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Abstracts of Presentation Papers

Sub-theme 1: Climate Science, Data, Information and Service Delivery

Topic 1.1: Climate science

Paper 1.1.1: AN ASSESSMENT OF AFRICA'S CLIMATE OBSERVING NETWORKS AND DATA INCLUDING STRATEGIES FOR RESCUING OF CLIMATIC DATA

Authors ***Buruhani S. Nyenzi, Tufa Dinku, Seleshi B. Awulachew, Girmaw Gezahegn, Semu A. Moges, Yilma Sileshi, Laban Ogallo, Workneh Degefu***

Keywords Climate data network, data rescuing, missing data, data sharing

Abstract Effective management of climate variability and change requires that climate information be used effectively in planning and that climate risk be incorporated routinely into development decisions. In order for this to happen in Africa, the National Meteorological and Hydrological Services (NMHSs) and other climate services providers in the continent must work to strengthen the observational networks, quality control, manage and exchange data as well as enhancement of their capacity to produce and deliver the full range of climate services in support of sustainable development. African Climate Policy Center (ACPC) as a continental body mandated to address the need for greatly improved climate information for Africa and strengthening the use of such information for decision making, by improving analytical capacity, knowledge management and dissemination activities. It works with various players in order to ensure that countries realize the need to address climate issues in their policy planning thus contributing to the national sustainable development. This paper has looked on the situation of climate data and observations network in the continent. It is shown that the spatial distribution is poor with least coverage over rural areas, many stations do not operate and data from some of the operating stations is not fed into the international system. The quality of data is still poor with gaps of missing data and in some cases there are inefficient quality control systems. There have been some efforts to reduce these problems through data rescue and filling gaps using remotely observed data from satellites and other sources. Furthermore, the paper looks at some possible coordination mechanisms that could be adopted in the continent to ensure that Africa's observations network, data quality management systems and archival systems make available enough of the required climate data, from many parts, and share it widely with other stakeholders. The NMHSs' observation networks need to be strengthened to provide local climate information which is required for various applications. African NMHSs and regional climate centres need to be strengthened to ensure that data archives at all levels are well maintained. ACPC has a role to foster collaboration among all stakeholders to ensure that all this happens so that countries are able to address well climate related issues at policy levels. The following are among of the key recommendations to make this happen:

- In order to reverse the deteriorating climate observation stations networks there is need for the reinvigoration of the African network through both sustainable maintenance as well as installations of new, preferably automatic, station. There is a need to improve data management and archive systems;

- Devise new approaches in filling data gaps by combining observations from all available meteorological stations and global products such as satellite proxies and climate model reanalysis data;
- Make inventory of data that has been rescued and that need to be rescued. Furthermore make data rescuing an ongoing continuous process;
- The principles of a framework like the WMO Global Framework for Climate Services (GFCS)would be well placed to coordinate climate data management and observations network across Africa. Furthermore strengthening Regional Climate Centres will improvement management regional data banks; and
- ACPC should coordinate with regional, sub-regional and countries and carryout advocacy, at the highest level, for investing in sustainable long-term climate observation networks and data infrastructure. It should also help in defining requirements for climate data for different applications and facilitate a means of implementing some of the identified gaps such as those by Global Climate Observation Systems (GCOS)

Paper 1.1.2: TARGETING CLIMATE RESEARCH AND SERVICES TO DEVELOPMENT NEEDS IN AFRICA: THE DFID-MET OFFICE HADLEY CENTRE CLIMATE SCIENCE RESEARCH PARTNERSHIP (CSRP)

Authors *Richard Graham, Yvan Biot*

Keywords monthly-to-decadal prediction, onset, teleconnections, attribution

Abstract The objectives of the DFID-Met Office Hadley Centre Climate Science Research Partnership (CSRP) are improved understanding of the drivers of African climate variability and change, improved prediction on monthly-to-decadal timescales, development of climate monitoring and attribution systems and strengthened use of climate science in Africa. Objectives have been shaped through consultation with Africa stakeholders to optimise usefulness of the research to the development agenda. To contribute to improved climate models and reduced uncertainty in climate predictions a study has been made to investigate, for the whole African continent, the ability of climate models to represent remote influences (teleconnections), e.g. El Niño Southern Oscillation, on rainfall variability. Most climate models are found to have inadequate representations of several important teleconnections, and this provides a baseline for focussing model improvement. Higher horizontal resolution of models has been found to improve representation of teleconnections to African rainfall. Rigour in attributing the role of human-induced climate change in extreme climate events will help avoid potential for misguided adaptation measures. To help address this, a climate-model-based near-real-time attribution system is in development. Preliminary analysis of the severe 2010/11 drought in the Greater Horn of Africa suggests that human-induced climate change increased the risk of below-normal

rains observed in the March-May 2011 season. Encouraging levels of skill have been found for seasonal prediction of onset timing for West Africa, East Africa and southern Africa and experimental onset forecasts for the 2011/12 rainy seasons have been trialled at the Regional Climate Outlook Forums of these regions. Through a CSRP fellowship scheme eleven African climate scientists, working at African institutes, are engaging with CSRP outputs to advance the programme's objectives. A training workshop to strengthening use of dynamical seasonal forecasts products has been delivered to representatives from 9 National Meteorological Services in countries of the Greater Horn of Africa.

Paper 1.1.3: CLIMATE PATTERNS AND HYDRO-CLIMATIC SCENARIOS IN THE UPPER BLUE NILE BASIN

Authors *Solomon S. Demissie, Matthew McCartney, Seleshi B. Awulachew, and Birhanu K. Gebru*

Keywords Blue Nile; teleconnections; downscaling; RegCM3; water balance model

Abstract The climate and river flows in the Upper Blue Nile basin are highly seasonal with major rainfall occurring during the summer (Kiremt) and minor rainfall during the autumn (Belg) seasons. This study investigates climate patterns of the region and evaluates the future climate and hydrological scenarios of the Upper Blue Nile basin. Seasonal correlation analysis was used to investigate the teleconnections between daily rainfall properties and global atmospheric circulation and moisture fields over tropical oceans and land masses around Africa. The Kiremt rainfall properties of the high-altitude stations and the Belg rainfall properties of the low- and middle-altitude stations were found to be highly correlated with the ERA40 pressure, temperature, wind, and moisture fields for the period of 1982-2001. The correlation analysis revealed that the relative dominance of global (large-scale circulation) and local (orography and land cover) climate drivers on the rainfall formation mechanism varies with season, altitude, and location within the river basin. Therefore, any technique for generation of future climate scenarios must consider both global and local climate drivers. Hence, the ICTP RegCM3 regional climate model, forced by ECHAM5 GCM outputs, land use/cover and topography, was used to dynamically downscale local climate variables to 50km resolution. In most parts of the basin, the future mean Belg rainfall is predicted to decrease while the future mean Kiremt rainfall is predicted to increase. There is an overall tendency of wet parts of the basin to get wetter and dry parts of the basin to get drier. The future temperature would rise in all seasons with the increase in the low-land parts of the basin being greater than in the high-land areas. A simple lumped monthly water balance model was modified to capture the seasonality of rainfall-runoff transformation in the basin. The modified monthly water balance model was applied to 26 watersheds scattered throughout the basin. Regression analyses were conducted to establish statistically significant relationships between the model parameters and bio-physical characteristics of the watersheds. These relationships were used to parameterize the monthly water balance model at the grid points of the dynamic downscaling. The future runoffs at each

grid points and then at Upper Blue Nile sub-basins were estimated from gridded model parameters and downscaled climate variables. The future river flow scenarios show decreasing trends in the lower parts of the basin and increasing trend in the middle and upper parts of the basin.

Paper 1.1.4: CLIMATE CHANGE SIGNALS AT LOCAL SCALE OVER ETHIOPIA: INSIGHTS FROM NEW GRIDDED HIGH RESOLUTION GAUGE, SATELLITE, REGIONAL AND GLOBAL CLIMATE MODEL RAINFALLS

Authors *G. Mengistu Tsidu*

Keywords Climate change, singular spectrum analysis, trend, regional climate models, new IPCC scenarios

Abstract Climate change phenomena since the time of the mid eighteenth century are quite different from the changes occurred in the time of paleoclimatic and antiquity periods. The present day anthropogenically caused climate change is unique from its precedents in many respects and it has been bringing a serious challenge on life in different apocalyptic forms. This has a serious implication to Ethiopia since its economy is predominantly based on rainfed agriculture. In this paper, climate change signals are detected at local scale in the country from analysis of precipitation data. Precipitation records from in-situ rain gauge measurements from over 200 stations are employed in the analysis which involves reconstruction of missing values, homogenization and gridding onto degree. The monthly time series of gridded data are subjected to harmonic and singular spectrum analysis to see the seasonal cycles and trend components that predominantly account for the variability in the dataset. Harmonic analysis (HA) of the dataset reveals that the annual cycle accounts for 50 to 80% of the seasonal rainfall variability over northwestern and western parts as well as central and southeastern highlands of Ethiopia while the semiannual cycle accounts for 40% of seasonal rainfall variability over southern part of the country. A slow varying monotonic rainfall trend is detected using singular spectrum analysis (SSA). Mann-Kendall test is applied to determine statistical significance of the detected trend. The results reveal that almost all of the grid points show either significant increasing or decreasing trend at both 95% and 99% significant levels. Similar analysis on rainfalls from a number of regional climate models has reaffirmed these findings individually as ensemble member. The ensemble mean rainfall as well as trend agree quite well with the above findings from rain gauge data. Spatially from both gridded gauge and ensemble mean rainfall, parts of southern Ethiopia with a bimodal rain type and some parts of western half of the country, which has a monomodal type long rainy season, have shown decreasing rainfall trend. Southeastern highlands and most of the southeastern lowlands have also exhibited long term decline in rainfall. The north and northeastern part of the country and very localized places of western Ethiopia have exhibited an increase in rainfall for the last 30 years. The rainfall over the central rift valley areas has been decreasing whereas it has been increasing over the southern rift valley

areas. We have also analyzed the trends of rainfall and temperature extremes from General Circulation Models(GCM) simulations for the new IPCC scenarios for the next 100 years and found out that significant but small increase in warm days and cold nights per year over Ethiopian highlands are likely to occur under RCP4.5 scenario. There is also an indication from most models simulation that there will be an increase in percentage of heat waves over Afar and Gambela regions.

