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## CLIMATE CHANGE AND DEVELOPMENT

### CONSULTATION ON KEY RESEARCHABLE ISSUES

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**SECTION 5: EAST AFRICA REGION**  
**SECTION 5.3. NAIROBI WORKSHOP REPORT**  
**ACTS - VICTOR ORINDI AND OTHERS**

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**African Centre for Technology Studies (ACTS)  
Workshop Report on**

**CLIMATE CHANGE AND DEVELOPMENT IN KENYA AND EAST AFRICA**

**14<sup>TH</sup>-15<sup>TH</sup> APRIL 2005.**

**ICRAF COMPLEX, GIGIRI**



## **Acknowledgements**

This report was compiled by Victor Orindi, Celine Achieng, David Wafula, Andrew Ochieng and Elvin Nyukuri. Thanks are due to all the presenters and participants who took time from their busy schedules to share their ideas and experience with others. ACTS would like to thank the various government ministries/departments from Kenya, Uganda, Tanzania and Sudan, Research Institutes, Universities and Non-Governmental Organizations for their continued support and participation in our activities. ACTS particularly appreciate the efforts of Dr Saleemul Huq and Dr Hannah Reid of IIED in providing leadership in this exercise. We would also like to thank the Department for International Development (DFID-London) who financially supported this exercise through IIED.

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## **1.0 Introductions**

The consultative workshop on *Climate Change and Development in Kenya and East Africa* was part of a scoping exercise aimed at identifying what developing country stakeholders in East African region regard as the most urgent research needs in relation to climate change and its implications for poverty reduction and sustainable development. It was one of the conclusive activities of a scoping exercise by ACTS and other RING members particularly the International Institute of Environment and Development (IIED), UK. The scoping exercise combined both Literature Review and interviews, the output from which the two background papers for discussion were prepared. The objective was to identify areas which research on climate change in Kenya could usefully address.

## **1.1 Conference Aims**

The two day national and regional workshop was an opportunity to present ACTS findings from the recent climate change and development scoping exercise on Kenya, Sudan, Tanzania and Uganda. Two background papers-on Kenya and east Africa were distributed. Presenters from other organizations in each of the four countries were also invited to give presentation on what they are doing/have done to generate ideas through comparison with the ACTS background papers.

The conference brought together a wide range of stakeholders- civil servants, civil society representatives, researchers, academics, farmers and a donor, to reflect the broad nature of climate change challenges. In order to generate substantial and useful results, key discussants from different sectors were invited to give brief comments on what they feel research on climate change and development should focus on followed by open floor discussion. The last session each day was meant to summarize and prioritize research issues coming out of the discussions.

## **2.0 Welcoming Remarks, Keynote Address and Conference Overview**

The Conference opened with welcoming remarks by Mr. Benson Ochieng on behalf of ACTS Executive Director Prof Judi Wakhungu.

Mr. Ochieng started by welcoming the participants to ACTS. He then noted the various climate change related activities that ACTS have been involved in the past including organizing the first conferences on climate change. Climate change activities are now being carried out under the Energy and Water Security Programme in line with ACTS new Strategic plan. He also acknowledged collaboration between ACTS and other institutions including UNEP, RING partners among others on climate change. He expressed hope that such partnerships will continue growing stronger more so in light of coming into force of the Kyoto Protocol. It was therefore appropriate, he said to have such an impressive group of participants from different fields of expertise and ACTS was honored to take out major debates in the area of climate change.

Dr Joy Hutcheon- Director of Communication and Knowledge Sharing, DFID London, said that they were interested in the consultations that would be going on for the two days because climate change is one of the four research programmes that DFID would be focusing on. She however said that they would be largely participating as observers.

She then introduced her two colleagues, Dr Simon Anderson and Mr. James Tuohy and wished participants a successful two day meeting.

Dr Saleemul Huq of IIED London then thanked and welcomed participants once again. He noted that the workshop is part of larger scoping exercise funded by DFID and being undertaken by IIED and RING Colleagues in Kenya and East Africa, Senegal and West Africa and India and South Asia. He said that the exercise was to assess what has been and what is being done with a view of identifying gaps that climate change related research could usefully address in the region.

The scoping exercise, he said consisted of literature and activities review; one on one interviews and finally the workshops on one hand and an on-line survey by LEAD International. The idea of literature review was to assess both published and grey literature especially at the country level some of which has not been published and often difficult to access. The exercise looks at both national and regional activities to identify what priorities for research ought to be. The first day was to focus on important issues for Kenya and while the second day was to consider the regional aspects .

He said that priority ranking will be done after receiving inputs from participants-to get an array of priority issues/areas that require attention at the national and regional level as well as specific sectors and targeted stakeholders. He briefly gave an overview of what took place in the India Workshop a week ago.

Dr Huq's remarks were followed by individual introduction from the participants.

### 3.0 Summary of Presentations and Discussions

ACTS background paper on Climate Change and Development in Kenya was presented by Victor Orindi (see Annex 1). It was noted that Kenya's development is increasingly being affected by climate related disasters including drought, floods and landslides which the country cannot continue to ignore. The increasing climate variability and long-term climate change could only accelerate the high poverty levels hence the need to promote adaptation among vulnerable communities.

In terms of climatic trends, certain areas could be wetter while the dry lands which constitute approximately 80% of land area in Kenya could get drier with long-term climate change. This would create additional challenges to the various livelihood groups. The agricultural sector is already faced with many challenges including increasing population and subsequent pressure on land, declining soil fertility, increasing indebtedness and isolation from markets. Climate variability is an additional and major constraint to productivity as it limits adoption of improved farming technologies and investment in agriculture especially in the marginal areas. Food production is becoming more vulnerable to climate variability as rainfed agriculture for example moves into marginal areas. Addressing these challenges will entail incorporating climate/weather forecasts in decision making; mapping and characterizing marginal areas to identify appropriate activities that may be carried out and the risk involved; identifying the risk of pests and diseases; improving crop varieties and reforming agricultural policies to support development of subsistence farming and pastoralism which have received relatively limited attention compared to commercial agriculture. Incorporation of seasonal forecasts will require development of reliable indicators and downscaling the climate information in an appropriate format. The need to document and strengthen Indigenous knowledge and coping strategies with scientific findings to help communities cope better with future challenges was also highlighted.

In terms of **health**, climate variability and climate anomalies like the El-Nino Southern Oscillation (ENSO) are key drivers in the increased incidence and spread of climate sensitive diseases. Such diseases include malaria, dengue fever, cholera, meningitis, rift valley fever among others. Other factors such as poverty, changing population, drug resistance and land use changes also have significant influence on outbreak of such disease epidemics. Malaria epidemics on which many studies have been done compared to other diseases is associated more closely with climate variability than increase in average temperatures. Assessment of climate impacts on health has however been difficult due to high spatial climate variability and lack of long-term data series from different sites. Developing and fine tuning existing disease epidemic prediction models could contribute greatly to the effective management of diseases epidemics. Rescuing data and improving management of existing medical records is therefore a priority.

Rainfall is the climate parameter that will be greatly affected by climate change. Surface water is more sensitive to change in climate compared to ground water resources which have a considerable time-lag. In areas far from surface waters (e.g. ASALS), future development will increasingly focus on ground water even though available information is not adequate. In certain areas, limited water access is a result of poor laws or policies (which makes it difficult for certain groups to access water resources) and inappropriate management strategies. The water sector is currently being reformed creating new laws, regulations and institutions with a move towards greater involvement of water users and private sector in water resource management and service provision. Unless adequate

safety nets are put in place, this could marginalize certain areas (e.g. poor urban and rural areas) even without climate variability/change. Poor urban and rural areas are likely to remain unattractive to private investors. There is a feeling that the reforms being carried out are too many and drastic for the common person to understand and participate in the development of new management strategies. The reforms have also been criticized for focusing narrowly on increasing efficiency of drinking water supply rather improving access for different water uses. Poverty eradication will require the broadening of management systems to include productive uses such as irrigation.

