PRIFYSGOL ABERYSTWYTH UNIVERSITY

Davies Papers

Africa Series, *No.2, February 2014*

Water and Food Security in the Nile Basin: Climate Change from Policy to Implementation

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This report was prepared for the DDMI conference 'The Human Dimensions of Climate Change: The Politics of Food and Water Security in Africa' at Aberystwyth University in September 2013. Although Dr Mirghani was unable to attend the conference in person, the report is published here in the 'Africa Series' of the *Davies Papers*.

 Please cite as Muna Mirghani, 'Water and Food Security in the Nile Basin: Climate Change from Policy to Implementation', *The Davies Papers: Africa Series* #2, February 2014.

1. Introduction

1.1. Background

➢ **Climate change in the Nile Basin**

The existence of climate change impacts in the Nile Basin is no longer contested. Creeping drought and devastating floods occur in all countries within the region, including the hyper-dry North Africa, the Sahel, the Horn of Africa, East Africa, and extend as far as Central and Southern Africa. Climatological studies have showed that climate change results in increasing temperatures and considerable variations in rainfall all over Africa.

Predictions indicate decreasing rainfall trends in the Sahel and the Horn of Africa; and increasing trends in central, east and southern Africa (AMCOW, 2012). Nevertheless, the uncertainty about climate change at the country level has contributed to the inadequate consideration of regional scenarios in development planning, including in the water and agricultural sectors.

Countries most affected by climate change are those with vulnerable ecosystems, namely: arid, semi-arid and dry sub-humid areas. In these regions, agricultural and water systems, and the livelihoods of small scale rain-fed subsistence farmers and pastoralists, are the most vulnerable.

Among the most important causes of vulnerability are the very high dependence on rain-fed agriculture in the Nile basin as well as low adaptive capacity of the inadequate infrastructure, weak state environmental institutions and lack of broader public awareness about the impacts of climate change.

➢ **Water and Land resources**

The Nile basin is endowed with considerable water and land resources. This natural wealth is, however, unevenly distributed with geographic variations across the countries.

The water resources in the Nile countries vary from large to minor resources, local/endoreic to cross border, and from ephemeral to perennial systems.

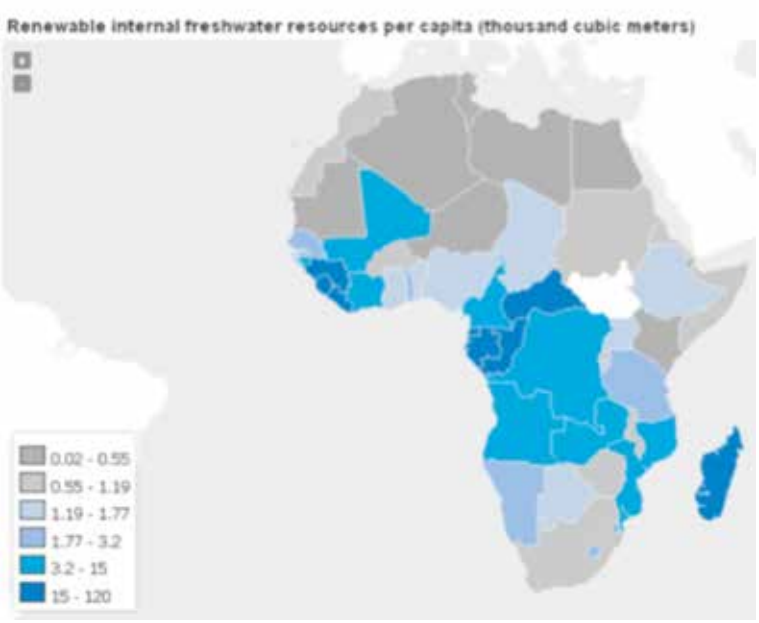

Figure 1: **Renewable Internal freshwater resources per capita (m3 per year) in September 2011.**
Source: http://opendataforafrica.org/page/edit/nthraxd#

Looking at the distribution of fresh water resources (Figure 1 and Table 1), a number of Nile countries are relatively water rich. As with many Least Developed Countries (LDCs), some Nile countries are economically poor, although rich in water and land resources.

Table 1. Regional Water Resources Situation, GWP, 2009. *Source: FAO, AQUASTAT.*

Country	1. Cultivated area / inhabitant (ha) 2002	2. Irrigation potential ('000 ha)	3. As % of cultivable area	4. Ave annual precipitation (mm)	5. Internal renewable water per inhabitant (m3/cap)	6. Total renewable water per inhabitant (m3/cap)	7. Dependency ratio %	8. Ag as % total water withdrawals	9. Industry as % total water withdrawals	10. Withdrawals as % TRWR
Ethiopia	0.15	2,700	**20.5**	848	**1,685**	1,685	0.0	**93.6**	0.4	4.6
Kenya	0.16	353.06	**3.6**	630	**638**	947	32.6	**79**	4	8.9
Sudan and South Sudan	0.49	2,784	**2.7**	416	**874**	1,879	76.9	**97**	0.5	57.9
Tanzania	0.14	2,132	**5.3**	1,071	**2,230**	2,469	9.7	**89**	1	5.6
Uganda	0.27	90	**0.5**	1,180	**1,461**	2,472	40.9	**40**	15	0.5
Sub-Saharan Africa	0.24 (Africa)	-	**-**	678	**4,528**	-	-	**86**	4	-

Nile countries have considerable areas of agricultural land resources (Figure 2), defined by the FAO as the share of land area that is arable, and under permanent crops or pasture.