Topic 1.2: Lessons learned from various initiatives

All Papers for Section 1.2 to be provided sub-regional climate centers

Paper 1: ACMAD (African Centre of Meteorological Applications for Development)

Paper 2: AGRHYMET (Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle)

Paper 3: ICAPC (IGAD Climate Prediction and Applications Centre)

Paper 4: SADC-CSC (Southern African Development Community - Climate Services Centre)

Paper 5: AMESD (African Monitoring of the Environment for Sustainable Development)

Topic 1.3: Data and information

Paper 1.3.1: CLIMATE SCIENCE, INFORMATION, AND SERVICES IN AFRICA: SITUATION ANALYSIS, GAPS AND POLICY IMPLICATIONS

Authors *Tufa Dinku, Tatiana Arivelo, Seleshi B. Awulachew, Andre Kamgaf, Semu A. Moges, Buruhani S. Nyenzi, and Yilma Sileshi*

Keywords

Abstract Climate variability and change are serious challenges to sustainable development in Africa. The current famine crisis in Somalia and the surrounding region is yet another reminder of how fluctuations in the climate can destroy lives and livelihoods. Coping with negative impacts of climate and benefiting from favorable conditions would require implementing adaptation strategies that could reduce the vulnerability to current climate variability while building resilience against risks from climate change. This is best achieved through mainstreaming climate issues into development planning and practice. Climate information is a critical input for effective climate risk management. Science-informed policy, planning, and practice will ensure that development is more resilient and less vulnerable to negative impacts of climate, thus fostering sustainable development. However, the use of climate information and science in Africa has been very weak. On one hand, the climate community in Africa has not been able to provide the appropriate decision-relevant information. On the other hand, even the available climate information is not being used properly. The major challenges for the climate community have been critical lack of trained manpower, inadequate station network, and very weak communication and computational capacity. From the user side, the main obstacles include lack of appropriate climate information and services, lack of awareness about the existence of specific climate information, lack of

understanding and capacity to use climate information, reluctance to incorporate climate issues in management practices, and poor understanding on how to deal with scientific uncertainties. Lack of communication between the users and providers of climate information has also been the other serious problem. Thus, strenuous efforts should be made to improve the provision of climate information and services on one hand, and promote the integration climate into development planning and practices on the other. This paper will assess the current state of climate science, data and information in Africa and its use in development activities. It will identify key gaps and recommend actions needed to be taken for bridging the gaps.

Paper 1.3.2: CLIMATE OBSERVATIONS AND AFRICAN DEVELOPMENT

Authors *William Westermeyer, Richard Thigpen, and John Zillman*

Keywords climate observations, GCOS, ClimDev Africa

Abstract The paper addresses the importance of improving Africa's climate observing systems, emphasizing that improved observations will lead to better climate services, and better climate services will enable more effective climate risk management for sustainable development. It discusses the historical significance of the observing networks of African National Meteorological Services (NMSs), which provide the basis for much of what is known about the climate of Africa over the past century. It describes a history of Global Climate Observing System (GCOS) activities in Africa, including the GCOS role in facilitating the development of the Climate for Development in Africa (ClimDev Africa) Programme and in implementing observing system improvements through the GCOS Cooperation Mechanism. And it makes the case that the ClimDev Africa Programme provides a significant opportunity--one that must be seized--for substantially improving Africa's climate observations and services in the next few years.

Paper 1.3.3: ANALYSIS OF THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) IN CLIMATE CHANGE AWARENESS IN SEKE AND MUREWA DISTRICTS OF ZIMBABWE

Authors *Shakespear Mudombi and Mammo Muchie*

Keywords ICTs; climate change awareness; information; adaptation; sustainable livelihoods

Abstract The paper provides an analysis of the role of Information and Communication Technologies (ICTs) in contributing to climate change awareness in rural areas namely Seke and Murewa districts in Zimbabwe. The literature review showed that for successful adaptation and mitigation by individuals and communities, information and knowledge about the nature of the problem, its causes, its effects and possible solutions, are a prerequisite. Agricultural communities can get information from the traditional agricultural extension system, however due to various constraints to the extension system, ICTs have the potential to reach a wider audience including even those with no access to extension. Of importance is to package the climate and climate change information in an appropriate form, language and time and ensure that it is credible, legitimate, and salient as highlighted by various authors. The paper is based on primary data whereby both quantitative and qualitative data collection methods were employed. The study found out that the majority of respondents are aware of climate change. Though there are many different sources of information, ICTs were found to significantly influence climate change awareness. ICTs such as the radio and mobile phone are likely to increase the odds of being aware of climate change. Reading Farming/Environmental magazines also had a significant influence on the odds of being aware of climate

change. However, a negative relationship was found between television ownership and the odds of climate change awareness.

Paper 1.3.4: THE “DATA POVERTY” SYNDROME AND ITS ASSOCIATED CHALLENGES IN MANAGING WATER RESOURCES UNDER CHANGING CLIMATE IN AFRICA

Authors *Victor Kongo*

Keywords Data, uncertainty, resource management, flux dynamics, monitoring

Abstract Quality hydrometeorological data is a necessity in water resources management, with cascading and crucial use and applications, especially in developing pragmatic policies for sustainable water resources management. Good policies can only be based on factual information, the latter being a derivative of quality data. Research in water resources management in many regions in Africa, at different scales, is often subjected to numerous challenges, with availability of quality and sufficient data being the main setback. Currently, we are witnessing and increase in flux dynamics (both biophysical and socio-economic) at different scales than ever before, with multiple feedbacks. This calls for better insight and detail of understanding of the system dynamics to enable the development of pragmatic mitigation or adaptation approaches. Climate change is one of the additional dynamic that need to be accounted for in water resources management, on and above other drivers of change including population increase, pollution, land use change etc. We can only understand such complex dynamics and interaction of these drivers through analysis of relevant and appropriate observed data sets, of which need to be adequately available. Due to the complexity associated with some of the flux dynamics at different scales, there is a need to apply other data gathering approaches (in water resources management) that have the potential to capture the relevant flux signatures at the desired scales, of which the conventional techniques have limitations. Thus, there is a need to enhance the commitment and determination in increasing the monitoring and observatory prowess of water resources in all countries if the region is to have sustainable development and meet the MDG,s. Unfortunately, data availability (both quality and quantity) in most African countries is wanting. Several studies in Africa have highlighted a general downward trend in capital investment in monitoring water resources including decay of motivation and lack of purpose to maintain or expand hydrometeorological networks. Thus, one of the research questions, that is of interest to both scientists and the development community, is to quantify and establish the propagatory path of uncertainty and associated costs when using unreliable hydrometeorological data sets to develop policies or making decisions in water resources management. A good number of researchers in water resources management use modelling techniques to develop scenarios with the objective to have an insight on potential impacts of different water management options. Modelling in water resources management, as an art and science, is good and should be encouraged. However, the main concern is on the input data. It is evident that, we cannot overcome the “garbage in – garbage out” challenge with the aid of mathematics but rather looking for better garbage. As researchers, the questions we could ask ourselves, of which forms the basis of the proposed study, include: (i) are we determined to look for a “better garbage?” in our analytical work? (ii) are we communicating clearly to policy makers on the need for quality data? (iii) what are the associated costs of using insufficient data/information in water resources management and (iv) Can we quantify the economic value of hydrometeorological data in the changing climate?