Increasing population translates into increasing water demand. The challenge facing this sector is therefore how to manage the increasing demand together with increased variability and long-term climate change. Information is therefore needed on the possible effects of climate variability/change on water quality and quantity. Already, there are increased conflicts over water resources among the different livelihood groups in Kenya which could be a reflection of decreasing water availability and/or inadequacy of current management systems. Addressing some of the challenges may require strengthening or integration of customary systems into the formal systems. One area that has a big potential to address increasing water demand is rain water harvesting. Rain water harvesting which is very decentralized has potential to harvest rain water during rainy season and store for use during the dry seasons. Rainwater can be harvested for drinking, farming etc. Runoff can be directed to recharge points for storage in the soil- this being the most effective way of storing rainwater for future use.

Climate related disasters have increased of late and may worsen with increasing variability and climate change. Floods commonly affect three river basins including Tana, Nyando and Nzioa while drought on the other hand affects large areas including parts of Eastern, Rift Valley and North Eastern Provinces. High rainfall has sometimes resulted into mudslides in the hilly areas. The El-Nino of 1997/98 not only damaged infrastructure but also led to outbreak of certain diseases like the rift-valley fever affecting pastoral communities. The drought in the year 2000 led to reduced power generation and resulted in blackouts and power rationing which is estimated to have costed the economy USD 20 million. Inadequate disaster preparedness has contributed to the high impacts on both household and national economies. This has the effect of diverging the limited resources from development to dealing with impacts.

Whatever we do, some climate change is evitable because of past emissions. It is therefore important that the most vulnerable including the poor are enabled to with adverse impacts of climate change and benefit from the positive impacts through adaptation process. One way through which this can be achieved is by providing the right information to individuals, institutions and government to be in a position where they can make decisions about the future with some degree of certainty. Available climate information/forecasts are currently not used optimally due to the lack of trust on the value of such forecasts, poor packaging of climate information, ineffective dissemination methods and inappropriate timing of such information. More often than not, the information disseminated through (TV, Radio and Newspapers) rarely reaches the intended users who happen to be majority of the poor that depend directly on natural resources. The form in which climate information is presented is rarely understood by many while the fact that it is released late limits the use of such information. Seasonal forecast information sometimes reaches farmers when they are well into the planting season even though it is supposed to help them make investment decision.

Dissemination of climate information is even more difficult when dealing with pastoral communities who are mobile in nature but whom nevertheless need climate information. Research on climate change should therefore focus on empowering vulnerable communities to use climate information.

#### **Comments and Clarifications from the floor.**

There was a feeling that Indigenous Knowledge on climate and weather forecasts need to be captured and brought out more strongly. Communities use such indicators like flowering of plants, changing of fruit colors to forecast future seasons and plan their activities. Some of the participants noted that some work has been done in Machakos and Western Kenya. The ICPAC carried out a pilot study on indicators.

Concerning dissemination of weather forecasts, **Simon Gathara of IMTR** noted that even though it has been weak in the past, a lot of effort has been put in place to improve on this since the El-Nino of 1997. He cited the RANET- Radio and Internet Programme to disseminate climate information in rural areas. The system uses a world space receiver and battery-less radios hence able to cover even remote areas. User workshops cutting across all sectors are also being organized to improve interpretation and use of climate information.

**Angela Wauye of Action Aid-Kenya** noted that climate related disaster (floods/droughts) could lead to food insecurity but the reverse is also true where it forces people to unsustainable resource use/livelihood strategies. She felt that there is need to focus more on the non-economic causes of food insecurity which have largely been ignored in the past. Other areas that she felt need to be addressed include farm trade policies to make them pro-poor, insurance for the agricultural sector which is currently lacking due to absence of an index to gauge the risks associated with farming.

**Ms Ritu Verma- TSBF-CIAT** supported the idea of focusing more on the vulnerable persons in society. But she questioned the recourse if information given to farmers turn out to be untrue. In response, Dr Louise Verchot of ICRAF said that forecasts models at present are very experimental but will get better with improvements. He also noted that we are dealing with probability which nevertheless could be used to improve farmer's resilience.

#### **Key Discussants**

**Prof Wandiga, KNAS** kicked off the discussion by stressing the need for data to make good weather predictions. He also felt that the window of prediction need to be broadened for increased reliability and acceptability. Organizations concerned with forecasting should be facilitated and given room to collect and disseminate climate information. Timing of forecasts is also important. He felt that giving forecasts information a few days to the coming season does not allow individuals/communities to use that information for decision making. Providing forecast information three to six months in advance would be appropriate. Prediction of some climatic anomalies like the El-Nino/La Nina is becoming better globally but translating this information for use at the community level is still a big problem.

He was of the opinion that policy makers are aware of climate change but think it is a "long term" problem more so with IPCC focus on 2100 which makes it look far away. It is important that research show the near term impacts and need to adapt now. Highland areas like Kericho are already affected by increased temperature of 3.6°C observed in

the last 30 years. There is need to collect information and downscale global scenarios to national and regional levels on a regular basis. This will provide information which is appropriate for national and regional policy/decision makers.

Private sector (e.g. banks) should be brought in the climate change initiatives to provide resources that can support innovation of ideas. This is only possible if they are provided with adequate information. The role of genetic engineering (GMO) in coming up with high salt tolerant and drought resistant varieties need to be explored as well to improve on food security.

**Francis Edalia- Deputy Director of Water Resources** concurred that water availability is directly related to climate change impacts. Renewable freshwater endowment in Kenya is 20 billion M<sup>3</sup> compared to 0.6-1.0m<sup>3</sup> for ground water. He felt that future focus of water development will be on surface water except for the ASALs (lacking surface water sources) and urban areas where ground water is developed as a supplementary source.

Most of the problems relating to water access were to do with poor management which is being addressed through decentralization of water management. Already seven water management boards (which are autonomous) have been created to plan and regulate water use in different parts of the country. A country water management strategy exists and indicates that irrigation is the greatest consumer of water accounting for 70% of the total water use. Access to data on water resources should not be a problem as there is an existing data service which has been running for six years.

The new Water Act requires that water is also conserved for the environment/ecological functions. The sector is being liberalized so that whoever meets the criteria to provide water services will be allowed to operate after satisfying the respective water service boards.

The conflicts over water may be attributed to resource scarcity and inadequate management systems. This could be addressed through investing in water conservation structures to improve water availability. Each catchment area also has an advisory committee consisting of 15 members representing different interest groups. Water user associations will also be involved in management to ensure that all users effectively participate in decision making concerning water resources. An Appeals Board is also provided for under the Water Act, 2002 as a mechanism for settling disputes. In terms of rainwater harvesting, a lot has been done including construction of water pans and regular desiltation of the same.

The water strategy recognizes water related disasters like floods, droughts and landslides. There is a flood strategy which includes flood monitoring which however has not been very effective. The new water management strategy promotes conservation of catchment areas as a way of reducing/minimizing disasters.

It is worth noting that under the new arrangement, the ministry of water and irrigation will be addressing policy issues only. The newly created institutions under the new Act will carry out the other functions. For example the Water Resources Management Authority will be responsible for management of water resources while water supply will be coordinated by the water service boards. Strategy for drought management adopted is through developing water storage structures. The statement that climate information is not factored in planning could be true for some aspects like floods but not all. The per capita water storage in Kenya is less than 500 m<sup>3</sup> given in the background document and may need to be revised accordingly.