Cereal production in the region is however low compared to global rates, and shows declining trends reaching alarming figures in the Sahelian countries as well as the rest of Africa (ECA, 2013).

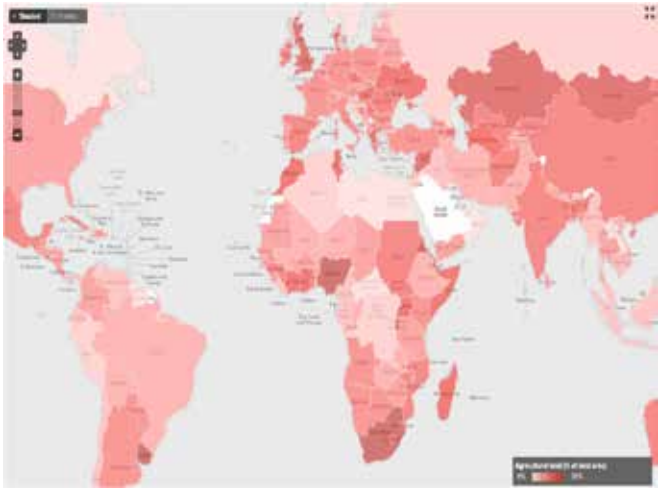

Figure 2: Potential agricultural land % of land area (2008-2012). Source: http://data.worldbank.org/indicator/AG.LND.ARBL.ZS/countries?display=map

➢ **State of national water & food security**

Water Security is defined as "the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, as well as an acceptable level of water-related risks to people, environments and economies" (Grey and Sadoff, 2007). Based on this definition, measures to achieve water security include Integrated Water Resource Management (IWRM), as well as infrastructure for water storage and conveyance. Most Nile countries are characterised by water insecurity as they have not developed adequate physical or socio-economic infrastructure. Access to water in the Nile countries is among the lowest globally and in Africa.

Food security is achieved through three main outcomes or pillars, namely: availability (national/ macro level), access (micro) and utilization (IFPRI, 2012). The stability of those outcomes is a further factor. The focus of this working paper is on the national level, particularly on the food availability pillar, and crucial climate factors affecting national food security. Food security is directly linked to land availability and

access, especially in Africa where rural livelihoods centre on agriculture and livestock production. Land and livestock productivity in the Nile basin is highly vulnerable to climate change.

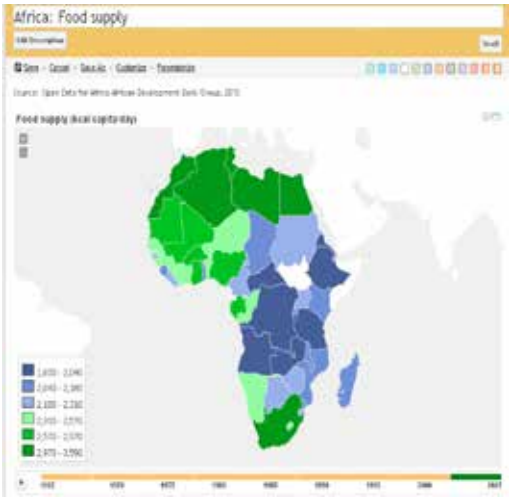

Figure 3: **State of National Food supply. Source: African Development Bank Group, 2010.** http://opendataforafrica.org/page/edit/ajgbtfd

The state of national level food security (Figure 3) together with the impact of climate change on agricultural production globally, suggests a need for a significant increase in domestic food production to meet basic human needs.

Food production has been impacted directly, through changes in agro-ecological conditions. More variable weather conditions, increasing frequency and severity of extreme events, mostly in semi-arid and sub-tropic regions, have affected stability of food supplies. A critical factor of food insecurity is the exceptional shortfall in aggregate food production as a result of crop failure and natural disasters.

The Nile Basin includes countries with high levels of hunger (in number of persons and in the degree of scarcity). According to the Economic Commission for Africa (ECA), the Committee on Food Security and Sustainable Development (CFSSD-6) (Oct 2009), DRC and Ethiopia account for 38% of sub-Saharan Africa's hungry people; with 80% and 41% of their respective sub-regions. Together with Nigeria and Tanzania, they account for almost half of the total of the sub-continent.

Agricultural yield in Africa is comparatively low among developing countries in most food crops such as cereals. The average cereals production in Africa is only 1.5 tons /ha. In Asia it is 3.8 tons/ha, and in America 5.2 tons/ha (calculated from FAO database on production [tonnes] and harvested area [hectares] in 2011; see http://faostat3.fao.org/faostat-gateway/go/to/download/Q/QI/E). It is evident that promoting sustainable production intensification strategies is a key for achieving food security in Africa.

1.2. Objectives and Scope of the Study

The paper presents a review of national policies in the water and food sectors in an effort to appreciate issues of policy making in the Nile region related to climate change adaptation. To undertake the study, case studies from the Nile basin were carried out in six countries, namely: Ethiopia, Kenya, Sudan, South Sudan, Tanzania and Uganda.