Sub-theme 2: Climate Resilience Development and Adaptation

Topic 2.1: Socio ecological resilience and climate vulnerability

Paper 2.1.1: VULNERABILITY AND CLIMATE CHANGE HOT SPOTS IN AFRICA- MAPPING BASED ON EXISTING KNOWLEDGE

Authors *Dr. Benjamin Lampte et al*

Keywords

Abstract

Paper 2.1.2: CLIMATE CHANGE AND HEALTH ACROSS AFRICA: CRITICAL ISSUES AND OPTIONS

Authors *Owen C. Owens, Chukwumerije Okereke, Jeremy Webb, Miriam Musa,*

Keywords systems approach, transdisciplinarity, climate adaptation, resource use efficiency, innovation

Abstract The IPCC report and other literature indicate that globally, climate change is expected to alter temperature, air movement, and precipitation in various ways and to varying degrees across Africa with consequences on human health. With the strong connection between a population's health and economic and environmental health, the impact of climate change on each is one of the major ways in which climate change may impede the development of the African continent. African countries will suffer health consequences due to impacts of climate change as many African countries have populations that are among the most vulnerable to climatic changes in the world. This vulnerability is due in part to existing problems of poverty, weak institutions and armed conflict, which limit their capacity to deal with the additional health challenges posed by climate change. The relative impact of climatic and socioeconomic factors is generally difficult to quantify. This complexity in turn affects studies and policies on the health impact of climate change on Africa. In general, it is rarely possible to separate climatic and socio-economic effects when assessing the health impacts of climate change on any specific population. The majority of human health problems that could be linked to climate change are not strictly speaking created by changes in climate. Rather, they are problems exacerbated or intensified by changing weather patterns and other climatic conditions leaving population un-or-ill-prepared for new health impacts. For example, climate change may affect health through increased frequency and intensity of extreme weather events (EWEs) (such as hurricanes, heat-waves, floods, and droughts) each of which are drivers of malnutrition and changes in the distribution of diseases. According to IPCC, rising temperatures will affect pathogen life cycle and range affecting rate of infections, especially vector-borne diseases. An increase in global mean temperature will also alter heat and cold-related death rates around the globe. While there might be some positive benefits associated with weather changes such as a reduction in cold-related deaths in some temperate regions, the overall balance of effects on health globally is likely to be negative. These effects will not be evenly distributed across the world's populations as loss of healthy life years as a result of climate change is predicted to be 500 times greater in poor African populations than in European populations. Even within Africa, the type and magnitude of the health impacts of climate change will vary significantly among communities and regions. Variations will be due to many factors such as geographic differences in temperature and precipitation, socio-

economic conditions, the quality of existing health infrastructure, communication capacity and underlying epidemiology. Therefore, in this report we lay out the current state of direct and indirect impacts of environmental factors on health in Africa. While there are many uncertainties in magnitudes of climate change, particularly with timing, the existing literature makes interesting observations about potential health impacts and the populations that could be most at risk. The paper presents the potential impacts climate has on human health and analysis the various direct and indirect impacts that climate change will have on the African population, many of which are uncertain in terms of scale in terms of anticipated population affected, or the change in Disability Adjusted Life Years (DALYs). Due to the emerging nature of the issue and literature, there are many gaps in knowledge on the impacts climate change will have on human health. Importantly Africa is already addressing climate and health options arising out of "The Libreville Declaration on Health and Environment in Africa" and there are grass roots actions such those being taken by the Climate and Health Working Group in Ethiopia. In terms of policy perhaps the most important question is: what should be done differently to address health concerns across Africa given what we expect in terms of climate change? In some cases it may be more of the same (e.g. the use of mosquito nets and other measures to prevent malaria). In other cases effective preparation or response may require completely different approaches to health care across the continent.

Paper 2.1.3: INTEGRATED SYSTEM APPROACHES TO INNOVATIVE CLIMATE CHANGE ADAPTATION AND RESOURCE USE IN AFRICA

Authors *Prof. Martin P. de Wit, Prof Mark Swilling, John van Breda, Nicholas Ozor, Prof. Shem O. Wandiga, Prof. Richard Y.M. Kangalawe*

Keywords systems approach, transdisciplinarity, climate adaptation, resource use efficiency, innovation

Abstract Climate change and resources depletion are among the today's world greatest environmental challenges which could have unpredictable but potentially dire consequences for Africa if not handled innovatively.

Africa is considered to be very vulnerable to both climate change and unsustainable depletion of resources. Innovative ways of response are, therefore, urgently needed for effectively coping with these top challenges. To tackle this situation, robust interventions are often privileged as seen in some projects, however, such responses required strong financial, technical and institutional levels. Social, institutional, political and cultural support systems in Africa are malfunctioning or under severe stress already, hence a systematic transdisciplinary approach that acknowledges complexity and takes account of the whole system transitioning is needed for effective climate change adaptation, and efficient resource use and management. Therefore, the aim of the present paper is to further explore the parameters of innovative approaches to climate change adaptation and resource use in African conditions. The paper short outlined academic literatures on complexity, transdisciplinarity and systems approaches which are then applied to the fields of climate adaptation and resource use. Suggested parameters for an integrated conceptual model are formulated. Innovative approaches to complex issues such as adapting to climate change and improving resources use efficiency in Africa would require an integrated system approach across transdisciplinary that takes into account both African contexts as a point of departure, and explicit

analysis of human behaviour as a force of change. This integrated approach provides a basis for the development of sustainable innovations for climate change adaptation and resource use issues in Africa.

Paper 2.1.4: CLIMATE CHANGE AWARENESS AND RESILIENT ADAPTATION:

INDIGENOUS DRIVERS OF REGIONAL STI POLICY IN NIGER DELTA

Authors *T. C. Nzeadibe, C. L. Egbule, N. A. Chukwuone, V. C Agu*

Keywords Climate change; awareness; resilient adaptation; Niger Delta; STI Policy

Abstract The aim of this study was to examine the level of awareness of Niger Delta communities about impacts of climate change and to identify and document indigenous innovations and practices for resilient adaptation to climate change by farmers in the region. Three states were randomly selected from the nine states that make up the Niger Delta. Multi-stage sampling technique was used to interview 400 heads of farming households in Cross Rivers, Delta and Rivers States. The data were analyzed using simple descriptive statistics while the results were presented as tables, figures and charts. Two single sex Focus Group Discussions (FGDs) were conducted in each of the survey states giving a total of six FGDs. Data from the FGDs complemented the survey results. Findings of this study showed that about 90% of respondents were aware of climate change and its impacts. It was found also that the mass media played a major role in climate change awareness in the study area. The results further indicate that the farmers have practiced some innovative indigenous measures for climate change adaptation for many years. This study concludes that extension workers, the media, researchers and civil society groups have some lessons to learn from the farmers and could assist in diffusing these indigenous innovations for widespread adoption in other communities. The identified indigenous adaptive strategies which have Scientific foundations,, Technology and Innovation (STI) policy relevance could be used in designing and implementation of future Agricultural, Development and Climate Change Policy in Nigeria. It is recommended that policy makers should be aware of the innovative practices of the farmers and incorporate them in designing Agricultural, Development and Climate Change Policy in Nigeria., investments. Adequate investment in research and capacity building are imperative in building resilient adaptation to climate change impacts in the Niger Delta region of Nigeria.

Paper 2.1.5: MANAGING LOSS & DAMAGE FOR CLIMATE RESILIENCE DEVELOPMENT & ADAPTATION IN AFRICA

Authors *Dr. Koko Warner et al*

Keywords

Abstract TBC

Topic 2.2: Climate change and water in Africa

Paper 2.2.1: CLIMATE CHANGE ON THE WATER RESOURCES OF AFRICA AND ESSENTIAL INTERVENTIONS

Authors *Seleshi B. Awulachew, Matthew McCartney, Michael Menker, Seydou Traore, Solomon Seyoum,*

Keywords African water resources, climate change and water, global drivers, water interventions, storage

Abstract This paper focuses on the nexus of water resources and climate change in Africa. It uses the review of existing knowledge from relevant literature as well as the writers' extensive work in relation to water management in Africa. It looks at major global drivers of change and focuses on water as crucial natural capital that if managed and used effectively can contribute to economic growth and increased food and energy production in Africa. It focuses on the current level of development of water use in various sectors and the potential and opportunities for future development. The sensitivity of the water sector to current climate variability and future climate change (i.e. likely additional pressures on water availability, accessibility and demand in Africa as well as increasing difficulty of water resource management) are discussed and approaches to adaptation are discussed. Constraints and opportunities for adaptation in the water sector issues and prospects for technological, infrastructural, social, institutional interventions that can improve future water management in an era of climate change are highlighted. Interventions that support the development of robust water resource systems in specific situations taking water infrastructure options focusing on water storage are provided through in depth discussion. The typologies of storage interventions taking the continuum of such systems starting from in-situ storage to large scale dams are considered. Comparison of the storage systems considering the inherent benefits and risks, additional risks due to climate change and the economic and social benefits are synthesized. Finally, the implications for future development, research and policy are highlighted.