**Amos Odhacha** of the Ministry of Health started off by noting that the Ministry of Health is at the end of the chain of climate change impacts and therefore, a consumer of problems that results from climatic events. Food insecurity resulting from climate impacts on agriculture leads to malnutrition which is a health problem. Both droughts and floods also impacts on health directly. Uptake and use of information is very low in the ministry just like other government departments. Example is the drug prescription changes on chloroquine which took 15 years. Window of change in regard to climate information is therefore limited. Both malaria and cholera can be fixed through dealing with poverty. Much change in behaviour and attitude is also needed for people to use latrines and bed nets, for example. This could be achieved through sensitizing households and communities alike. In fact drug resistance is a question of poverty and attitude (for example taking half a dose of treatment). In terms of health infrastructure, there are 72 district hospitals in Kenya, 22 of which are considered "illegal". Health records in most of the hospitals are computerized but it is still difficult to capture data from many of the facilities. Probably, only a third of the information is captured but the WHO is keen on assisting the ministry to improve records management.

**Mr John Nyangena of the Ministry of Planning** mentioned that even though the Ministry would like to integrate environmental issues including climate change in national planning, their greatest dilemma is how to integrate such information in the planning process as they lack tools to interpret such information and include in the planning process.

Many policy makers are concerned with short-term goals which coincide with their duration of tenure. This makes it difficult to get long-term considerations like climate change impacts to be incorporated in the plans where they can attract budgetary allocation. Cost of floods to the economy and that of mitigation are yet to be computed for example.

Capacity is also a constraint in terms of generating and utilizing information. A number of institutions have mandates touching on the environment (climate) but coordinating them so as to plan and develop ways of addressing environmental concerns remains a problem.

The Ministry together with United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP) is initiating a project on poverty reduction Initiative. The National Environment Action Plan (NEAP) is also under implementation.

**Dr Peter Cooper- ICRISAT.**

Because climate change is inevitable owing to past emissions, there is need to focus on adaptation to climate change which is of most and immediate relevance to farmer's need. Rainfed agriculture accounts for 90% of food production and climate variability is key in defining production uncertainty and risks aversiveness with regard to investment in agriculture in both high potential and more marginal environments.

ASALS deserve more attention as they account for 80% of land areas of Kenya, are faced with climate variability affecting peoples' livelihoods and in-migration from higher potential areas with migrants often carrying with them inappropriate or unsustainable practices. Rainfall variability is likely to increase while total amount could decrease in the semi arid areas.

With projections that many people will be living in urban areas practicing urban agriculture by 2025, there is need to look at the urban environment scenarios. Emphasis on the inter-relationships between climate change, Natural Resources Management,

human health i.e. ecosystems approach to human health is also being championed by IDRC. An integrated livelihoods approach to climate variability and climate change research is appropriate because of the many linkages between climate change and the different sectors.

There is need to make seasonal climate forecasting more accurate, acceptable and usable. The challenge that remains is how to link seasonal forecasting, existing/improved practices and coping strategies with long-term climate change since variability within seasons may also increase with climate change.

Kenya has a lot of climate data which is not used well at the moment. New partnerships between agricultural institutions and meteorological departments are required to make good use of this information. There is need to look at long-term climatic records to 'ground truth' global climate change predictive models. It is important to analyze long-term climatic records to verify farmer's perceptions that climate change is occurring. In conclusion, Dr Cooper outlined the following points as deserving further attention:

- The need to analyze and draw lessons from case studies (in Africa and elsewhere) where communities have successfully adapted to change (what led to success?).
- Greater attention to the role of private sectors and linking farmers to market as a potential mechanism for helping 'buffer' against the impacts of Climate Vulnerability (CV) and Climate Change (CC).
- The impacts of CC on the incidences of pests' outbreaks both during the cropping cycle and in the post harvest period.
- The need to adopt a perspective that analyzes the threats (and opportunities) of CV and CC in the context of other key 'externalities' that currently restrict the growth of the agricultural sector. For example, factoring Climate issue in the national planning will ensure that the environment and natural resources are not degraded further and that productivity is improved.

### **Open Floor Discussion**

**Prof Mwakio Tole of Kenyatta University** underscored the importance of urban agriculture where there is increased use of waste water which may harm consumers despite being an important source of livelihood for the urban poor. He gave the example of Nairobi which receives high amount of wastes while at the same time being used for irrigation. There is need for recognition and regulation of waste water re-use in the informal sector which may be achieved through policy reforms.

Tourism industry supports many people through direct employment, service provision and is an important source of revenue to the government. It should therefore, be safeguarded against climate change impacts for example, perception of negative changes ( e.g. providing clear information on outbreaks of diseases like Rift Valley fever in terms of areas affected, measures put in place to protect people from such diseases). Infrastructure development should consider future scenarios to avoid or limit the extent of damage. Diversifying tourists' attraction is also necessary to take care of some of the impacts on the environment. For example, bleaching of corals in the Indian Ocean could reduce their value in the tourism industry.

**Prof Nuhu Hatibu- ASARECA** explained the need for identifying entry points. He identified risk assessment to inform investment decisions in promoting adaptation to climate change. Up-stream meteorological information need to be converted to locally useful information. Support is needed to develop local capacity since upstream meteorological information already exists. Exploring the possibility of developing sinks

for GHGs could provide many benefits. **Dr Bancy Mati of Jomo Kenyatta University of Agriculture and Technology (JKUAT)** wondered what happened to reports from studies on different sectors commissioned by the then Ministry of Research which no longer exists? Climate variability and change means change in rainfall patterns and therefore research should answer the questions when, how much, at which time?

**Ritu Verma of TSBF-CIAT** felt that there is need for a better policy that could promote or safeguard water access among the poor and other vulnerable groups. It would be useful to look at how liberalization of the water sector (including privatization) would affect water access by the poor. Even socio-cultural modeling is rarely practiced, linking climate and socio-economic modeling would be more useful.

**George Sikoyo** explained that national development planning consists of short, medium and long-term objectives. For climate change to be mainstreamed well in the process, it would be necessary to look at how these may be integrated in all the strategies. This could be achieved by linking climate change with on-going policy reforms or activities e.g. Environmental Impact Assessment for projects/programmes; need to link public sector- private sector and farmers to not only create an enabling environment but also provide resources for infrastructure development. He gave the example of Mt. Elgon District Project on Natural Resource Management and Food Security. The annual maize production is 300 000 MT while consumption is 190 000 MT. But lack of storage facilities is a big problem forcing farmers to sell their produce at very low prices and buy later at high prices. In such a situation, partnerships between the different stakeholders could contribute to infrastructure development to ensure farmers can store or transport their produce to markets where they can get good profits.

Most of the wildlife population is found in the dryland areas which also suffer from the frequent droughts. An environmental tax of USD 1 per tourist could be used in developing a drought master plan.

**Dr Daniel Olago of Pan-START** felt that water pollution needs more mention. Due to our reliance on surface water, pollution could reduce water availability. Hydrological data collection was good up to late 70s but major gaps emerged since then making it difficult to come up with long-term series. The same applies to health data. He sought clarification on the figures given by Mr. Edalia concerning the ratio between surface and ground water and attributed inaccuracy to inadequacy of information on water resources. There is need to build better water storage facilities

Climate change studies should consider all aspects of the environment hence; be multidisciplinary bringing together people from different backgrounds (health, water, agriculture, meteorology etc).

Capacity building needs to focus on existing capacities/initiatives in both government and non government sectors to mainstream climate change in development.