Focussing on water and food security goals in the context of climate change, this study has analysed the water and agricultural policies, as well as the environmental policies. The focus of the policy analysis is:

- Whether the national water and agriculture/ food policies are sufficient to deal with the challenges imposed by climate change.
- Whether there is sufficient information to promote adaptation of the water and agricultural sectors.
- The degree of interaction between policy mechanisms in relevant sectors.

- The role of cross-sectoral institutional models in addressing shared responsibilities and the roles of different sectors etc.
- The overall strengths and weaknesses in the water and food policy frameworks.

The paper thus brings together a three-fold focus, addressing the implications of climate change on the state of water and food policy in the Nile basin. It addresses a crucial issue in regional politics: whether the water and agricultural policies have the potential to secure water and food sustainability despite the reality of climate change in the countries studied, and the potential of national environmental policy frameworks to guide actions that address climate change challenges in the water and agriculture sectors.

1.3. How the report is organised

Following this introduction, the report is divided into the following sections. Section two reviews and analyses climate change in relation to the environment, and the national water and agricultural policies. Section three presents the overall study findings regarding barriers to achieving water and food security under existing climate change policies, and areas of improvement. Lessons learned from these practices in the region are presented in section four.

2. Overview of Climate Change Policies

2.1. Climate Change in Environmental Policy

The review of the environmental policy in the six selected countries indicated that all national environmental policies include a framework for adaptation to climate change. A key limitation is the weak regulatory and oversight function due to the absence or lack of activation of a Climate Change Act to support the implementation of the policy.

In general, all of the environmental policies have considered water security, however, one country (Sudan) did not include IWRM and the catchment level management as a key policy issue to ensure water security. The environmental policies on food security have focused on strengthening Early Warning Information Systems for food security and disaster preparedness response measures to extreme climatic events or accidental hazardous emissions into the atmosphere.

Kenya and Uganda were successful in formulating strong environmental policy frameworks addressing climate change, however the implementation and capacity building processes are still recent and not yet operationalised. So far, in Ethiopia, South Sudan and Sudan environmental policy lacks an adequate framework to address climate change and strengthen adaptation governance.

Kenya, Tanzania and Uganda have fewer water and food production problems compared to drier countries of the Nile Basin, and have given equal emphasis to adaptation in the water and food systems and mitigation aspect regarding conservation of the environment. On the issue of water and food security, Ugandan and Tanzanian policies developed in the previous century (1995 and 1997) were more concerned about the effect of climate variability on the dominant rain-fed food production system rather than climate

change. However, the recently developed climate change strategies have recognised climate change as a main cause of increased variability and frequency of extremes.

In general, all environmental policies highlighted the high impact of climate change on rain-fed agriculture representing the main source of food production in the Nile countries. The National Adaptation Programmes of Action (NAPAs) have thus emphasized climate resilient agricultural strategies focused on rainfed agriculture, water harvesting, recession agriculture and supplementary irrigation.

The countries' policies regarding regulatory, compliance, oversight and coordination vary from those supporting distributed powers to related sub-sectors, and others favoring a central environmental body. While Tanzania devolves bulk of operational functions for the environmental management responsibility to relevant sectors or ministries at different levels; policies in Sudan, Ethiopia, Kenya and Uganda concentrate these powers under the environment sector. The Tanzanian multi-sector model includes an environment council which functions as an advisory body responsible for enhancement of scientific research, information generation and monitoring and assessment of the effectiveness of actions. Coordination is ensured through the services of the Vice President's Office (Division of Environment) and through regional decentralized authorities (districts). Coordination remains a challenge in all review counties. An emerging model based on regional devolution of development in Kenya is believed to be promising in implementing policies through local level involvement, since the recent reorganization of the governance structure has led to localized policies by the regional governments in order to address the weak implementation of the policy by central administration.

A summary of the status of climate change in the national environmental policies is presented in Table 2; and the environmental policy gap analysis in six Nile countries is shown in table 3.

Table 2: Environment policy and climate change in the reviewed countries

Country	recognition of cc impact	climate change policy	water food sec. goal	integration/ harmonization policy (IWRM)	x-sector coordination policy	oversight/ regulatory policy	integrated information policy	monitoring compliance & effectiveness
Ethiopia	✓	✓	✓	✓	✓	✓	x	✓
Kenya	✓	✓	✓	✓	✓	✓	x	✓
South Sudan	✓	✓	✓	x	x	x	x	x
Sudan	✓	✓	✓	x	✓	x	x	x
Tanzania	✓	✓	✓	✓	✓	✓	x	✓
Uganda	✓	✓	✓	✓	✓	✓	x	✓