Paper 2.2.2: CLIMATE CHANGE AND WATER IN AFRICA: A STRATEGIC PERSPECTIVE

Authors *Prof. Elfitah Eltahir*

Keywords

Abstract One of the main threats to sustainable development of water resources in Africa is the process of climate change forced by evident changes in the chemical composition of the global atmosphere, since climate change redistributes the natural occurrence of the hydrologic phenomena that supplies water to different regions. The art of predication of regional climate change impacts is one of the frontiers of global change science. While global climate models agree in their predictions of global

climate indicators such as global surface temperature and extent of polar ice sheets, the same models disagree on the predications about specific regional climates. Water resources and hydrology in Africa is no exception. While global models seem to agree in predicting warming of surface temperature over this region, the same models disagree on even the sign of the predicted changes in rainfall and river flow. When it comes to the future of water availability in Africa, our best answer would remain uncertain for years to come.

So how can we approach the issue of climate change given this uncertainty? Here, we propose a comprehensive, flexible, and low cost strategy that has five pillars: (1) improvement of regional predictions through local development and use of the new class of regional climate models; (2) development of the regional capacity for adaptation through: (i) minimization of irrigation water losses which should help to alleviate water shortages in the event of decreased flow, and (ii) addition of new reservoir storage capacity that can be used to manage water better in the event of increased flow; (3) limited good faith efforts in mitigation of climate change by combating anthropogenic deforestation and desertification in the region; (4) vigorous pursuit of the opportunities available: (i) through the Clean Development Mechanism (CDM) of the Kyoto Protocol to get certified emission reductions (CER) for any new hydropower project in Africa, and (ii) through new international compensation schemes that may be developed in the future; and (5) enhanced efforts in education, research, and outreach to prepare the next generation of scientists, engineers, and policy makers who will deal with the issue of climate change as impacts become more evident and models become more accurate. All five pillars of the proposed strategy represent objectives that would be of great benefit to society and should be pursued under all circumstances.

Paper 2.2.3: GROUND WATER RESOURCES AND CLIMATE CHANGE IN AFRICA

Authors *Paul Pavelic, Callist Tindimugaya, Selehi B. Awualchew, Dam Mogbante, Kaen Villholth, Ange-Benjamin Brida, Bernand Keraita*

Keywords

Abstract Ground water is one of the most important sources of water for drinking, livestock water, and irrigation in Africa. It is specially affiliated to the Millennium Development Goals (MDGs) target of accessing clean water, as most of the rural Africa and considerable urban areas are supplied from ground water, and as such it has high relevance to development and wellbeing of Africa. The extent of the resource, potential of development, extent of vulnerability due to climate change is not well document. Although ground water systems respond to changes slowly, climate change could affect ground-water sustainability through changes in ground-water recharge resulting due to change in precipitation and temperature or seasonal distributions, due to long droughts, change in land use/land cover, and increased demand. Factor in ensuring the sustainability and proper management of ground-water resources such as boundary and transboundary aquifer management, quality, recharge, effect of hydrological cycle and related issues are important in ground water. This paper particularly looks at regional hydro-geological framework, what is known, where is work now being focused and where the knowledge gaps exist, distribution and current knowledge of aquifers, ground water potential, climate change impacts on ground water, research gaps, policy implications for meeting the MDGs and livelihood goals.

Paper 2.2.4: MANAGING WATER SUPPLY UNDER CLIMATE CHANGE: THE CASE FOR SMALL WATER UTILITIES

Authors *Dr. Kenneth K Odera*

Keywords water, water utilities, climate change, and adaptation

Abstract This paper examines the adaptive capacity of small water utilities in light of climate change in Africa using case studies from three medium-sized towns around Lake Victoria in East Africa. The three urban water service areas examined, Masaka in Uganda; Kisii in Kenya; and Bukoba in Tanzania, rely almost entirely on surface water from the Lake Victoria Basin. The basin is a delicately balanced freshwater system controlled primarily by climate conditions. Lake Victoria receives 80% of its water from rainfall falling on the lake and loses 80% to evaporation, thus the lake is highly sensitive to changing weather patterns. An analysis of climate change models for the Lake Victoria region finds warmer temperatures and greater rainfall over the next 50 years, with future annual rainfall projected to exceed surface water lost to evaporation from warmer rising temperatures. In an effort to understand the effects of climate and demographic change on urban water utilities around Lake Victoria, scenario analysis is applied to an integrated water supply and water demand model for Masaka. The integrated model for Masaka forecasts increased rainfall and greater water supplies in the event of a climate change future by 2050 compared to current trends. However, current population pressures and inadequate waterworks system capacities remain the near-term impediment to achieving full access to piped-water services. Climate projections for higher net annual rainfall obscure intensified monthly volatility in rainfall, which increases monthly changes to Lake Victoria water levels. With population growth rates already among the highest in the world, the added effects of climate change to Lake Victoria exacerbate a host of socio-economic changes underway in a region heavily dependent on agriculture, fisheries, and hydropower. This dynamic threat from both climate and demographic change to fixed-asset water utilities blurs long-term planning horizons, confounding benefit-cost-based management responses. Thus, to further strengthen the opportunity for cooperative management and adaptive capacity, the paper examines water utility management strategies in light of future climate and demographic scenarios and offers recommendations for climate change adaptation in the investigation areas.

Paper 2.2.5: CLIMATE CHANGE AND WATER CHALLENGES IN SMALL ISLAND NATIONS IN AFRICA: THE CASE OF A COMPREHENSIVE STRATEGY ADOPTED BY MAURITIUS

Authors *K M Baharul Islam*

Keywords climate, warming, water resources, small islands, cyclone, weather, strategy

Abstract The impacts of climate change on sea level rise is perhaps most crucially felt in the case of small island nations and the case of Africa is not an exception. The Republic of Mauritius, including Rodrigues, St Brandon and Agalega are mostly affected by the climate of the South West Indian Ocean (SWIO) and the small island states is often affected by tropical cyclones and other extreme weather. Some of the islands like the Saint Brandon or the Cargados Carajos Shoals and Agalega are now threatened by sea-level rise as well, according to Mauritius Meteorological Services (MMS). Though the GHG emission of Mauritius is insignificant, a definite warming trend is already recognized and according to MMS: “Average temperature at all stations is rising at the rate of 0.15 °C per decade and has risen by 0.74 – 1.2

°C when compared to the 1961-90 long term mean. Similar warming trends have also been observed at the outer islands like Rodrigues, St Brandon and Agalega. At the same time sea levels in SWIO is also showing a rise of around 1.5 mm/yr at Port Louis and 1.3 mm/yr at Rodrigues, (Church, et al., 2006). Analysis of Port Louis data for the period 1987-2007 gives a mean rise of 2.1 mm/yr for the last 10 years. A number of impact factors are now becoming crucial to the environment and future trends in island nations like Mauritius that demands our immediate attention. Longer dry season, shift in the start of the summer rains, increase in dry days and delay in rains is ultimately affecting the water resources. The SWIO Islands countries are now facing this challenge of climate change. Against this backdrop, the paper presents the case of climate change and its long term effect on a nation's sustainable development goals. The paper also presents an analysis of futuristic strategy adopted by Mauritius as detailed in the "Maurice Ile Durable" programme presented in Parliament in June 2008. It highlights the positive features of the collective efforts being made by the country that can be a model for other nations in Africa.

Topic 2.3: Climate change and agriculture in Africa

Paper 2.3.1: CLIMATE CHANGE AND AGRICULTURE IN AFRICA: ANALYSIS OF KNOWLEDGE GAPS AND NEEDS

Authors *Owiyo, T., Riedacker, A., Habtamu, H., Seleshi B. Awualchew*

Keywords Food production, productivity, climate change impact, GCM, RCM

Abstract A review of the current status of agricultural production in Africa was conducted on the role of agriculture in the economies of African countries and in poverty reduction initiatives, the production trends and the public investments in the sector in recent years and the vulnerability of the sector to the short term climate variability (CV) and long term effects of climate change (CC). The nexus between agricultural policy and research and development in CV and CC was also explored to identify existing knowledge gaps that prevent agricultural policy development from integrating CV and CC information. The study also reviewed the role of African agriculture in international CC negotiations. Nearly 80 percent of the African population live in rural areas and subsist on agriculture, largely smallholder production. On average, agriculture accounts for 15 percent of the gross domestic product of African countries. In spite of this, public investment in the sector by many countries in the continent, food production declined rapidly in the past two decades. This has led to emergence of unsustainable land use practices, depletion of the natural resource base (soil nutrients, water and forests) by agricultural producers. High cost of agricultural inputs, poor access to credit facilities and high cost of establishing efficient irrigation systems have all contributed to decrease in production per hectare and overall increase in poverty rates among rural populations in the continent. Between 1997 and 1999 for example, the cereal consumption in Sub Saharan Africa was 84.5 million metric tons, 16 percent of which was imported. Low use of fertilizers have been identified as one of the most important challenges to increasing food production in the continent. Agriculture in the continent is therefore more vulnerable to the effects of short-term variability and long-term climate changes than are other regions. At the policy level, many countries in the continent have not integrated CC adaptation strategies in the agricultural and national economic development policies. Lack of appropriate policy framework for integration of adaption and mitigation strategies in sector has also contributed to the decrease in investments on the sector over time. Although there is substantial understanding of the global, and to extent regional impacts of CC on key

sectors of the development, significant knowledge gaps exist with regard to regional, sub regional and national level in Africa. Most CC scenarios are generated from the Global Circulation Models (GCM), which are relatively coarse and regional circulation models (RCM), the downscaled versions of the former. Key knowledge gaps include the uncertainties that arise with the use of GCMs and the RCMs and uncertainty on the impact of CC and CV on agro-ecosystems, the impact of CC on agricultural water supply. The synthesis concludes that even as African countries address the sources of uncertainty in the use of CC and CV information, there is urgent need to elevate the position of African agriculture in international CC negotiations. African countries need to start integrating the CC and CV into development policies and agricultural sector specific policies to stimulate investment in the sector. Indeed, a clear role emerges in this regard for the regional economic communities (REC) to play in developing regional policies along key crop value chains and agroecological zones. The ACPC should play a coordination role of synthesizing data and information from CC and CV research into policy useable information for the countries and the RECs.