Simon Gathara felt that the climate prediction issue was well captured in the background document. The fact that the density of meteorological stations decreased so much (from 3000 rainfall stations to only 600 over the last decades) means that meteorological department may not have representative data for good forecasts. In the past, many stations were manned by non government entities (with support from meteorological department) but this is no longer possible with the limited financial resources. The department is currently carrying decentralization of its activities by equipping the meteorological field stations with computers (provided by the UK met office) so that the field officers not only collect information and relay to the headquarters but also participate in the analysis and dissemination of such information.

Peter Cooper highlighted the need to follow-up on climate forecasts including intra-seasonal rainfall patterns which could affect crops due to even short spells of no rain). This is being addressed through some of the initiatives involving the Meteorological Department, ICPAC and IRI. Dr Ouma of ICPAC informed the workshop that some work is going on concerning in-season variability. Some models are being developed at ICPAC. Alex Oduor of Regional Land Management Unit (RELMA) reiterated the need for more focus on ground water prospecting and development which is weak in Kenya compared to countries like India.

### **Afternoon Session-Day I**

The first session was chaired by Prof. Tole of Kenyatta University. The first presentation on ***Impacts of climate change on health: Focus on Malaria and Cholera*** was made by Dr. Andrew Githeko of KEMRI/CDC Kisumu. Both diseases are the most relevant with respect to climate change impacts. Malaria is water based insect borne and very sensitive to temperature change (i.e. the vector). Approximately 40% of the world population is affected by malaria. Highland malaria attributed to changing climate is the major source of concern as it affects populations who lack immunity and the main concern is climate variability or anomalies that precipitate disease epidemics. Transmission of malaria has mainly been during the long-rain seasons but now being experienced during the short rains as well. High temperatures increase algae in lakes contributing to cholera outbreak. Incidences of diseases such as malaria and cholera were found to be high during periods of El-Nino.

Main drivers include rainfall, temperature, topography, land use and land cover (the vector needs open sun-lit pools), hydrology and drainage. Topography is important in malaria transmission- flat valley bottom with poor drainage increases the risk of malaria. Biological drivers of malaria include intensity of transmission, duration of transmission, immunity, human genetics, and parasite genetics (including drug resistance).

Malaria control strategies have failed in the past due to a number of factors including inadequate health facilities, ineffective anti-malaria drugs, inadequate vector control, poor housing and environment. It is therefore important to look at other strategies that communities can use including planting of trees which not only helps in controlling mosquitoes but also provide environmental and economic benefits. *funestas tolerate vegetation and shade and transmit malaria during dry season while gambie likes sun-lit stagnant water and transmits malaria parasite during wet season.* Data on health for example disease outbreaks is available through the WHO but not easy to get locally. This should be addressed to allow local researchers access to information for use in developing the disease epidemic predictive models.

**Investigation on Utility of weather and climate forecasts on farming activities in Kwale district Kenya. Josephine M. Mwinamo.** This survey carried out in Kwale district aimed at assessing the relevance of seasonal forecasts to farmers in Kwale in terms of availability and accessibility; finding out how best farmers and other users employ such forecasts to improve their production activities. It was found that forecasts from DMC (ICPAC) rarely reach farmers due to inappropriate/ineffective mode of dissemination. Local people continue to rely on traditional forecasting which uses indicators such as behaviour of animals including birds, flowering of plants etc. Traditional forecasts mostly give an indication of onset of rains but not the duration. Future research could possibly compare meteorological with traditional forecasts.

There is need to strengthen informal institutions to enable them mobilize resources to make good use of climate forecasts. Such institutions could also assist in sensitizing communities on the need to use forecast information.

Use of improved varieties was found to correlate more closely with wealth and education. Poorer and illiterate individuals stick to traditional varieties. Improved varieties if planted with the right forecasts could increase crop yields. Peter Cooper clarified the difference between 'certified' and 'composite' seeds explaining that certified seeds include both composites (which could be re-used for years) and hybrids that have to be bought yearly.

The key lesson was the importance of explaining to people the risk and uncertainty associated with forecasts to maintain the peoples' trust and confidence in the climate forecasts. Nevertheless information is needed that can help people plan their activities within existing conditions.

ICPAC is carrying out a pilot project to promote climate information in a number of processes at both policy and farmer levels.

### **Session III-Day I**

The final session on the first day was chaired by Prof. Wandiga. This session discussed possible climate change research questions. One thing that came out strongly is that scientists always complain about decision makers not making use of scientific research products. Part of the reason is that the products are not tailored to meet demands of policy makers. There is need to carry out demand driven research by encouraging stakeholder participation in all stages of research. Recommendations that came up from the discussion include:

#### **A. Planning**

To mainstream climate change in development, there is need to engage more with policy makers at all levels (National, Sectoral and Local levels) and sensitize them on the need to focus on climate change which is a long-term agenda. This may be achieved by demonstrating the potential impact of climate change including the cost of inaction. In showing the cost of inaction versus adaptation, the best point to start from is the cost of climate related disasters followed by cost of preventing such disasters. ICPAC for example, start working with forecasters from the region on seasonal forecasts and later invite other professionals like biometricians from agricultural institutions to provide the down-scaled seasonal forecasts in appropriate and easily understood format. Climate information needs to be tailored to meet the needs of decision makers if they are to make use of research outputs.

There is need to develop models/methods through which information on climate change could be captured and integrated in the planning process. ICPAC costed flood damage and demonstrated its impact on the economy which led to the development of a new flood management plan using seed money from the UNDP. Similar targeted studies at different levels (at community, district, regional and national levels) are needed to show the cost of impacts, cost of adaptation and benefits of adaptation.

Planning also takes place outside public sector hence the need to include other groups from private sector through creating partnerships between different organizations to make better use of the available climate data.

#### **B. Health**

The health infrastructure (both human and institutional) was found to be very weak hence could not adequately provide the services required.

Lack of data on many diseases during certain periods can not allow long-term series analysis to be carried out. There is an urgent need to improve data collection and management. Information lying in files scattered in different places need to be rescued before they are lost.

There is need to downscale or develop disease epidemic predictive models for different climate sensitive diseases and localities.

A lot of effort is needed to improve the uptake and use of climate information especially within the public sector where this has been very slow and limited.

Sensitization of individuals and households is necessary to encourage people to use available methods. Some of the health problems have been found to be a matter of attitude or culture.

Some of the diseases like malaria could be controlled through Agroforestry and reforestation using suitable trees. Such trees need to be identified.

#### C. Agriculture and food security

Agriculture in Kenya with many challenges which need to be addressed using a combination of strategies covering the following themes.

- Capturing IK on climate
- Packaging of climate/weather information –tailored to meet specific demands
- Dissemination ( format and timing)
- Identifying non-economic causes of food insecurity
- Socio-economic modeling for the region
- Research on improved crop varieties/GM crops
- Creating incentives for public- private partnerships/ Greater role for private sector to buffer the different livelihood options.
- Urban agriculture and waste water

Within the agriculture sector, there is need to build on existing capacities and networks for example, that between agricultural networks and meteorological departments aimed at decentralizing management of climate information. The President of Kenya recently launched strategy of agricultural revitalization which includes focus on semi arid areas and rainwater harvesting.

#### D. Water

- Water monitoring and quality assessment. Monitoring of river flows within the newly created water catchment areas is necessary for the purposes of licensing water operators.
- Impacts of liberalization of water services on the poor.
- Strengthening informal water management strategies (laws, institutions) could help in dealing with conflicts over water resources.
- Investment in water conservation structures.
- Policy on waste-water re-use in the informal sector.
- Flood and drought prediction

#### E. Cross-cutting issues

Josephine Mwinamo felt that climate experts need to work with the traditional forecasters for longer time periods (several seasons and compare their findings). Such results will help to improve on the forecasting ability i.e. strengthening the traditional forecasting mechanism.