Table 3: Environmental policy gap analysis in six Nile countries

Strength	Policy gap / weakness	Proposed area of improvement
All Countries: – Recognize that climate change is a serious problem for its environment and population. – Sustainable development as an overriding goal. – Water and food security are climate sensitive national development goals, and reflect this in the environmental policy. – **Ethiopian**, **Kenyan** and **Ugandan** policy adopts IWRM principles for the protection of the environment – **Kenya** incorporates climate change in the Constitution, viewed under human right to protect livelihood. – **Kenya** formulates comprehensive multi-sector standalone climate change response strategies. – **Uganda** completed a draft climate change policy. – **Ethiopia**, **Kenya**, **Tanzania** and **Uganda** promulgated Environmental Acts covering climate change impacts.	All countries: – A large gap in coordination between ongoing activities related to climate change, due to the lack of clear policies, strategies or institutional frameworks in place to tackle climate change. – Insufficient legislation to set out standards and procedures, duties and limits, creating obligations for all sectors and stakeholders, which fit human activities and govern resources sustainably. – Lack of a reliable information base including standards and guidelines. – Trends and impacts of climate change are not well articulated in the policies. – Inadequate integration of sectoral policies in formulation and implementation. – The available information hardly promotes adaptation as a tool for sustainable water/ food systems. – Low interactions between sectoral policy mechanisms – Poor linkages to IWRM and the catchment level management as a key policy to ensure water security. – **Sudan** has ignored IWRM in the environment policy frameworks – Overlapping responsibilities and the roles of different bodies/ levels/ sectors etc. – In **Sudan** the environmental law is not activated in order for the Higher Council to play its coordinating role between various sectors – In **Sudan** there is incomplete implementation of the institutional structures – **South Sudan** has unclear institutional roles and responsibilities; lacks capacity to monitor development and resource use; there is a lack of coordination between sectors. – There is no clear provision for monitoring and oversight of sectors in **Ethiopia**.	Common regional need: – Awareness by political leaders that climate change is not just a threat but an opportunity – and they can seize it. – Advocacy involving the media to raise awareness, and promote climate change adaptation measures. – Developing a standalone policy on climate change is critical for a sound institutional framework addressing climate change issues. – Strengthen regulatory frameworks of climate change, not only at national level but also the regional and catchment levels. – Laws are needed to enforce policy objectives. – Legislation addressing negative impacts of climate change on agricultural productivity. – Improve observation of climate change and variability in terrestrial and aquatic ecosystems. – Integrated information management and sharing is needed. – Sector-relevant forecasting of climatic change to support communities and national leaders to respond to new opportunities and challenges. – Establishing standalone climate change policy, law and bylaws to back all adaptation objectives, defining structures, functions and major players for adaptation and mitigation. – Programmes/ initiatives paying attention to the strengthening of governance crucial for coordinated implementation and coherence of the water and agriculture sector policies. – Integration of environmental conservation measures in development programmes. – More stakeholders' sensitization, and facilitation of national adaptation programmes of action (NAPA) projects by production of simplified manuals for local governments. – Facilitate the process of logical framing in project management, with milestones of achievements for objectively following-up on specified and verifiable indicators for the NAPA projects.

2.2. Climate Change in Water Policy

The review of water policy in the selected countries indicated that only one (Kenya) out of six national water policies included a framework for climate change emphasising mitigation and adaptation needs. Although all policies emphasised IWRM and sectoral cooperation, climate change is still considered an environmental issue that is external to the water sector.

Adaptation to climate change in the water sector is about implementing IWRM and related governance advocated by all national water polices. However, the implementation status is alarming according to African Ministers' Council on Water (AMCOW) report (2012) and African Development Bank (AfDB) east Africa survey (2009), as 71% of the countries in east Africa have not yet incorporated water resources management in national plans for climate change adaptation, despite the impacts of climate change in reducing water resources availability and increasing the costs of development in the region.

Politically, the positioning of the water sector as a service provider has dominated its prime role in the management of this vulnerable resource in the Nile countries. Water resources management in the Nile countries continues to be influenced by service sectors such as irrigation, hydropower generation and water utilities. As a result the development of water resources – not directly controlled or regulated by the IWRM governance – fails to achieve the goals of climate change adaptation.

The challenges of water security in the context of climate change are twofold. On one hand, water governance in the Nile countries does not separate the management of the water resources from the development of water services, namely: irrigation, industries, domestic water, etc. This influences the allocation of water in favour of politically attractive (often inefficient) uses and projects, and generates non-transparent practices. Greater transparency and measurable targets are needed within an IWRM framework of decision-making.

On the other hand, the positioning of adaptation to climate change as an environmental function, and the failure to recognise the core human nature of adaptation under the umbrella of the water sector, is a significant obstacle to water security.

All water policies prioritise both the human/social and the economic development goals above the environment goal. While clear targets (human and economic) are generally set for water services, water management goals are hardly associated with sound targets for its implementation. Measurable targets are crucial for supporting investment.

A summary of the status of climate change in the national water policies is presented in Table 4; and the Water policy gap analysis in six Nile countries is shown in Table 5.

Table 4: Water policy & climate change in the reviewed countries

Country	recognition of cc impact	climate change policy	water food sec. goal	integration/ harmonization policy (IWRM)	x-sector coordination policy	oversight/ regulatory policy	integrated information policy	monitoring compliance & effectiveness
Ethiopia	x	x	✓	✓	✓	x	x	✓
Kenya	✓	✓	✓	✓	✓	✓	✓	✓
South Sudan	✓	x	✓	✓	✓	x	✓	✓
Sudan	✓	x	✓	✓	✓	x	✓	x
Tanzania	x	x	✓	✓	✓	✓	✓	✓
Uganda	x	x	✓	✓	✓	✓	✓	✓

