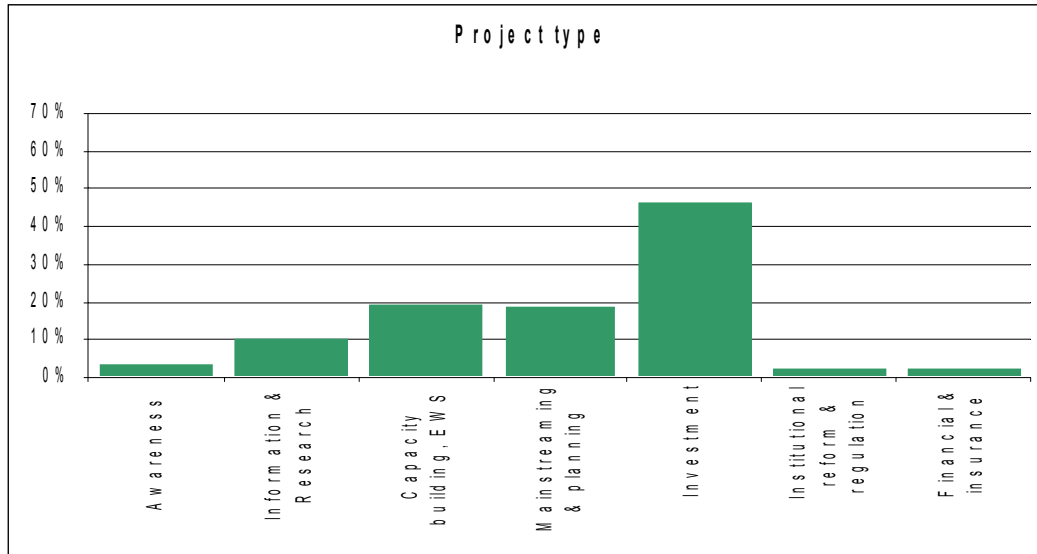
Table 3: A report card on progress by NAPAs in meeting challenges for climate adaptation¹⁶

- Investment: direct actions involving changing resource management in specific households or regions.
- Institutional reform and regulation: changing policies, resource management institutions and barriers to wider action on climate adaptation, often promoting more efficient use of resources.
- Financial and insurance: approaches involving spreading the risk through financial mechanisms or insurance.

The distribution of projects proposed by NAPA teams (as of 2006) is shown in the following figure.

Such projects might targeting specific vulnerable groups, for example poor farmers in semi-arid regions, focus on community based adaptation, working with a broad spectrum of households at the community level, whether identified through livelihoods (e.g., smallholder farmers) or specific regions; be sector-wide developments, often housed in the line ministry (e.g., Ministry of Agriculture) and working across levels from livelihoods to sectoral infrastructure and development planning; cover more than one sector in a region, often based on community development approaches but including some regional planning and infrastructure; or work at a national level, often associated with projects oriented toward policy and planning across a number of sectors.

¹⁶ Jallow, B.P. and Downing, T.E. 2007. NAPAs: Priorities to policies. *Tiempo* 65: p18.



Classification of NAPA projects as of mid 2006. Source: B. Osman and T E Downing. 2006. Lessons Learned in Preparing National Adaptation Programmes of Action in Eastern and Southern Africa. Oxford: European Capacity Building Initiative.

Range of adaptation projects

- A data base and synthesis of proposed projects in Africa should be developed, drawing upon existing inventories, such as the UNDP Adaptation Learning Mechanism, the IIED/CLACC data base of community based adaptation projects, and the wiki component of the weADAPT platform.
- Examples of project designs for the full range of types of adaptation projects should be developed, based upon experiences in Africa (e.g., with similar development and disaster risk reduction projects). Training in the design and preparation of sound adaptation projects should be offered on a regular basis at a regional and country level.¹⁷

5.3. Technology and innovation

Technological innovation and technology transfer are key to the future of climate adaptation. Technology is taken as a wide umbrella for knowledge (local and global), information, and materials. For instance, seasonal climate forecasts provide prediction on changes in weather parameters compared to past years. This type of information could be vital in preparing for adaptation. Even though, skills in climate prediction offer considerable opportunities to managers of the agricultural and other land use systems to realise the systems' potential through increased productivity and profitability, these opportunities are not fully tapped. Much is still unknown about climate change in Africa. Constraints include limited understanding and integration of forecasts into local existing skills and knowledge; inadequate understanding of probabilistic information and difficulty in communicating the probability of risks.

¹⁷ The CCAA project has made good use of Outcome Mapping in project design, monitoring and evaluation.

Transferring existing technology and promoting technological innovation

- Africa needs to fully take advantage of existing technology, and recommendations from the UNFCCC technical paper and subsequent negotiations should be pursued. Access and quality of existing information needs to be enhanced. Support should be rapidly increased for the involvement of African institutions and scientists on climate related modelling, the use of climate information and risk communication with users, as well as understanding potential impacts and interventions.