Prof. Wandiga concluded by saying that research on vulnerability should have been done to identify the sources of vulnerability (i.e. climate change), identify the coping strategies to ensure ideas are not imposed on communities and to learn what communities affected would prefer. The idea should be to add value to what is happening. Future research should focus on how vulnerable and how communities are coping. Such research should be Interdisciplinary; incorporating both socio-economic and other aspects and need to capture indigenous knowledge.

## **II. Day Two- Climate Change and Development in East Africa.**

### **Session I**

The first session Chaired by Dr. Evans Kituyi of the University of Nairobi started with a general introduction of the participants which included Kenyan participants from day one and regional participants from Sudan, Tanzania and Uganda. This was followed by a key-note message from Joy Hutcheon, DFID London. She said that DFID has always focused on Research-which is growing. DFID is focusing on four key research programme areas for the next four years one of which is climate change. The scoping exercise being carried out is aimed at identifying a range of researchable questions to understand urgent and do-able research. Some questions that the exercise was meant to answer include what will have impacts, what is urgent and what other are doing already.

Dr Saleemul Huq, IIED London gave an overview of the scoping exercise which he said is being carried out in three countries and regions aimed at identify priority areas that research on climate change could usefully address.

Mr. Aaron Munyu, a farmer from Kitui District, Eastern Kenya gave a brief account of the situation they are faced with in Kitui which is a dry land area. Climate variability in form of erratic rainfall is partly responsible for the high poverty levels in the primarily pastoral and peasant farming region. Water scarcity is a major problem as they have only one reliable source of water. Some people are forced to walk long distances spending up to 8hours a day looking for water for both human and animals. He felt that the highly variable rainfall and low household income in the region contributes to food insecurity manifested in malnourished children under the age of five years. Health infrastructure is very poor with the few facilities available often lacking medical personnel lacking. As a result, expectant women rarely attend clinic. Malaria is a serious health problem in the area while drought seriously affects human health.

Weak or absence of informal institutions prevents people from optimally using available resources. Farmers are exploited by middlemen due to lack of functional market. Often they get very low prices from middle men who take advantage of the poor infrastructure.

Dr Peter Cooper reiterated the need to look further than just research. Three levels that need to be considered include process, effects and impacts. He felt that there is need to focus on public knowledge and understanding while redesigning technologies and policies to address challenges brought about by climate variability/change.

Prof. Wandiga felt that prioritization can only take place if research on vulnerability to determine its causes (whether due to climate variability/climate change or other drivers) and how communities are coping at present has been carried out. This, according to him is the most important part of research question as we need to learn lessons from listening to communities. According to Ms Verma, TSBF-CIAT, it is important that people recognize that climate change adds new challenges to existing vulnerability. Dr Simon Anderson concluded by saying that research should not only produce high quality scientific outputs but also information that may be used for poverty reduction. Research need to build capacity of both researchers (supply side) and users of research (demand side) which includes policy makers and practitioners.

## **Session II:**

The first presentation was given by **Dr Faustin Maganga of the Institute of Resource Assessment**, University of Dar es Salaam on *Current initiatives on Tackling poverty through formalization of land and water rights*.

Formalization of land and water rights is an important aspect of climate change and development research more so considering the dwindling water resources for agricultural and pastoral groups. There is a multidisciplinary project currently going in Tanzania. Pastoralism depends on access to water and fodder. With formalization, access to some of these resources could be curtailed. He noted that the current emphasis on formalization of rights comes from Hernando de Soto's advocacy of formalization of property rights which is being taken up in a big way in Tanzania. It is argued that many poor people have been locked out of the global economy because of lack of titles. Tanzania adopted communal land ownership (ujamaa) compared to Kenya which where formalization of land rights through surveys and issuing of individual title deeds has been going on for along time.

Formalization of water rights in Tanzania was adopted in line with 1992 Dublin Principles of water management. It was noted that both customary and statutory systems of land and water management have both strengths and weaknesses and that in most cases, they have existed side by side (legal pluralism). The way forward is to look for ways through which informal systems may be strengthened and allowed to exist along the formal systems. Formalization of land and water rights could marginalize certain livelihood groups. Subdivision of land and subsequent issuance of individual titles interferes with pastoral management systems for example which necessitates that such group's move in search of water and fodder.

Some of the areas that research could usefully focus on include effects of formalization on investment and commercial agriculture, effects on tenure security especially for the poor groups, effects on relationship between pastoralists and settled farmers.

Dr. Olago talked of some pastoral people in Kenya now becoming more interested in land titling and individual ownership yet this may not be the best way to use pastoral areas as it interferes with the migratory nature of their resource management systems.

**Dr Sumaya Zakiideen** gave a presentation on *Community based rangeland rehabilitation for drought management (Annex 3)* The AIACC project implemented in Sudan was aimed at reducing the risk of production failure by increasing the number of alternative livelihood strategies. Some of the activities carried out to promote community resilience include institutional building, training on a number of issues including rangeland rehabilitation (which included replanting and stabilization of sand dunes, creation of windbreaks, livestock restocking and management); community development (implementation of both water and energy plans, introduction of revolving credit and drought contingency planning).

Participation in decision making processes among marginalized groups and access to grazing areas improved after implementation of the project. In addition, the project demonstrated the viability of livestock keeping as opposed to farming in this marginal environment. It was realized that availability of market information and access to credit facilities are important for rural livelihoods. Ground water management and conflict resolution over shared resources are priority areas for Sudan considering that much of the land area is arid or semi arid.

**Dr Rao, KPC of ICRISAT** gave a presentation entitled *making the best of our climate* drawing lessons from an-going research in dry land area of Machakos, Kenya (Annex 4) The main target area of looking at climate variability should be the Semi-arid tropics (SAT) where agriculture is practiced but rainfall is highly variable. It is here that diversification of production systems are needed. The risks associated with highly variable rainfall have limited adoption of improved farming technologies and investment in agriculture. From the study, it is emerging that farmers are able to use seasonal forecasts if they are reliable and available with enough lead time. Farmers also use indigenous forecasting which relies on such indicators as temperature, rings around the moon, behavior of birds and indicator trees which are not documented hence difficult to verify.

He concluded by saying that high variability in seasonal rainfall is forcing farmers to adopt low risk conservative management strategies. Though it is difficult to get accurate forecasts, significant gains could be achieved using the available forecasting skills. Use of seasonal climate forecasts has the potential to serve as an adaptation strategy to long-term climate change.

**Dr. Gilbert Ouma of ICPAC** gave an overview of ICPAC which started in the early eighties as a drought monitoring centre and later split into 2-one in Harare and the other in Nairobi. The mandate has been broadened from looking at how the impacts of drought can be reduced to improving rainfall forecasts season by season for each of the ten countries they cover. The Climate Outlook Forum is usually organized three weeks before each season to produce a consensus. Policy makers are invited to this forum where the forecasts are given. Country representatives from different sectors (e.g. agriculture, health etc) are usually seconded to the centre for short training and to attend workshops as part of capacity building in the region.

Multidisciplinary pilot application research projects are also carried out. The aim is to create a good network of professionals to improve dissemination. ICPAC is already working with journalists who are invited to the climate outlook forum to disseminate information that could influence policy makers. The centre also carries out applications research in collaboration with the University of Nairobi and other institutions for Masters and PhD students. He concluded by saying that adapting to climate variability is like “a dress rehearsal” for adapting to climate change.

A question was directed to Dr. Ouma on the accuracy of their predictions. In response, he gave the example of 1984 drought which caught people unprepared resulting to huge loses. He felt that the predictions are getting better with time and less damage has been experienced in the more recent droughts for example, the 2000 drought. He attributed this to aggressive campaigns mounted and working closely with the disaster management team in the office of the president.