Table 5: The water policy gap analysis in six Nile countries

Strength	Policy gap / weakness	Proposed area of improvement
– Recognition of the cross-cutting nature of water in several development sectors. – Water policies adopt IWRM approach providing tools for the sector adaptation to climate change. – Prioritising contribution to social development goals of water and food security – Recognising the challenge of climate variability, and increasing frequency of extremes (floods and drought) caused by climate change. – Put forward enabling environment policies emphasising implementation of effective regulatory, institutional, information and monitoring systems. – Clear infrastructure policy addressing water storage gap in all the Nile countries.	– Confusing adaptation, which is a human centred water management strategy, with mitigation, which is an environmental issue. – Low implementation of IWRM policies. – Regarding climate change as an environmental issue and ignoring the human dimension evident in the water and food insecurity. – Insufficient technical and financial resources for implementation of the water policy. – Lack of capacity and effective means of predicting the occurrence of flood and drought. – Absence of tools to communicate climate change to the decision makers. – Insufficient regulations, procedures and guidelines to enforce the water legislation. – Lack of accurate or sufficient information to support the decision-making process. – Weak interactions between policy mechanisms. – Unclear shared responsibilities and the roles of different bodies/ levels/ sectors etc. – Lack of awareness of political leaders with respect to viewing climate change as an opportunity: for example in providing funds for adaptation, and a win-win strategy for demand management vis-à-vis enhancing efficiency, managing pollution, and managing conflicts. – Low water storage capacity and unsustainable infrastructure for water harvesting and storage.	– Develop IWRM structures at the lower government levels. – Communicable goals and targets, which can be monitored and measured transparently. – Integrated water and climate information management and sharing. – Knowledge of uncertainty to improve decisions – Reliable forecasting of climatic change, flows and recharge to support communities and politicians to respond to new opportunities and challenges. – Instruments for efficient allocation, redistribution, transfer, storage and efficient use of water resources for adaptation to climate change. – Integrating 'green' water management in overall water resources management, priority setting and identifying method of implementation. – Attainment of strategic goals and guidelines for effective cross-sector institutions, regulations and guidelines for enforcing the IWRM policy. – Include water quality/quantity indicators in the monitoring of water resources. – Increase (technical and financial) resource mobilisation for implementation of the water policy with increased focus on institutional strengthening for sustainable infrastructure development.

2.3. Climate change in agricultural policy

Generally, given the fact that agriculture in all countries studied is predominantly rain-fed and subsistence, the challenge of climate variability is emphasised by all polices. This has been the case in arid and semi-arid countries as well as in countries such as Ethiopia, South Sudan, Tanzania and Uganda with sub-tropical climatic zones.

The focus of agricultural policy in all the Nile countries has been on managing climate variability as a priority strategy for national food security. Although separate food security policies emphasising climate change adaptation measures are developed, there is a lack of coherence with other national agricultural investment priorities. The cases identify possible conflicts, with ambitious agricultural and water resources investment plans not taking account of climate change impacts and national priorities of water and food security. For example, the agricultural policies continue to endorse practices of expanding large scale irrigation investments. These include unsustainable modalities such as land grabbing by foreign investors especially in drought affected Sudan, Ethiopia, South Sudan and Kenya. These are the areas of evident conflict with food security policy in water scarce arid and semi-arid countries.

In the Comprehensive Africa Agricultural Development Programme (CAADP), commitment to adaptation to climate change in the agriculture sector is well emphasized in the strategic investment plans (COMESA, 2010). However, coordination and integrated information and monitoring remain capacity gaps hindering the implementation of the planned adaptation in the agricultural and food sectors.

A summary of the status of climate change in the national agriculture policies is presented in Table 6; and the agriculture policy gap analysis in six Nile countries is shown in Table 7.

Table 6: Agriculture policy & climate change in the reviewed countries

Country	recognition of cc impact	climate change policy	water food sec. goal	integration/ harmonization policy (IWRM)	x-sector coordination policy	oversight/ regulatory policy	integrated information policy	monitoring compliance & effectiveness
Ethiopia	✓	x	✓	x	x	x	x	x
Kenya	✓	✓	✓	✓	✓	✓	✓	✓
South Sudan	✓	✓	✓	✓	✓	x	✓	✓
Sudan	x	x	✓	x	x	x	✓	x
Tanzania	x	x	✓	✓	✓	✓	✓	✓
Uganda	✓	✓	✓	✓	✓	✓	✓	✓

Table 7: Agriculture policy gap analysis in six Nile countries.