Paper 2.3.2: AGRICULTURAL WATER MANAGEMENT IN THE CONTEXT OF CLIMATE CHANGE IN AFRICA

Authors *Tilahun Amede, Seleshi B. Awulachew, Bancy Matti, Seydou Traore, Muluneh Yitayew*

Keywords Agricultural water management, adaptation, productivity, intensification

Abstract The agricultural systems in Africa are commonly characterized by low-input, drought-prone farming evolved through interaction of a wide range of agro-ecological, cultural, social, political and economical factors. The effect of climate change would be most felt in Africa, where communities, governments and local institutions are not yet well prepared to respond to emerging climate challenges. There has been a wide variety of local climate change adaptation mechanisms in Africa to minimize negative effects, though these adaptation mechanisms are commonly community-specific and didn't expand beyond specific localities. Agricultural water management (AWM) offers a way of facilitating water-centred development to simultaneously reduce poverty, increase food security and adapt to climate variability and change. It focuses on ecosystems rather than commodities; on underlying processes (both biophysical and socio-economical) than simple relationships; and on managing the effects of interactions between various elements of the production systems. It aims to decrease unproductive water losses from a system, as well as increase the adaptive capacity of communities and institutions. The water saved from agriculture could be used for other uses but also balance the water needs between agricultural and environmental services. Adoption of AWM interventions would improve the profitability of smallholder agriculture by increasing crop and livestock yield by factors of up to five-fold, while net returns on investment could double. However, the adoptions of these interventions demand a multi-institutional engagement and collective action of institutions at various levels. The policy and institutional framework of NEPAD/ CAADP recommending sustainable land management and reliable water control systems along with improving soil fertility. Although the national policies in most of Africa didn't have functional policies in AWM, except for scattered statements across different ministries or sectors. The scattering of AWM issues across several sectors had resulted in unavoidable overlapping of policies, duplication of efforts and inefficient use of resources, as well as the lack of clear ownership of AWM issues. Weak institutional capacity at various levels and poor market access are other factors affecting adoption of improved water management for climate change adaptation. Moreover, the regional organizations in

Africa need to go beyond prescribing a common initiative to facilitating the ground for coordinated presence of bilateral and multilateral institutions across the board that would improve water resource governance, particularly related to water benefits, leading to efficient and equitable benefit sharing by riparian countries. Based on the past and present achievements, successfully AWM examples for increasing agricultural productivity and adaptation to climate change in Africa are discussed herein.

Paper 2.3.3: CONTRIBUTION TO THE ASSESSMENT OF CLIMATE CHANGE VULNERABILITIES IN THE LIVESTOCK SECTOR IN NORTH AFRICA, THE CASE OF MOROCCO

Authors *Dr. Fouad Bergigui*

Keywords Climate change, livestock, North Africa, livelihoods, food security

Abstract Through this paper, we attempted to spotlight on potential climate change consequences on North Africa's livestock sector and possible adaptation measures, it presents a literature overview of some relevant studies and projects on the subject in Morocco. Probable decrease in water and feeding resources associated to heat stress and outbreaks of emergent and re-emergent animal diseases underscore the need to act fast and efficiently through exploring quality data via methodological vulnerability assessment studies. Doing so may point the way towards appropriate adaptation strategies just in time to anticipate potential damages. Not doing so may disturb the fragile livestock's balance between ensuring food security, supporting livelihoods of rural populations and preserving the environment, in a region where the socio-economic balance is already bracketed by this year's wave of the Arab spring.

Paper 2.3.4 CLIMATE CHANGE AND AGRICULTURE IN AFRICA: THE NEXUS AND SITUATION

Authors *Arthur Riedeker, Firmin Adjahossou, Seydou Traore, Florent Gasc, Seleshi B. Awulachew and Youba Sokona*

Keywords

Abstract This paper conceptualizes that to promote more sustainable developments in Africa it is necessary to start by considering present and future, economic, social and environmental needs of countries and populations, and to prioritize actions, in particular in agriculture and related sectors. In the context of further population increase and climate change (adaptation and mitigation), it should also be remembered that "not to threaten food production", "allowing the development to proceed in a sustainable manner" and "allowing ecosystems to adapt naturally to climate change" being the three ultimate objectives of the United Nation's Climate Change Convention, and as such adequate policies and measures are to be taken in each country and globally for Africa. As African agriculture and connected areas (agricultural policies, fertilizer production, irrigation and electricity generation, research, etc.) contribute significantly to the GDP in many countries it should be given the highest priority: to provide more food for direct human consumption, more fodder for livestock, more non-food products to replace, as much as possible, fossil products and energy, and also to generate higher income. At each stage, from the sun and fossil products, up to the end use solar energy conversion and other conversions are therefore to be optimized. This requires primarily adoption of already well known and proven technologies to increase land use efficiencies (by increasing yields and multiple cropping and by reducing areas of fallow

land etc.), in particular by improving mineral nutrition of plants, (e.g. by increasing fertilizer inputs) as recommended by the NEPAD in 2006, by improving water supply and by using the best and most appropriate plant and animal material. By increasing land use efficiency more land could also be dedicated to non-food production and thus further increase the GDP, whilst reducing at the same time the need of additional cropland, e.g. deforestation or grassland conversion, thus curbing at the same time GHG emissions versus business as usual scenarios and helping to preserve biodiversity. With better fodder supply, water and livestock management, more milk and meat could also be generated with proportionally less GHG emissions. And with better conversion efficiencies by agro-industries, less land per unit of products would also be necessary. All these actions deserve to be better supported also through research, extension services and national and international networking, with higher contributions, in particular from countries having the highest historical responsibility in climate change. The full paper expands on these key issues based on literature and past evidence based results.

Paper 2.3.5: RECENT SCIENTIFIC INFORMATION REGARDING IMPACTS OF CLIMATE CHANGE ON AGRICULTURE IN AFRICA

Authors *Prof. Doreen Stabinsky, Matthew Stilwell, Seleshi Bekele Awulachew, Youba Sokona, Yacob Mulugetta,*

Keywords

Abstract Recent scientific studies provide more detail on the impacts of climate change on agriculture in Africa since the IPCC Fourth Assessment Report. The new scientific data provided by these studies can inform the African common position in the UNFCCC climate negotiations. This paper summarizes key findings from this report and the main conclusions are: 1) The overarching objective of the UNFCCC requires that greenhouse gas concentrations in the atmosphere be kept to a level and within a time frame to ensure that food production is not threatened. Any chance at maintaining adequate production under the rising temperatures and changing precipitation patterns expected in coming decades requires that significant adaptation efforts must start now, with sufficient finance, technology transfer and capacity-building resources provided by Annex I countries. 2) Recent science shows that from 1980-2008, due to rising global temperatures, global maize and wheat production has already decreased by 3.8% and 5.5% respectively. At the current rate of temperature increase, global average temperatures will have increased 1.5°C by 2050. Average predicted production losses by 2050 for African crops are: maize 22%, sorghum 17%, millet 17%, groundnut 18%, cassava 8%; 3) Currently, at 0.74°C of warming, African farmers and pastoralists are seeing changes in the timing of rains, in the severity of rains, in the temperatures they and their crops and animals are exposed to, and in the progressive drying of their soils.

TOPIC 3.1 GREEN ECONOMY IN THE CONTEXT OF AFRICA

Paper 3.1.1: CONCEPTUALISING OF LOW CARBON DEVELOPMENT IN THE CONTEXT OF AFRICA

Authors *Kevin Urama, Youba Sokona, Chukwumerije Okereke, Yacob Mulugetta, Nicholas Ozor, Haruna Gujba,*

Keywords Energy, cross-sectoral, low-carbon development, Africa

Abstract Low carbon development implies doing development in a low emissions manner. It provides the opportunity to transform climate challenges into development opportunities. The low-carbon development pathway also creates an opportunity for African countries to modernize and upgrade their water, energy, urbanization plans, agricultural systems, transport, and other critical infrastructure assets. However, there are detractors of this concept in the way it is applied to Africa. Some argue that mitigation or low carbon development is not necessarily an African agenda given that the continent is only responsible for an insignificant proportion of the GHG emissions. The focus should be on adaptation and building resilience and less on costly mitigation efforts. It is important to debate the value for pursuing low carbon development, and contextualise the concept so that it relates to circumstances in Africa.