5.5. Pilot actions and learning by doing

Many international agencies are showing keen interest in funding climate change adaptation in Africa. A first step is to develop a suite of pilot actions, learning by doing adaptation across the full range of agro-ecological regions, for each priority sector and focusing on the most vulnerable socio-economic populations. This is a sizeable effort, and compiling lessons learned should be an essential component of this stage in 'doing adaptation'.

With a critical understanding of what works, where and for whom, operational climate adaptation can pursue several strategies. Mainstreaming climate change into national policies and development plans is a well recognised strategy, although in practice existing development planning processes may need substantial investment and expansion in order to integrate climate change policies. Working with public bodies and civil society is inherent in operational development planning, and more so for long-term climate adaptation. Trade organisations, community-based social networks, large employers, as well as all scales of government, have crucial roles in developing new risk management approaches, disseminating lessons learned and motivating sound climate adaptation strategies.

From pilot actions to operational adaptation

- A structured approach should be taken to learning from climate adaptation pilot actions. Operational programming of climate risk management will require greater clarity regarding what works, how much adaptation projects would cost and sources of finance, and key actors to ensure successful outcomes.

6. Conclusions

A recent meeting organised by the IPCC in Africa reported a set of recommendations on climate change in Africa.¹⁸ The recommendations have been made with a view to providing pointers for action on the key issues, gaps and shortcomings identified and discussed during the workshop.

- **Put the African scientific community on the map.** Institutions in African countries should position themselves on the various issues pertaining to climate change, and contribute their views and thinking to the AR5. This would allow a better consideration of the national specificities, and ultimately of Africa's idiosyncrasies. There is a need to mobilise additional resources so as to secure a greater participation of African scientists in the IPCC process (and similar assessments, especially at the national and regional level). Ensuring that the national communication is based on the country's best scientific capacity would constitute a considerable boost to national policy as well as reviews by the IPCC. African scientists should contribute to enhancing the accuracy and quality of the national communications, especially in the Least Developed Countries.
- **Prioritise research.** The regional institutions should conduct comprehensive studies aiming to identify knowledge gaps and define high priority themes for research. This would make it easier for the African scientific community to turn their (usually limited) resources to what is urgently and actually needed. Research should focus on clearly defined priorities and direct its main thrust to informing policymakers on the issues which require a scientific edge. Agriculture should be a top priority for research.
- **Bridge the chasm between science and policymaking.** Policies and decisions on complex themes such as biofuels, groundwater and agrarian reform, in the context of climate change should be backed by reliable scientific guidance. The soundness of African policies will therefore depend, to a large extent, on the African scientific community's ability to provide a solid backing which considers the continent's diversities and specificities. Effective science communication will be critical to open the required channels between science and policymaking in Africa.
- **Meet the communication challenge.** Science communication in Africa must improve. This would entail training and recruiting skilled communicators who can address a variety of target audience groups (scientists, policy-makers, and the general public) and pitch messages accordingly so as to achieve maximum impact. Policymakers, a highly important target group for science communication in Africa, are typically "turned off" by bulky, complicated, jargon-filled documents. In this case, effective communication would require, inter alia, concise policy briefs containing facts and pithy messages. More broadly, science communication should be jargon free and straightforward without sacrificing scientific content. In the field of adaptation, communicators should be able to engage the communities—especially local authorities who play a considerable role in managing natural resources at local level— so that they can benefit from science applications to protect and improve their livelihoods. African research is in need of a marketing boost. Scientists should take active steps to publicise their work through both traditional and innovative channels (weblogs, websites, wikis, etc.). African researchers and scientists should publish more. National and regional institutions should seek ways of

18 These conclusions are drawn from (with slight editing) the recommendations of the Regional workshop for the dissemination of the Fourth Assessment Report findings to African researchers, Marrakech, Morocco, 29 - 30 April, 2008.

facilitating the much needed proliferation of peer-reviewed scientific publications.