Strength	Policy gap / weakness	Proposed area of improvement
– Recognises climate change impacts, and includes policy directive for adaptation. – Acknowledges food security as climate sensitive national development goals, and that this has been reflected in the agriculture policy. – Calls for contributions to the sector-relevant climate change response strategies and action plans. – Linkage between adaptation and the sustainability of land and water resource base is well appreciated. – Tanzania recognises the Environmental Management Act as a legal framework to safeguard the sustainability of the agricultural schemes, water sources and community health. – Kenyan irrigation policy aims to boost the national efforts to increase food availability.	– Lack of a coherent and unified identity of the climate change mitigation and adaptation functions, due to their fragmentation under various sectors. – Little mention of climate change in agriculture policy documents that will guide the development of the agriculture sector in the coming decades. – Ethiopian agriculture policy explicitly considers climate change as a non-agriculture sector similar to rural roads, rural energy and nutrition. Sudan's policy displays a similar attitude. – Weak linkages to non-agricultural sector policies, contributing to conflict strategies/ interventions. – Poor linkages to IWRM. – Lack of differentiation between climate change adaptation and disaster response. – The national food policies are not sufficient to deal with climate change. – Lack of adequate infrastructure contributing to the low climate change adaptive capacity. – Data and information sources are dispersed, not always freely available, most often not easy accessible or easy to use, in particular for integrated use. – Climate change is invisible to politicians; a challenge is how to communicate climate change to the decision makers to enhance the interactions between policy mechanisms. – Poor linkages to the water/ environment policy frameworks. – Weak coordination of shared responsibilities and the roles of different bodies/ levels/ sectors etc. – Green water is invisible to politicians, although it is the main system of food production. – Weak meteorological information and setups. – Weak institutional integration on the overall early warning system disaster response and preparedness. – Inadequate institutional setup and capacities of technical infrastructures to produce, analyse and disseminate information. – Lack of specific indicators to address climate change impacts on soil and productivity, and on sector returns.	– Strengthen regulatory frameworks of climate change, not only at the national level but also at the catchment level – Develop legislation addressing negative impacts of climate change on agricultural productivity. – Information management and sharing should be enhanced. – Sector-relevant forecasting of climatic change is needed to support communities and politicians to respond to new opportunities and challenges. – Bringing together scientists from various disciplines and institutions to share and improve climate change concepts and know-how. – All irrigation schemes should conform to the Environmental Management Act to safeguard the sustainability of the production, water sources and community health; while the service business model should observe climate change and its impacts. – Capacity development for result-based planning and budgeting processes at all levels to address climate change risks and its impact on agriculture. – International exchange of experiences on successful governance structure and institutional models for adaptation to climate change. – Address capacity gaps regarding inadequate funding, weak regulatory and institutional framework, poor knowledge of efficient irrigation technologies, weak land tenure systems, lack of credit facilities and inadequate research on irrigated agriculture business optimization. – Revisit National Export Strategy to deliberately include many more of Uganda's non-food crops. – Survey and inventory of Uganda's food crops. – Develop soil quality indicators in the monitoring of natural resources at the district level. – Develop and monitor indicators for productivity of land /agro-ecosystems, as well as on sector contribution to GDP.

3. Case study findings

3.1. Status of National Frameworks on Climate Change

In general, this policy analysis defined the problem of national water and food security in the Nile Basin and the climate change adaptation goal, examined the policy arguments, and analysed the implementation of policies. It is evident that drought, increased temperature and rainfall variability are predominant regional climate change features in the Nile basin countries, which continue to undermine national development efforts, in particular to achieve water and food security. The review shows that a number of Nile countries have progressed positively in addressing climate change policies in the water and food sectors. The common issue remains to narrow the implementation gap between the theoretical policy framework and the design of specific interventions on the ground. This represents a fundamental challenge in the region, because the effect of a policy is seen in its implementation. National water and agriculture polices in the Nile countries were formulated to contribute to national development strategies and maintain the delivery of sufficient water and food supplies.

All of this raises the question: do Nile governments care about climate change?

The answer is hardly an emphatic 'yes'. The governments are slow in taking action to develop policies, and much more needs to be done, and faster. Nevertheless, as shown in the following sections, the findings of the analysis identified specific strengths, weaknesses, and recommendations for improvement.

3.2. Strengths

The survey of the policy options in the environment, water and agriculture sectors implies considerable progress in countries of Ethiopia, Kenya, Uganda and South Sudan in prioritising climate change adaptation governance and capacity building.

First, the Nile countries recognize that climate change is a serious problem for their environment and population. The countries are members of the United Nations Framework on Climate Change and other international bodies that work to combat climate change. As such, countries are building institutions and formulating policies and laws to address the effects of climate change.

Second, countries are increasingly developing national and sectoral climate change policies that will ensure a harmonized and coordinated approach toward a climate-resilient water and food supply. Table 8 provides a summary of the strengths in climate change implementation frameworks.

Table 8: Summary of strengths in climate change implementation frameworks

Coordination and mainstreaming	Related data & information for water resources management & agriculture	Performance and benefit measurement methodologies
– Supportive policy in place – IWRM plans have been developed in all the considered cases.	– Recognition of the need for integrated information management system to support communication among actors, and inform sectoral policies implementation. – The agriculture–climate policy frameworks are in place in some countries.	– Monitoring of implementation is recognised by all policies.

3.3. Weaknesses and policy gaps

The consideration of climate change challenge in the water and agricultural and food frameworks is a recent development in the region. Before 2007 the main concern of the agricultural strategies in the reviewed countries was climate variability challenges. Since then, climate change has been gradually recognized as the key constraint to water and food security.

Adaptation strategies supporting water and food security are scattered across many sectors, but are not producing short-term tangible results. They require institutional reform and capacity building interventions, as the outcomes are not appreciated and not well evaluated by decision makers. The strategies imply that the focus on the infrastructure option is more appealing and produces more easily reported results.

Among the reviewed countries, Kenya is the only country to have explicitly introduced climate change in the water resources management framework (RoK, 2012). Countries which emphasised climate change in their agriculture strategies include Kenya (GoK, 2010), South Sudan (GSS, MAFCRD, 2012), Tanzania (URT, MAFC, 2012) and Uganda (RoU, MAAIF, 2011). Other countries, namely Ethiopia (FDRoE, 2010) and Sudan (RoS, 2008), have not so far acknowledged the need for specific climate change adaptation policies in agriculture.