**Dr Louis Verchot of ICRAF** gave a presentation on *Climate Change: Linking adaptation and mitigation through Agroforestry.*(Annex ) Agroforestry can play a major role in climate change responses. The need to address climate variability/change is due to a number of factors including increasing food demand, stagnating or decreasing harvested areas, limited ability of new varieties and fertilizers to further increase yields and resource degradation.

Adaptation in the agricultural sector is necessary because the primary drivers of climate change are not going to stop; global conventions are not sufficiently effective to stop the increase of GHG concentrations; mitigation effects will only provide a partial softening of effects of climate change and therefore, local climates and terrestrial ecosystems will change, threatening biota and human livelihood. At the farm level, some of the challenges that may need to be addressed in light of climate change include markets, risks of pests and diseases, weeds among others.

It is important that farmers are supported to remain agile (continuously moving targets) in responding to new challenges by adapting their production systems. Some of the outstanding questions for Agroforestry in adaptation to climate change include its role in buffering against droughts, potential of tree based production systems in vulnerable areas, quantification of relationship between biodiversity and sustainability and the synergy between climate change benefits and other ecosystem services (e.g. biodiversity, watershed function). Sub-Saharan Africa and south Asia are the “hotspots” for climate change. ICRAF in collaboration with the Kenya Agricultural Research Institute (KARI) and Extension Department are working in the degraded areas of Western Kenya.

Following the presentation, a question was raised if the study also considered the impacts of HIV/AIDS on population growth. The presenter responded by saying that they recognize HIV/AIDS, malaria and other diseases to have major impacts on the society but the population has been increasing at a high rate despite this. They will try to incorporate the socio-cultural factors in their study in Western Kenya.

Comments also came from Dr. Olago who felt that other issues including market decentralization and fallowing for degraded lands are also worth looking at. Solutions will however be heterogeneous as specific regions may require specific technology application. Another question raised was the stagnant production levels despite increasing land area.

### **Session III- Day II.**

Victor Orindi of the ACTS gave an overview of the scoping exercise background paper on *climate change and development in East Africa* (Annex). He noted that climate change affects the likelihood of success of development projects and programmes as they have impacts on natural resources and people. Development initiatives on the other hand may make communities better prepared to deal with climate change but may also reduce their ability to adapt to climate change. The good thing is that, measures aimed at adaptation also address poverty reduction.

East Africa has a highly variable rainfall system and has experienced many climate related disasters (including floods, droughts etc) in the recent past. In general, East Africa is expected to receive increased rainfall compared to Southern Africa for example. But even within East Africa, the impacts of climate change will not be uniform. Even with rainfall increase, some areas could experience decreased runoff due to higher temperatures. Arid and semi arid areas for example, are projected to get drier with climate change while areas with bimodal rainfall patterns are likely to get wetter.

Climate change could impact many sectors negatively. Agriculture which supports over 80% of the population and contributes approximately 40% of the regions GDP could for example be seriously affected by changes in precipitation and temperatures. Rainfall

variability is already affecting agricultural production as it limits adoption of improved farming technologies and investment in agriculture due to the many risks associated with rainfed agriculture. Compared to other regions (e.g. West Africa), East Africa has the least area under Irrigation agriculture despite the high potential. Sudan which is relatively dry compared to Kenya, Uganda and Tanzania accounts for most of the area under irrigation in this region. Irrigation development is one of the ways through which agriculture could be protected from risks associated with highly variable rainfall. But it is important that socio-cultural factors are considered when coming up with new irrigation plans to avoid marginalizing certain groups. Women for example are responsible for subsistence food production but have been displaced by men when irrigated areas start producing for markets. Pastoralists are another group faced with many challenges (e.g. subdivision and individualization of land ownership, diminishing forage and water resources, poor infrastructure including markets etc) even without climate change.

Research could therefore address many of the challenges facing the agricultural sector including provision of reliable forecasts, development of improved crop varieties, risk of pests and diseases, risk of land degradation and establishment of public-private partnerships to provide resources which are currently not available.

Climate change will influence the epidemiology of many vector borne diseases because the vector organisms have adapted to different ecosystems. Climate variability and short-term climate phenomenon have been associated with a number of epidemics including the 1997 malaria outbreak in South Uganda and Rift Valley in Northern Kenya attributed to the El-Nino. There has been an effort towards developing disease epidemic predictive models which could contribute to effective management of disease epidemics. Further monitoring of appropriate climate and disease variables for long-term trend analysis are needed. Sudan and Tanzania acknowledged in their initial national communications to the UNFCCC the difficulty in assessing climate change impacts on malaria due to lack of reliable epidemiological records and limited resources. Nevertheless, studies conducted in the region have shown that malaria transmission may become more intense at higher altitudes within tropical areas but could be limited in parts of Sudan due to higher temperatures. Meningitis infection (which is associated with decreased rainfall and dusty conditions) together with dengue fever (which could be increased with increased water storage) should be a priority for dry areas

In all the four countries, health infrastructure (both personnel and facilities) and data management systems are poor/inadequate. These must be strengthened to provide accurate information that may be used to develop or validate models for more targeted and effective control of climate sensitive diseases. Socio-economic and political factors that are also important factors in the disease epidemiology also need to be addressed. Care should be taken to ensure that the vulnerable groups are protected.

Climate Change and water resources: Large parts of East Africa are arid or semi arid commonly experiencing rainfall of below 500 mm/yr. Such areas already face problems of water scarcity because most of the countries depend on fresh water resources for domestic, agricultural and hydro-power generation. The fact that precipitation is one of the variables that will be most affected by climate change means that the number without access to water may increase. Competition among different users could stiffen leading to conflicts. Already, conflicts between pastoral and agricultural groups are being experienced in many places more so during the dry periods. Dry areas in East Africa could get drier with climate change. Some of these areas are far from surface water

sources (e.g. rivers) and may increasingly focus on the available ground water sources. Unfortunately only limited information is currently available on ground water resources which could guide such development.

Many reforms are currently being implemented in the water sector including formalization of water rights accompanied by creation of new rules and institutions, liberalization of water services including greater involvement of the private sector and water users. While the intension is to improve water management and therefore, increase available supply, some of the activities could marginalize certain groups further. Poor urban and rural areas that may be unattractive to private investors could be easily left out in terms of expansion of water service infrastructure; requirement that people apply for a license for irrigation could marginalize the poor who practice subsistence irrigation but may not afford to pay even what is considered. There is a feeling that the reforms have been carried out hurriedly without adequate sensitization of the public and that the focus has been too narrow (on drinking water).

Research could provide useful information on river flows that may guide large adaptation strategies (like inter-basin water transfer) and economic activities (e.g. hydro-electric power generation), data to guide development of ground water resources and effective ways of managing shared water resources. Impacts of liberalization of the water sector on the various livelihood groups need to be explored as well.

Climate related disasters contribute to the high poverty levels in the region and non-achievement of development targets. The frequency and extent of climate related disasters has been increasing over the past years. The region has suffered from numerous droughts and floods. Large areas of Kenya and Sudan are affected by drought. The 1997 El-Nino is estimated to have damaged 10000 km of roads in Uganda while the year 2000 drought is estimated to have costed Kenya USD 20 million due to reduced hydroelectric power generation which resulted in frequent blackouts and power rationing. Dealing with disasters calls for development of early warning systems and disaster preparedness schemes. In addition, both floods and droughts could be mapped and costed so that resources are allocated to help in coming up with appropriate management strategies.