- **Build networks and share knowledge.** Move towards faster regional integration. This would help mobilise the required resources for research in Africa. Networking will be essential if the African scientific community is to gather the momentum it needs to make progress. Regional research hubs could be established (under a hub-and-spoke model). Virtual networking could also be performed through videoconferencing technologies. Virtual conferences, moderated by recognised experts, could be organised to establish scientific exchanges on specific themes. Thematic networks could also be envisaged. In any case, the African researchers' willingness to share knowledge and engage in collaborations will be critical to the success of any integration endeavour. Experiences and success stories must be shared and valorised.
- **In-depth analysis of vulnerability and more research on adaptation.** More attention should be given to the analysis of vulnerability beyond the geophysical and biophysical aspects. The possibility of developing vulnerability indicators encompassing all aspects covered in the scientific literature should be reviewed. Climate change adaptation in Africa suffers numerous knowledge gaps. Due attention should urgently be devoted to uncharted research areas such as the linkages between adaptation and development. As climate change unfolds, research into disease-resistant crop species will be critical to food security in Africa. More efforts are needed to boost research in the field of climate-proofing Africa's agriculture.
- **Integrate mitigation into sustainable development policies.** In the short term African countries should make the best possible use of affordable and available mitigation technologies. In the medium and long term, conduct extensive research on the overlaps between mitigation and development. Incentives must be put in place to ensure the full participation of the private sector in the large scale deployment of low-emission technologies. Mitigation should be integrated into the African countries' sustainable development policies.
- **Capacity building.** Most African institutions are lagging behind in terms of their capacity to plan ahead and devise adequate strategies. They should be strengthened so that they can take the lead in coordinating Africa's response to climate change. Securing a bright future for African climate research entails more investment into training home-grown scientists. Incentives should be put in place to encourage African youth to pursue scientific careers. The continent has never had a greater need for bright, inquisitive minds to meet the challenge of climate change. Only African researchers can devote the required time and attention to addressing the continent's specificities. Scholarship schemes and research grants can help African researchers to hone their skills and unlock their potential. The continent's scientific and technical institutions should join forces with universities to create "hybrid" academic programmes in which researchers would focus on specific, "practical" themes.
- **Enhance Africa's observational systems.** Achievements in the field of observation, including remote sensing, should be harnessed to supply reliable data and give a new impetus to research. Build long-term forecasting capacity for effective planning. Reliable and multidimensional observational systems will be crucial to devising effective adaptation strategies in Africa.

7. Annex: Tunis Declaration of the African Union from AU

At the Tenth African Union Summit, held earlier this year, the Executive Council expressed concern regarding the seriousness of climate change, highlighting the importance of tackling the challenges of climate change in the international arena and the particular threat it poses for Africa. The Council welcomed the Tunis Declaration and Action Plan on International Solidarity against Climate Change in Africa and the Mediterranean region, deciding that the Declaration be referred to AMCEN and AMCOST for further discussion (ARC, 2008) and requesting that AMCEN make appropriate recommendations to the Council (AU, 2008).

The Tunis Declaration came out of the "International Solidarity Conference on Climate Change Strategies for African and Mediterranean Regions", held in Tunis, Tunisia, on 18-20 November 2007 and attended by governments, multi/bilateral organizations, corporate, NGOs and academics. The Declaration highlights the gravity of the climate change problem and the urgent need to establish adaptation mechanisms and develop attenuation and clean development techniques in Africa. It states that climate adaptation should be integrated within sustainable development policies, strategies and plans with a view to achieving sustainable economic growth and eradicating poverty (MDGs); and synergies with efforts to combat other environmental problems (e.g. desertification, sand encroachment and biodiversity degradation) should be optimized. Recognising Africa's growth and development priorities and limited capacity of adaptation, parties to the declaration agree to, among other things, include adaptation in development strategies and integrate adaptation measures into activities at all levels and across sectors, including developing awareness, capacity and sharing information; and in so doing request support from the international community in terms of financing, research and guidelines.

The Tunis Action Plan lays out a number of priority actions, including:

- Assistance for the elaboration and implementation of national adaptation plans
- Integration of Climate Change adaptation in development strategies and plans
- Strengthening participation by stakeholders (including local capacity building, gender sensitivity, promoting good governance)
- Climate adaptation in agriculture and the management of natural ecosystems (including promoting suitable practices, raising awareness among actors, preparing for harmful natural phenomena and disasters, strengthening genetic resources conservation, strengthening synergies with adaptation plans in other fields, making funding sources easier to access)
- Adaptation to climate change for better management of water resources
- Adaptation to climate change as regards infrastructure (including enhance the countries' ability to assess infrastructural vulnerability, integrate climate considerations into planning and designing, promote technology transfer to combat coastal erosion)
- Preparedness for health impacts and natural disasters

In order to implement these actions it is suggested that adjustments are needed to further adapt and strengthen current funding systems and devices, including international carbon deals, alternative mitigation funding such as taxes on GHG emissions, easier access to funding from GEF and other donors, and an increase in financial aid flows to Africa.

8. Annex: List of authors

The preparatory paper adopted the model of the IPCC. The paper is still in a draft stage: African experts and international advisers are strongly encouraged to comment on the draft and become lead and contributing authors for the final version!

The process of producing the preparatory paper is overseen by two convening lead authors: Thomas E. Downing (SEI) and Youba Sokona (OSS).

A secretariat to the writing team has overseen the contribution of material from lead experts on climate change related topics both in Africa and internationally. The secretariat has also collected and reviewed relevant background literature on subject areas to be covered in the paper. The secretariat was led by Moliehi Shale (SEI-Cape Town), Anna Taylor (SEI), Ben Smith (SEI) and Anna Kontorov (UNEP).

Jian Liu (UNEP) coordinated the entire project, and served as review editor.

A team of authors contributed to the topics identified by the convening lead authors through discussions with the AU, UNEP, experts in Africa and other stakeholders. These lead and contributing authors include:

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