Climate change institutional weakness is evident in all reviewed countries. Facing the climate change challenge on national water and food security requires not only hard investment, but also careful management strategies that set in-place appropriate soft governance measures to regulate development initiatives.

Although they have prioritised water supply and irrigation services and infrastructure development, all polices have failed to advocate optimum business models for their development services under climate change, contributing to financially unsustainable implementation of water and irrigation projects.

The budget allocation for climate change adaptation in the water and agriculture is ‘a drop in the bucket’, and an increased funding is crucial. Although national expenditures on climate change-related activities are rising since the completion of the NAPAs, a substantial amount of these allocations is still used to prepare aviation forecasts and documents for commercial air traffic. Much less is used for climate change sensitization programs.

The national policies review indicated the need for improvements in implementing climate change policy options. While the need for climate change adaptation is well appreciated at the planning level of both the water and agriculture as reflected in the reviewed sectoral policies and strategies, the progress in operationalising these policies has not been realised. Climate change effects (e.g. decreased water quality and availability, crop failure, food deficit, etc.) only recently received the attention of politicians when at peak levels of intensity and when management options are quite urgent.

The prevailing political practice regarding climate change response in the Nile region has been to adopt a crisis management approach through the provision of relief or emergency assistance to the affected areas or sectors. One cause of this is lack of information, and hence uncertainty about anticipated climate change, which hinders decision-making and prevents the timely implementation of policies. National policies addressing devolved coordination and monitoring of implementation have often not been backed up with

adequate instruments and resources to support the new responsibilities. Again, the provision of information and advisory services is critical to inform policy implementation.

Water and agricultural policies in Ethiopia, Kenya, Uganda and South Sudan formulate potential reform of the organisation and governance structures conducive for adapting water and food strategies to climate change risks. A framework for the governance, coordination and financing of climate change response plans at all levels is lacking in most Nile basin countries. Countries such as Kenya and Uganda that have managed to develop climate change policy / strategy have not yet worked out sectoral legislative and regulatory reforms that enable implementation of all adaptation priority actions.

The agricultural sector has only recently started to grapple with the implications of climate change. As a consequence, the key policy narratives, actors and interests which will shape the policy response to climate change are still coalescing, and the picture remains somewhat unclear.

Finally, it can be concluded that the dilemma of the Nile countries – as in all of Africa – is the positioning of climate change agenda as an environmental issue. In essence it is a human issue in Africa, with social and political and economic dimensions. Unlike developed countries which contributed most to changing the global climate, Africa has had an insignificant role in producing these emissions and the resulting warming. This is matched by poorly defined Africa-specific targets, and a failure to win political will to invest on crucial climate change adaptation strategies, for example in regulatory systems, institutions, information, monitoring and compliance. Table 9 summarises identified weakness in climate change implementation frameworks.

Table 9: Weakness in climate change implementation frameworks

Coordination and mainstreaming	Related data & information for water resources management & agriculture	Performance and benefit measurement methodologies
– Weak integration framework of the environmental sector institutions leading climate change strategies in the Nile. – Fragmented activities mainly in the rural areas. – Lack of interactions between various policy mechanisms. – No clear separation of roles, and tendency of shifting blames and laxity in the implementation. – Ambiguity of shared responsibilities and over-lapping roles of different bodies/ levels/ sectors etc. – Inappropriate leadership capacity. – Absence of transparency mechanisms. – Capacity building programmes are at an early stage in most of the countries with slow progress towards implementation.	– Climate information is not easy to understand. – Problems with the reliability and relevance of available information to promote adaptation of the water and food sector. – Multi-sectoral data and information for policy shaping, and for the development of effective management and technical solutions for adaptation, is often missing. – Lack of long-term projections and rapid guidance in emergency situations. – Poor linkages to IWRM. – Lack of agriculture relevant research and information, e.g. to enhance diversification of farming and introduction of other varieties. – Poor knowledge of the climatic aspects of sustainable food systems. – Capacity gaps regarding the course of action (approaches and appropriate technology) for the delivery of water and food security goals.	– Lack of human centred targets to measure benefits and achievements. – Climate change–agriculture and climate change–water linkages are weakly framed. – Transparency, politics and corruption cases lead to the delay in completion of some of the projects on water storage facilities. – Communities still do not appreciate the benefits for diversification of farming through introduction of other varieties and hence the need for public awareness forums and materials.

3.4. Areas of proposed reform

Climate change challenges provide a number of opportunities for cooperation between relevant sectors on supporting coherent implementation mechanism joining the NAPAs, and the national water and food security plans.

A summary of the recommended reform for the national climate change frameworks in addressing water and food security is given in Table 10.