Biomass resources account for over 80% of the energy consumed in the region. Hydro-electric power which is a major source of energy for industries is also sensitive to change in precipitation. The projected reduction in precipitation in some of the river basins (e.g. pangani and Ruvu in Tanzania) could result in decreased electricity generation. Some of the renewable energy technologies exist (e.g. solar) but they remain largely expensive and inaccessible to majority of the poor. There is need to address the issue of cost so that available renewable energy could be widely adopted.

The long East African coastline consists of many diverse and ecologically important ecosystems. Projections indicate that a sea level rise of 1M could inundate over 2117 Km<sup>2</sup> of Tanzanian coast accompanied with a number of risks including destruction of infrastructure and property, contamination of fresh water resources among others. Estimating the risk of erosion, salinity and temperature variations could provide useful information that can be used to guide coastal development.

East Africa is rich in biodiversity which supports the tourism industry. Tourism is a major foreign exchange earner and support many people in form of employment and service

provision. Climate change is likely to change ecosystem boundaries creating new challenges. This may add on to the current challenges including human/wildlife conflicts that need to be addressed. There will be need for more flexible management systems that may encourage communities neighboring wildlife areas to be actively involved in wildlife management for example through sharing benefits.

### **Key Discussants**

**Paul Isabirye -Metereology Department, Uganda.** Uganda experiences moderate climatic conditions. In the recent past, the country has experienced an increased frequency of drought accompanied by a sustained warming of 0.3°C per decade over the southern parts of Uganda. Minimum temperatures are rising much faster than maximum temperatures.

As Uganda's socio-economic development will continue to depend on utilization of natural resources, this could predispose the country to the vagaries of climate. Agriculture contributes over 40% of the GDP and over 90% of export earning. Successful poverty reduction strategy in Uganda is more likely through the agricultural sector compared to the industrial sector. This is because Uganda does not have heavy industries. Coffee is one of the crops that is likely to be affected most by climate change. The anticipated increase of 2°C could significantly decrease coffee growing areas.

Increasing temperatures could also contribute to problems of water scarcity in Western Uganda. The shrinking of snow on Mount Ruwenzori will affect river flows and water availability in many areas. Uganda used to export HEP to Kenya and Rwanda but now plans are underway to import electricity from Kenya due to drop in water levels at the Owen falls dam in Jinja. Tourism, another important industry, could also be affected by climate change.

The increased incidences of Malaria in Southern Uganda have been associated with increase in temperature creating conducive environments for malaria transmission. Temperatures of 40°C have been experienced of late.

Uganda is carrying out a NAPA which could yield more realistic and researchable areas for different parts of the country. This would be useful in guiding research that could provide useful information for the different sectors. Some research carried out in the past has been "too course" to be useful. It should be noted that different agro-ecological zones have different information needs hence research should provide such information.

It is important to do research on real livelihoods because some people may not be aware of how sensitive various aspects of their lives are to climate change. There is need to build on indigenous knowledge by enriching it with scientific research to help communities adapt to changing climate. Forecasting is important and some good work has been done. However the existing capacity should be used in carrying out more research and downscaling global climatic models to regional and local levels.

**Daniel Nkondola –Vice Presidents Office, Tanzania** noted that his country also endorses adaptation as many sectors including agriculture and livestock, water, health etc will be affected by climate change. Under agriculture and food security, he felt that there is need to focus on changes in land use and crop management, improving management of irrigation systems. For livestock sectors, issues to be addressed include changing grazing systems, animal breeding and land use title deeds. Review of existing disease management programme could help in addressing current weaknesses and

together with an effective monitoring and early warning system; the health sector would be better prepared to deal with some of the disease epidemics.

According to **Dr. Andrew Githeko**, one of the priority areas for research is the role of Agroforestry and reforestation programme on climate regulation and disease control. Reforestation could provide climate buffers that may provide cool microclimate effective in controlling vectors. It also has additional benefits in terms of wood and other products. Agroforestry and reforestation are also important in terms of mitigation of greenhouse gas emissions. **Dr. Olago** of Pan-African START felt that within the agriculture sector, other benefits from agroforestry initiatives should be explored. More work is needed on decentralization of resource management systems and diversification of livelihood strategies; traditional modes of coping to separate myths and realities. This will improve understanding on what works and what may not work in different areas. Hydro-climatic Zoning could also help in identifying appropriate crops for the different areas.

Within the health sector, it would be necessary to secure the historical health data that may be lost. Otherwise, it would be difficult to study disease history without such information.

Lake Victoria is a source of livelihood to over 20 million people. Fisheries resources support many people around the lake. Change in fish production due to climate change will affect many people. Warming for example has affected nutrient cycling in Lake Tanganyika causing a decline in fish production. Monitoring of biological parameters would be useful in detecting such changes. Higher temperatures have also been shown to lead to anoxic conditions which could significantly affect fish production in the lakes. Knowledge of hydrological regimes is still inadequate even though it is known that a lot of mass wasting has occurred affecting river flows. With climate change, rivers could dry and affect livelihoods. More work is also needed on the impact of land use and land cover change on microclimate. Activities such as reforestation could also reduce the risk of climate related disasters like land slides. Design of structures need to be reviewed and factor in potential impacts of climate change.

Coastal ecosystems like mangroves play many important roles but are also sensitive to climate change. Sea level rise will likely affect freshwater aquifers where many people in coastal areas draw water from. Above all, rapid and low cost environmental indicators need to be identified. Integration of climate change/environmental education could assist in sensitizing the public.

Dr. Gilbert Ouma of ICPAC concurred that data rescue and retrieval are necessary to ensure that existing information is not lost. In addition more targeted research in each sector combined with climate information would be useful in promoting adaptation to climate change.

Dissemination of climate information should be enhanced by engaging with key audiences. Surveys may be carried out to identify what kind of information people need. Cross-border trade could be an important coping strategy hence it is important to harmonize regional policies. ICPAC is currently carrying out research and downscaling global climate models to local conditions. Other regional centres that could provide useful information include the regional centre for resource survey and remote sensing.

Dr Sumaya Zakiideen, Sudan was of the opinion that scenario based research which was used in the initial studies for preparing the initial national communication generates a lot of data but focuses too much on certain sectors (e.g. rainfed agriculture) but not

other important sectors which for Sudan include coastal and river zones which should be addressed.

Models for the Gash River show that it has two courses which keep on shifting causing a lot of damage due to floods more than even drought. Some places are affected by both floods and droughts but decreased precipitation from climate change would lead to serious problems considering that more than 50% of Sudan is either desert or dryland area.

Stakeholder analysis using bottom up approaches could generate a lot of useful information as seen in the many research activities going on along the White Nile. This kind of research is not very expensive and could be easily done. Lack of Land Use Policy in Sudan is causing a lot of problems. In certain areas, development causes hindrance to movement and conflict over resources. This may worsen with climate change.

Prof. Wandiga felt that social Sciences has to be a key element of any climate change research programme for better discussion with policy makers. This is still the weak link between climate change and development. Dr. Olago and Ms Verma concurred that equity is as part of social entitlements need to be addressed clearly in the adaptation mechanisms since the most vulnerable groups are disproportionately impacted. Example is the loss of ice caps on East African Mountains which could affect the hydrology and Hydro Electric Power generation despite their limited contributions to green house gas emissions. There is need to know the implications and what needs to be put in place in terms of contingency. Projections show that the snow cap on Mount Kilimanjaro could all melt by 2030. Biomass which accounts for the largest share of energy used in the region will be impacted by a number of factors including global warming and land use changes. Land use change will result in loss of biomass sector which could affect the energy supply.

Research must find ways of mainstreaming the concerns into sectoral policies by creating a framework through which this can be integrated.