The paper will interrogate what is understood as low carbon development, what relevance it has for Africa, what are the important sectors to take into account in planning for low carbon development, what are the key constraints and opportunities associated with low carbon development.

Paper 3.1.2: GREEN GROWTH PARADIGM IN AFRICA

Authors *Myung-Kyoon Lee, Jae Eun Ahn*

Keywords growth, green economy, low-carbon development, Africa

Abstract A rapid economic growth in Africa during last ten years and the prospected growth in the coming years indicate that African countries will face increasing energy demand, fossil fuel-dependent growth, generating massive greenhouse gases (GHGs) emissions and other pollutants in the near future. Unfortunately, this quantity-oriented growth following the conventional development path ignores various social and environmental consequences, including climate change, environmental sustainability, and social equity. Taking into account these various global issues, green growth emphasizes the crucial principle that economic growth and environmental sustainability are one intricately intertwined concept that will guarantee a more sustainable future for human kind.

This paper seeks to provide an overview of green growth and its rapid emergence in international agenda on climate change. It further identifies the implications and applicability of green growth in the context of Africa. The implementation of green growth paradigm would bring greater importance particularly to African countries, which are known to be more vulnerable to the current economic and environmental crisis. In exploring green growth opportunities in Africa, this paper presents a case study of Global Green

Growth Institute (GGGI) project on Ethiopia's Green Growth Plan (GGP). The paper concludes that green growth paradigm would be most appropriate development option for achieving sustainable and economic growth and protection of climate and environment in Africa as well as other continents.

Paper 3.1.3: GREEN ECONOMY IN THE CONTEXT OF AFRICA: CASE STUDY ON CLIMATE RESILIENT GREEN ECONOMY ETHIOPIA

Authors *Selam Kidane Abebe, Wondwossen Sintayhu*

Keywords Climate resilience, green economy, Ethiopia

Abstract The government of Ethiopia introduced the Growth and Transformation Plan for (2010/11-2014/15). The plan promotes accelerated economic growth and "the right to development" with a vision stated: "to see the country where democratic rule, good governance and social justice reigns, upon the involvement and free will of its people; and once extricating itself from poverty becoming a middle-income economy".

The development plan also introduced a Carbon Resilient Green Economy (CRGE). It states the need to respond to the opportunities and threats presented by climate change and become resilient to changing rainfall patterns and warmer temperatures through adaptation as well as move along a carbon neutral pathway (by 2025). The two building blocks of the climate strategy under construction are outlined under the Ethiopian Programme of Adaptation on Climate Change (EPACC) and the Nationally Appropriate Mitigation Actions (NAMAs).

The paper will share the Ethiopian experience and tease out opportunities for African countries to understand the mechanisms and discuss the process of Ethiopia's CRGE strategy

Paper 3.1.4: SUSTAINABLE RESILIENT LOW CARBON TRANSPORT – CROSS-CUTTING ISSUES

Authors *Roger Gorham*

Keywords Transport, Sustainability, Low carbon, urbanization

Abstract Climate change is a major threat for the sustainable development of Africa, a continent which is extremely vulnerable to impacts on food and energy security, health, and critical infrastructure. Transport is a crucial part of sustainable development strategies; providing access to vital services, mobility and supporting the economic development of the region. While transport in Africa is not currently a major source of world Greenhouse Gas Emissions, its importance in developing an African approach to climate change should not be overlooked. First, the continent is poised to undergo a process of substantial urbanization over the next 30 years; as this process occurs, demand for transport will surge. Second, even without climate change, transport development is seen as a key to developing Africa's potential, and strengthening regional economic communities. Climate change will heighten the urgency of the need to develop the sector, as communities seek to rapidly adapt to changing but unforeseeable circumstances. Gaining international support for mitigation and adaptation to climate change, therefore, is important to strengthen the long-term sustainability of Africa's transport systems, while minimizing their impact on global climate change.

The paper will summarize the key issues concerning the links between climate change and transport, demonstrating the importance of a sustainable transport system as an integral part of a low carbon

development, the specific requirements from the transport sector on the challenges of adaptation and developing strategies towards better accessibility of climate finance for the sector.

3.2 ENERGY ACCESS AND POVERTY

Paper 3.2.1: ENERGY ACCESS AND ENERGY FOR POVERTY ALLEVIATION IN AFRICA

Authors *Smail Khennas, Kavita Rai, Yohannes Hailu, Alemu Mekonnen, Youba Sokona, Yacob Mulugetta, Haruna Gujba, Essel Ben Hagen, Abebe Beyene*

Keywords Energy access, poverty, Low carbon, renewables

Abstract The year 2012 will be the ‘Year of Sustainable Energy for All’ within which issues of ‘energy access’ and ‘poverty’ will feature prominently. However, it is important to differentiate the difference between notions of energy access and energy for the poor. For example, ‘energy access’ implies lack of access due to a number of reasons including absence of modern fuels, whereas lack of access for the poor refers to the economic logic of ‘non-affordability’. Hence, understanding the distinctions between them provides the basis for better targeted policy initiatives to address the issue of access and poverty as part of a constellation of policy interventions. The paper will explore the challenges associated with these in the context of Africa and provide some recommendations.

Paper 3.2.2: INTEGRATING RENEWABLE ENERGY AND CLIMATE CHANGE POLICIES: EXPLORING POLICY OPTIONS FOR AFRICA

Authors *Yohannes Hailu, Haurna Gujba, Tsehai Atakilt, Mulugeta Saare, Lars Nilsson, Yacob Mulugetta*

Keywords Clean energy, energy access, renewable energy

Abstract The confluence of two major challenges in Africa, energy development and climate change adaptation/mitigation, has numerous implications to sustainable development. It has long been established that access to clean and modern energy sources is a catalyst for development, as energy buttresses economic activities and delivery of vital social services. The current low levels of access to clean energy sources in urban and rural Africa has long been a policy concern, which African countries have attempted to tackle through energy sector reform and investment in new infrastructure. Renewable energy sources offer greater opportunities to meet energy access challenges. Concern about greenhouse gas (GHG) emissions and climate change, mostly related to energy generation and consumption, has also increased interest in cleaner and sustainable energy sources. The dual nature of the energy and climate change challenges and policy opportunities for dealing with both has increased interest in innovative climate-sensitive energy policies in Africa, particularly in the realm of renewable energy development. This paper aims to contribute to this discussion by exploring energy and climate change issues in Africa and discussing some policy opportunities that can inform analysts and policymakers.

Paper 3.2.3: AGRO-INDUSTRIAL LOW-CARBON DEVELOPMENT OPTIONS IN SOUTHERN AFRICA: THE CASE OF BIOENERGY FROM SUGARCANE

Authors *Vikram Seebaluck, Francis X Johnson*

Keywords Sugarcane, bioenergy, low-carbon development, southern Africa

Abstract The twin challenges of energy insecurity and threat of climate change pose a complex challenge in Africa. In many respects, Sub-Saharan Africa represents a key testing ground for the future bio-economy as it lies at the heart of the “biomass-poverty belt”, i.e. the tropical and sub-tropical regions of the world where extreme poverty coincides with great bioenergy potential. Africa is currently highly dependent on inefficient uses of biomass, but at the same time has the greatest potential for bioenergy development of any world region. The exploitation of this potential can bring significant socio-economic benefits as well as helping to stimulate advances in the agricultural and forestry sectors.

Among the various bioenergy options, the long experience and the considerable future potential for sugarcane in southern Africa makes it a valuable case study for the Green Economy of the future. Bioenergy from sugarcane offers an option that is attractive in socio-economic and environmental terms as it draws on climatic advantages and brings new economic opportunities to rural areas while supporting a more sustainable economy. Sugarcane offers an example of a versatile resource for food, feed, fuel, fibre and various specialized products, which together can reduce the dependence on fossil fuels in favour of low carbon development paths.

In this paper, the authors draw on a long-running North-South-South policy research network that has focused on expanding the role of sugarcane in southern Africa as a sustainable resource for agro-industrial development. The key phases or sectoral dimensions are reviewed, including agriculture, industry, markets, impacts, climate, strategic issues and international comparisons. A synthesis across the various dimensions of the sugarcane agro-industry is provided in terms of optimal scenarios, locations and markets to support African development.

Paper 3.2.4: FOSSIL FUELS IN AFRICA IN THE CONTEXT OF CARBON CONSTRAINED FUTURE

Authors *Alemu Mekonnen, Abebe Damte, Haruna Gujba, Zenebe Gebreegzabher, Yacob Mulugetta, Rahel Deribe*

Keywords Fossil fuels, Africa, energy access

Abstract Africa has considerable reserve of fossil fuels of all kinds: oil, coal and natural gas. Much of this resource is either utilized outside of Africa or some of the resource is not developed at all for use within the continent. Meanwhile, there are concerns that the future of fossil fuel use will need to take place in the context of a low carbon development pathway. It is, therefore, important to explore the resource and technical challenges and opportunities associated with the expanded utilization of fossil fuels in Africa. This paper will review existing reserves and geographical distribution of fossil fuels across the continent, review technical options for decarbonizing efforts and associated costs, and provide

policy recommendations that would enable use of resources for the continent's development efforts while ensuring minimization of GHG emissions.