Table 10: Recommended areas of policy reforms, capacity and knowledge development

Coordination and mainstreaming	Related data & information for water resources management & agriculture	Performance and benefit measurement methodologies
– Establish communication between water and agriculture sectors, research & academia, the public and the political level. – Strengthen regulatory frameworks of climate change, not only at the national level but also at the catchment level. – Develop specific legislation addressing negative impacts of climate change on water and agricultural productivity. – Introduce decentralised institutional models devolving water management and agricultural functions to the regions. – Develop IWRM structures in the lower government levels for coordination and oversight to enhance delivery of policies. – Focus on the policy level and lowest community levels in advocacy/ awareness raising, as well as sectoral capacity building strategies required for implementation. – Strengthen Parliamentary Forum on Climate Change, learning from the Ugandan experience. – Optimise business models for financing water and food infrastructure for water and irrigation services.	– Conduct research to develop databases and information systems crucial for constant and timely feedback for decision making. – Sector-relevant forecasting of climatic change to support communities and the political level to respond to new opportunities and challenges – Climate change impact assessments as well as uncertainty mapping. – Develop and widely disseminate climate change information to promote adaption activities to address development and enforcement of pollution control policies. – Integration of sectoral information systems, and exchange of data. – Provide regional governments with more of a role in the agricultural and environmental conservation functions to aid in localising the best practices in the regions. – Specification of empirical indicators to operationalise climate change policies in the sector.	– Institutionalise a decentralised monitoring function. – Setting policy targets and progress indicators for politicians to appreciate investment. – Measuring the relation between human and environmental security in climate change adaptation policy in the region. – Legislation that includes compliance and incentive mechanisms for environmental management at all levels of governance, from the national level to the lowest sub-regional level. – Targeted scientific research to generate knowledge on uncertainty, develop monitoring indicators and carry out assessment of the effectiveness of actions taken.

4. Lessons learned for capacity building

Based on national policy analysis, a number of key conclusions and recommendations are identified.

The emphasis on the 'environmental paradigm' in African climate change response has misinformed national policies and hindered the implementation of the adaptation strategies. This has led to incoherent climate change policy, and creates a risk of undermining long-term policy goals on adaptation in the water and agriculture. Continuous advocacy and awareness raising on climate change adaptation strategies as a human issue is crucial for the implementation of the sustainable supply of water and food.

The challenge of adaptation in the water and food sectors in the Nile countries is primarily about the fragmented institutions and conflicting sectoral strategies. Although some of the policies are sector-wide and are executed through a working group comprising the relevant sectors, the concentration of operational decisions is hindering the implementation of climate change policies. It is strongly believed that the decentralisation of water and agricultural functions to the regions would make the working groups more proactive and effective. Basin-level coordination is among the crucial policy implications of climate change in the water and the agriculture sector.

Lack of information, climate change research and advisory support were among major constraints on policy implementation. The high cost, scattered data collection mandate, multi-sector relevance and vague predictions are at the heart of integrated information challenge facing the implementation of climate change adaptation policy.

Dealing with hydrology and managing climate change is not a pure deterministic modelling and decision making process. The decision maker's knowledge about uncertainty in climate predictions and consequences of adaptation actions strengthens the decision process. Although the exact outcome is not known, implementing climate change policy based on both known cause-effects and admitted uncertainty needs to show:

- The possible outcomes.
- Quantitative information about uncertainty, namely estimation of the probability that a particular outcome will occur.
- Residual risk (e.g. failure of structures) quantification within planning.

A stand-alone climate change framework law to facilitate the necessary policy direction, coordination and high-level political prioritisation is key to mainstream climate change across government functions. The overarching legislative framework will need to take account of institutional and financial considerations for effective climate change adaptation.

Politics in some Nile countries is shaped more by the particular situation of a leader's hold on power. However, a policy framework remains a critical element of driving responses to climate change issues when opportunities evolve. The sector leaders are generally interested in ownership of salient outcomes and immediate outputs that can be monitored as concrete achievements. Although climate change threats to water and food security is acknowledged by all sectors, sectoral strategies have different interests. Key questions include: which benefits can be added? Where are investments cost-effective? Who pays?

Promoting knowledge of business models integrating climate change interventions into politically attractive investments opportunities will enhance the implementation of soft adaptation measures of long-term results. To ensure adaptation, there is a need to create synergy between the ecosystem approach for the environmental balance and IWRM for harmonising the management and the use goals of water resources, as well as a coherent agricultural sector emphasising the green water paradigm through integrated green-blue water management as the optimum adaptation strategy for the pre-dominantly rain-fed agricultural systems in the Nile basin.

Effective adaptation to climate change in the water, agricultural and food policy sectors could benefit from different options of the green water paradigm by Hatibu (Nile IWRM, 2008):

- Re-orienting the agricultural policies and practices from just irrigation to holistic management of agricultural water.
- Water policy that balances resource development and demand control.
- Strategic and integrated public investments.
- Response to climate variability.
- Managing water through land management.
- Considering virtual water trade for food security.

Governments are often forced to respond in an emergency manner and allocate funds for short term adaptation measures. A key principle in climate change response is to adopt an adaptive approach which is anticipatory and not reactive. Risk management approaches for drought and flood disasters management should be integral part of a climate change response strategy. This would promote the development of appropriate institutions, information and infrastructure capacities as well as contingency funds.

In the Nile countries where most of the water resources are transboundary, political decisions in the water sector are influenced by external interests which ignore serious local climate change impacts. A basin framework is thus crucial for adaptation in the Nile countries. Local communities in the Nile countries are vital in ensuring their food security, hence capacity building strategies are necessary to promoting community-based approaches to adaptation along the areas of jurisdiction. As such, solely focussing on experts or governments, and ignoring the importance of enhancing political will and local-level management, will adversely affect the implementation of climate change policy in the region.

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