Paper 3.2.5: ENTERPRISE, ENTREPRENEURS AND ENERGY IN AFRICA

Authors *Ibrahim Togola*

Keywords Energy, enterprise, private sector

Abstract The importance of unlocking domestic resources for development is critical. Potentially, this increases reliability of resource flows, internalizes the added value to support economic development, and creates the dynamic conditions for institutional and human resource development. Indeed, no country has succeeded in developing its economy (and social sectors) by relying exclusively on external support. Rather, achieving good development outcomes is predicated by the ability of countries to successfully mobilize the key actors within their 'borders' that can contribute to nurture innovative solutions and create stable local markets for them. This also applies with the task of enhancing access to energy services. In many parts of Africa, energy service provision has remained as the exclusive duty of the public institutions, and as such it has not created the space to enable private enterprises to flourish and make meaningful contributions in the energy sector. This paper will examine the challenge of creating local energy production capability (and markets) for local and national transformation in Africa, using some concrete examples. The paper will also make the case that a stimulated local economy and availability of clean modern energy services can together drive local economic growth, create jobs and improve living conditions in rural areas.

3.3 REDD+ and LULUCF

Paper 3.3.1: DELIBERATING REDD+ GOVERNANCE AND INSTITUTIONS

Authors *Olufunso Somorin, Mulugeta Ayalew, Chinwe Ifejika Speranza*

Keywords Forest, mitigation, livelihood, REDD+

Abstract Tropical forests are currently receiving enormous scientific and political attention due to their roles in climate change as both source and sinks. The global climate negotiations are now seeking to design an international framework to account for the mitigation potential of tropical forests; a sector that contributes about 17 % of the global emissions (IPCC, 2007). The idea of Reducing Emissions from Deforestation and Forest Degradation (REDD+) is simple in theory. In simple terms, REDD+ is expected to establish incentives for developing countries to protect and better manage their forest resources, by creating and recognizing a financial value for the additional carbon stored in trees or not emitted to the atmosphere (Corbera and Schroeder, 2011). Many African countries have expressed their interests in the REDD+ mechanism, partly due to their increasing rates of deforestation and degradation; and perceived benefits of economic returns from such mechanism. Given that deforestation is driven by complex mix of proximate and underlying factors; there have been questions on the capacity of most developing countries to reduce deforestation and its associated GHG emissions. At the core of increasing deforestation and degradation rates in many African countries are weak institutions and governance. Governance (or lack

of) is critical for any environmental outcome, in the case of REDD+: emission reductions, economic development, poverty reduction, biodiversity conservation, and other (un)known benefits.

This paper seeks to analyze the governance and institutional capacity of a number of African countries that have expressed their interests in the REDD+ mechanism.

Paper 3.3.2: CLIMATE CHANGE IN AFRICAN FORESTRY : THE BROADER POLICY CONTEXT

Authors *Godwin Kowero and Yonas Yemshaw*

Keywords Forest, Climate Change, policy, livelihood, REDD+

Abstract This paper examines the context or framework within which policies to bear on climate change is made, and will probably continue to be made. Since policies are about issues, the paper starts with a brief account of identified policy issues that are directly and indirectly related to climate change, globally, at African regional level, at national and personal levels and in different sectors of national and global economies. It then addresses selected related issues that feature prominently, but are not always confined to the forestry sector. This paper is devoted to issues relevant to the forestry sector, and makes reference to the wildlife sector where appropriate.

The paper highlights a number of key issues having a bearing on climate change policies at various levels. In Africa, it is critical that climate change measures are pro-poor because they are the ones affected and will continue to be affected more seriously. And they do not have resources, financial and technological, to cope with adverse effects of climate change. Availability of reliable and sufficient and timely information is also crucial, and this is actually one of the big constraints in climate change work. The level of awareness of the climate change challenge, as well as on the roles forests and trees in it has improved significantly in recent times. However, more political will is needed to make this awareness impact on policy. It is important to ensure that policies at all levels recognize and result in mechanisms that promote sustainable forest management and encourage substitution and the sustainable use of renewable resources. This means that policies and activities for implementation of REDD+ will have to be aligned with other national policies, plans and programmes. Because of the diversity of forest types and conditions, deforestation profile, as well as capacities of individual African countries, there is a need for context specific policy and action to climate change with focus on creating new value-added for pro-poor investment. Moreover, the paper argues that the scope of REDD is limited and needs to be expanded to cover all types of land uses including agriculture, agroforestry and other land uses (AFOLU). To improve on REDD initiatives it is necessary to learn from the failings of CDM.

Paper 3.3.3: REDD+ AND GENDER IN AFRICA

Authors *Terhas Hagos*

Keywords REDD, Gender, Africa, Climate Change

Abstract Women's role in agriculture, forestry and other land use (AFOLU) is important due to the role of women in gathering fuelwood and growing food for the household, and their vulnerability to the

adverse effects of climate change. However, often women's access to land is restricted by unfair customary practices in many developing countries which tend to affect optimal utilization of land and would be of particular concern in REDD (Reducing Emissions from Deforestation and Forest Degradation) projects. In REDD policy, the safeguard principles under the Forest Carbon Partnership Facility (FCPF) do not consider women, and there are few women professionals in REDD implementation. This paper draws from many African case studies in Zimbabwe, Tanzania, Kenya, the Sudan, Cameroon, Senegal, Ethiopia and the Congo Basin. These case studies provide examples of the vulnerability of women in forest action and evidence of success stories where women have been targeted in AFOLU projects. Overall, it is recommended that gender mainstreaming should occur in REDD policy design and implementation, 'Readiness' plans and in monitoring and evaluation of REDD projects.

The paper concludes that women must be recognized as key agents in climate processes, in order for the outcome of REDD negotiations to be effective and equitable. Thus, the role of gender in REDD needs specific recognition in both adaptation and mitigation of climate change.

Paper 3.3.4: WHAT'S IN LULUCF FOR AFRICA

Authors *Johnson Nkem*

Keywords carbon sequestration, land use, CDM

Abstract The United Nations Framework Convention for Climate Change (UNFCCC) defines Land use, land-use change and forestry (LULUCF) as "a greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities". It is argued by proponents of LULUCF that land-use related interventions can provide a relatively cost-effective way of offsetting emissions, either by increasing the removals of greenhouse gases from the atmosphere (e.g. by planting trees or managing forests), or by reducing emissions (e.g. by curbing deforestation). Under Article 3.4 of the Kyoto Protocol, Parties could elect additional human-induced activities related to LULUCF, specifically, forest management, cropland management, grazing land management and revegetation, to be included in its accounting for the first commitment period of the Kyoto Protocol. However, there are drawbacks in estimating greenhouse gas removals and emissions resulting from activities of LULUCF. In addition, greenhouse gases may be unintentionally released into the atmosphere if a sink is damaged or destroyed through a forest fire or disease. This paper will explore the opportunities and challenges associated with the LULUCF activities for climate change mitigation purposes, and more specifically explore the implications of LULUCF for Africa.

4.1 ECONOMICS OF ADAPTATION IN THE CONTEXT OF AFRICA

Paper 4.1.1: Economic cost of adaptation in Africa

Authors *Ms. Bella Aime*

Keywords Adaptation, resilience

Abstract TBC

Paper 4.1.2: Infrastructure and climate change

Authors *Raffaello Cervigni and World Bank colleagues*

Keywords Adaptation, resilience, vulnerability, infrastructure, Africa

Abstract Africa's infrastructures are at present inadequate, both in terms of physical stock and quality of service, to support sustained growth in the years to come, both under current and future climate. Yet, relatively little is known on how climate change may affect the desirable design, location, timing, and composition of the stock of infrastructure that will need to be built in the short to medium term.

A better understanding of the range of climate impacts on infrastructure development, and of the approach to deal with climate uncertainty, is thus necessary in order to inform future investment decisions and to avoid locking Africa in a pattern of climate-vulnerable development that will be very costly, or in some cases impossible, to repair in the future. It will be increasingly important to have a solid analytical base to inform decisions on how scarce climate finance flows will be used to enhance the climate resilience of Africa and other parts of the developing world. The paper will explore the critical questions relevant to strengthen the analytical base for investments in Africa's infrastructure under a future uncertain climate.

Paper 4.1.3: ECONOMICS OF CLIMATE CHANGE ADAPTATION IN AFRICA

Authors *Tom Downing*

Keywords Adaptation, resilience, vulnerability, infrastructure, Africa

Abstract TBC

Paper 4.1.4: CONTRIBUTION OF GEOTHERMAL ENERGY TO LOW CARBON DEVELOPMENT IN THE EAST AFRICAN REGION

Authors *Dr. Meseret T. Zemedkun*

Keywords

Abstract The Great East African Rift System (EARS) is one of the major tectonic structures of the earth where the heat energy of the interior of the earth escapes to the surface. This energy flow takes place in the form of volcanic eruptions, earthquakes and the upward transport of heat by hot springs and natural vapor emissions. The EARS extends for about 6500 km from the Middle East (Dead Sea-Jordan Valley) in the North to Mozambique in the South. The EARS passes through Eritrea, Djibouti, Ethiopia, Kenya, Tanzania, Uganda, Rwanda, the Democratic Republic of Congo (DRC), Zambia, Malawi, Mozambique and Madagascar. Estimated Geothermal energy resource potential in the EARS is more than 15,000 MWe.

Despite the high geothermal potential of the African Rift, only Kenya and Ethiopia have installed a capacity of about 217 MWe. Countries such as Djibouti, Eritrea, Tanzania Uganda, and Rwanda are at the exploration stage. Other countries such as DRC, Malawi, Zambia, Mozambique etc. to date, not gone beyond the resource potential inventory work. One of the main regional geothermal programmes in the region is the African Rift Geothermal Development Facility Programme (ARGeo). This paper will explore the ARGeo plans to deliver a package consisting of financial and technical inputs as a means for realizing that objective. ARGeo will also help demonstrate that the resource is reliable, cost effective, low in greenhouse gas (GHG) emissions, and indigenous as compared to other sources of power in the Eastern Africa region. The utilization of the resource in agriculture and industry will also be promoted.

4.2 CLIMATE FINANCE

Paper 4.2.1: LESSONS FROM ‘FAST START’ FINANCE

Authors *Yacob Mulugetta, Matthew Stilwell, Youba Sokona, Mulugeta Ayalew*

Keywords Cancun decisions, fast-start finance, UNFCCC

Abstract The need to enhance action on the provision of financial resources was recognised by all Parties in the 2007 Bali Action Plan. At the December 2010 UN Climate Change Conference in Cancún, Mexico, Parties to the UN Framework Convention on Climate Change (UNFCCC) took note of a collective commitment by developed countries to provide “new and additional” resources approaching \$30 billion for the period 2010-2012. Developed countries also confirmed their promise to mobilise new and additional climate finance that would increase to 100 billion USD a year by 2020, with a balance between mitigation and adaptation.

With the fast start finance period 2010-2012 now at midpoint, it is useful to take a close look at the experience of developing countries with with fast start financing during 2010-2012. This paper would go some way towards distilling any lessons that can be learned from the ‘fast-start’ finance experience and for efforts to enhance action on finance under the Convention for period commencing in 2013.

Paper 4.2.2: ENHANCING ACCESS TO CLIMATE FINANCE: UNDERSTANDING THE DIRECT ACCESS MODALITY IN EMERGING CLIMATE DISCOURSE

Authors *Huzi Ishaku Mshelia*

Keywords ‘Direct Access’; ‘Fiduciary Standards’; ‘National Implementing Entities’; Multilateral Implementing Entities’; ‘Executing Entities’

Abstract A major obstacle to the international climate negotiations has been the continued lack of consensus on climate finance. While relative gains seem to have been achieved with the ‘fast-start’ and long-term pledges made under the Copenhagen Accord, very little of these have actually been translated to deposits and disbursements. Contributions have remained erratic and in most cases uncoordinated with many remaining unclear as to whether they are ‘new and additional’ and, adaptation continues to remain grossly under-funded (Schalatek, 2010).

African and other developing countries are further confronted with the apparent limited understanding of the concept of the Direct Access (DA) modality adopted by the Adaptation Fund Board (AFB) for accessing financing under the Fund and, the requirements for prospective operating entities to meet with its fiduciary standards as condition precedent. While the Direct Access modality has been hailed as innovative and ensuring country ownership in the implementation of projects, the limited number of African countries that have applied under the DA clearly indicates considerable lack of understanding of the concept and/or the inability of countries to meet the fiduciary standards set by the AFB. Indeed the Adaptation Fund Board has confirmed that much (Adaptation Fund, 2011a).

This paper will analyze the concept of the direct access modality, its nature, benefits and limitations. It will also consider the fiduciary standards of the Adaptation Fund Board (AFB) and whether they are consistent with the general objectives and principles of the Conference of Parties (COP) in setting up the Fund; how these standards affects the ability of African countries to implement adaptation and what elements of the fiduciary standards are likely to find their way into the emerging Green Climate Fund (GCF). The paper will identify challenges and gaps so far experienced with the DA modality with some recommendations for future actions by African governments.

Paper 4.2.3 : OUTIL POUR L'ÉVALUATION DES FLUX D'INVESTISSEMENTS ET FLUX FINANCIERS (I&FF) POUR FAIRE FACE AUX EFFETS ADVERSES DES CHANGEMENTS CLIMATIQUES

Authors *Dieudonné Goudou and Henri Tonnang*

Keywords Guide méthodologique ; I&FF ; GES, Adaptation ; Atténuation ; Changements Climatiques ; Renforcement des capacités, Planification, formulation des positions à la COP/CCNUCC ; Niger

Abstract L'analyse des investissements et flux financiers (I&FF) pour l'atténuation des GES et l'adaptation aux changements climatiques est une activité importante pour la mise en place de mesures nationales efficaces et appropriées aux changements climatiques.

Cet exercice, initié par le Programme des Nations Unies pour le développement (PNUD) permet de soutenir les efforts des pays prenant part au projet de renforcement des capacités. Ce projet ne renforce pas seulement la capacité nationale des pays choisis, en matière d'élaboration d'options de politiques visant à faire face aux changements climatiques, mais permet également de produire des résultats analytiques susceptibles d'apporter une contribution dans la planification et à la formulation des positions dans les négociations menées au titre de la Convention-Cadre des Nations Unies sur les Changements Climatiques (CCNUCC).

L'outil d'évaluation des investissements liés aux activités d'atténuation et d'adaptation, fournie par le PNUD est un Guide méthodologique dont la démarche est souple, en ce sens qu'elle peut être modulée pour mieux répondre aux besoins particuliers du pays. L'objectif principal de cet exercice est d'apporter des assistances et appuis aux pays en développement dans la détermination, la hiérarchisation et la création d'un potentiel d'investissement en rapport avec les options offertes en matière de mesures d'atténuation et d'adaptation et de transformer le tout en une stratégie cohérente et compatible avec leur développement durable et autres priorités nationales.

Le Niger qui est un des dix pays pilotes a choisi les secteurs de l'agriculture/élevage (adaptation) et de la foresterie (atténuation) comme secteurs prioritaires pour mener cette évaluation. Les résultats de cet exercice ont été d'un grand apport dans l'élaboration des politiques et plans d'action à court et à long terme en matière d'adaptation et d'atténuation des changements climatiques.

Cette communication met l'accent sur un outil efficace d'évaluation des Flux d'investissement et Flux financiers pour faire face aux effets adverses des changements climatiques dans les pays PMA. Les résultats du processus au Niger seront présentés avec une discussion des leçons à en tenir pour une amélioration du Guide méthodologique.

Paper 4.2.5: INTRODUCING THE AFRICAN CLIMATE FACILITY (ACF)

Authors *Mafalda Duarte*

Keywords CDM, Africa, carbon finance

Abstract While global carbon markets are taking off, Africa lags far behind with only 7% of the Clean Development Mechanism (CDM) global market share. The African Development Bank (AfDB) is designing targeted financing instruments, such as the Africa Carbon Facility (ACF), to help build Africa's carbon markets and attract more green investments to the continent. The goal of the ACF is to address supply-side barriers by providing selective seed capital under a project development facilitation financing mechanism. The facility would address demand-side barriers by providing bankable, post-2012 guarantees from African projects until 2020 in the event there is no functioning post-2012 carbon market. The aim is to inject more private and public sector investment into CDM projects in Africa until 2012 and beyond. Finally, ACF would address debt financing barriers by leveraging the AfDB's existing debt financing role and overall capacity to support CDM projects coming through the Bank's lending pipeline, as well as ACF.

The paper will provide details of the design and operational features of the ACF.

4.3 ROLES & EXPERIENCE OF RECs & MEMBER STATES IN CLIMATE CHANGE

Paper 4.3.1: NAMAS AND MRVS: OPPORTUNITIES FOR AFRICA

Authors

Keywords MRV, NAMA,

Abstract TBC

Paper 4.3.2: CLIMATE ACTIVITIES IN COMESA

Authors

Keywords Adaptation, mitigation, finance

Abstract TBC

Paper 4.3.3: CLIMATE ACTIVITIES IN ECOWAS

Authors

Keywords Adaptation, mitigation, finance

Abstract TBC

Paper 4.3.4: CLIMATE ACTIVITIES IN UAM

Authors

Keywords Adaptation, mitigation, finance

Abstract TBC

Paper 4.3.5: CLIMATE ACTIVITIES IN CENTRAL AFRICA

Authors

Keywords Adaptation, mitigation, finance

Abstract TBC

Paper 4.3.6: CLIMATE ACTIVITIES IN EAC

Authors

Keywords Adaptation, mitigation, finance

Abstract TBC