Ms. Verma felt that the role of social scientists in climate change research should be encouraged. Impacts on culture which is a building block for life and livelihoods is an area of concern. Cultural biodiversity is important and need to be preserved. Other issues that climate change research needs to focus on include groups marginalized by climate change/variability with access to resources.

Godwin Kakama- Planning-Uganda noted that critique of government policies is necessary to attract attention of policy makers. Research needs to provide inputs to government policy making processes.

### **Session III.**

The Final Session was meant to summarize and prioritize issues emerging from the workshop. Some of the points which participants felt could be used in prioritizing research in the region include:

1. Vulnerability- knowing who and where vulnerability is. It is important to distinguish between those sectors/aspects that poor people really depend on which may be exacerbated by climate change e.g. effect on maize production.
2. Relevance of research questions to poverty.

3. Links to other processes like the Millennium Development Goals (MDGs), NEPAD etc

The research themes/problems outlined during the last session are as follows:

### **1. Agriculture and Food Security**

- Climate Forecasting (Developing reliable indicators, Packaging and dissemination of information-RANET Programme), reliable models, scenarios and indicators.
- Downscaling Global models
- Identification/development of appropriate/improved crop varieties
- Potential impacts of high temperatures to dairy industry
- Risk of pests and diseases
- Risk of land degradation (soil erosion especially areas of increased rainfall, desertification-Sudan)
- Public-Private partnerships
- Hydro-climatic zoning
- Markets and relationship to poverty
- Most vulnerable sectors in society
- Post harvest storage/losses
- Coping strategies in relation to on-going change
- Social cultural impacts
- Policies and institutions that (dis)encourage adaptation strategies
- Community capacity to deal with challenges
- Efficient utilization of water for irrigation
- Land-atmosphere interactions
- Use of long-term daily climatic data to characterize and map the probability of success of agriculture in the context of climatic variability and CC.
- Identify small scale income generating options
- Impact of shifting AEZ on crops/animals

### **2. Climate change and health**

- Development & Validation of predictive models for more targeted and effective control of climate sensitive diseases
- Socio-economic and political factors are equally important in addressing some of the problems (Most vulnerable groups).
- Role of Agroforestry and reforestation in disease vector control/ medicinal value of plants
- Review of health policies
- Climate, agriculture and nutrition
- Health infrastructure
- Health Data rescue improving data management for Climate Related Diseases
- Climate and other diseases e.g. HIV/AIDS

### **3. Climate change and Water**

- **Impacts of CC on inland waters; possibility of salvaging (fisheries, land use changes- Lake Jipe-river Lumi)**
- Hydrological modeling (Inter-basin water transfer, HEP)
- Water harvesting and storage
- Mapping of ground water resources/
- Artificial ground water recharge.

- Transboundary management of water resources
- Impacts of liberalization on the water sector/ water governance
- Improving irrigation performance
- Climate induced land use change and impacts on river basins.
- Impact on aquatic bio-diversity
- Early warning systems –floods
- Impacts of CC on Indigenous irrigation management systems
- Water quality for drinking

#### **4. Climate change and disasters**

- Mapping of both drought and flood risks - (damage to economies and public health problems)
- Delinking climate change and disaster
- Disaster preparedness and early warning systems Thresholds for various systems
- Costing impacts of droughts and floods
- Existing coping mechanisms of communities
- Mechanism of extreme climate events

#### **5. Climate change and energy**

- Improving access to renewable energy technology.
- Hydrological changes, climate forecasting and HEP Generation
- Impacts of land use changes on biomass energy
- Energy policy review & reforms
- Review of energy codes based on extreme events
- Impacts on hydraulic structures

#### **6. Climate change and coastal resources**

- Estimate risk of erosion, salinity and temperature variations to predict sea level rise
- Risk of saline water intrusion in coastal aquifers
- Effect of climate induced sea level rise
- Effect on marine biodiversity
- Somali currents-one of the richest

#### **7. Climate change and biodiversity**

- Shift in ecosystem boundaries-ecosystem fragmentation
- Current challenges including human/ wildlife conflicts need to be addressed.
- Sharing of benefits with communities neighboring conservation areas.
- Impacts on important biodiversity reserves
- Value of agricultural biodiversity in coping with climate variability and potential CC
- Biodiversity hotspots

#### **8. Cross-cutting issues**

- Indigenous Knowledge
- Equity
- Decentralization and diversification of lives
- Policy reviews
- Vulnerability
- Science-policy/society linkages

- Land use change
- Multidisciplinary
- Capacity building
- Access and sustainability of Natural Resources
- Socio-cultural/economic impacts

## Annexes

### Annex I: List of participants

#### List of Participants

#### ACTS Consultative Workshop on Climate Change and Development

14th April and 15th April 2005

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**Annex II: Agenda for 14<sup>th</sup> and 15<sup>th</sup> April 2005**

**Consultative Workshop on Climate Change & Development  
Conference Hall World Agroforestry Centre (ICRAF) Nairobi  
14- 15 April, 2005**

**DAY one 14<sup>TH</sup> April**

<b>Time</b>	<b>Session</b>	<b>Chair/Presenter</b>
8:30 -9:00 am	Registration	Celline Achieng
9:00 -9:45 am	Welcome address  Introductory Remarks  Project Background	Benson Ochieng, ACTS  Joy Hutcheon DFID Simon Anderson, DFID James Tuohy, DFID  Dr. Saleemul Huq, IIED
<b>9:45 – 10:15 am</b>	<b>TEA/COFFEE Break</b>	
10:15 -12:45 pm	<b>Session I</b> <i>Presentation on Climate change and development in Kenya (results of the scoping exercise).</i>  Questions and Clarifications          Open floor discussion	<b>Chair:</b> Dr. Saleemul Huq Victor Orindi- ACTS  <b>Key discussants:</b> Prof Shem Wandiga – KNAS Mr. Francis Edalia –Deputy Director Ministry of Water Amos Odacha- Ministry of Health John Nyangena- Ministry of Planning Dr. Peter Cooper-ICRISAT
<b>12:45 -2:00PM</b>	<b>LUNCH</b>	
2: 00 – 3.45pm	Session II  <b>Interactive session covering studies on impacts of climate change in various</b>	<b>Chair:</b> Prof. Mwakio Tole- Kenyatta University

	<b>sectors &amp; use of climate information</b>  <i>Impacts of Climate change on Health</i>  Open Floor discussion  <i>Investigation on Utility of weather &amp; Climate forecasts on farming activities in Kwale District Kenya</i>  Open floor discussion	Dr. Andrew Githeko – KEMRI/CDC  Ms. Josephine M Mwinamo, Waa Girls' High School, Ukunda.
<b>3:45- 4:15pm</b>	<b>Tea/coffee Break</b>	
4.15-5.30p.m	Summary and Discussion on Kenya research priorities	<b>Chair:</b> Prof Shem Wandiga, KNAS
<b>5: 30 -7:00pm</b>	<b>Cocktail</b>	

**Day Two 15<sup>th</sup> April**

<b>Time</b>	<b>Session</b>	<b>Chair/Presenter</b>
8:30 – 8:45 am 8.45- 9:45am	Registration ( Regional participants) <b>Session I</b> Welcome remarks  Introduction  Project Background	Celline Achieng'  Victor Orindi  Dr Evans Kituyi  Dr. Simon Anderson DFID James Tuohy, DFID  Dr. Saleemul Huq IIED
<b>9:45 – 10:15</b>	<b>Tea /Coffee Break</b>	
10:15 – 1:00	<i>Presentation on Regional Studies</i>  <i>Current initiatives on Tackling poverty through formalization of land and water rights</i>  Discussions  Strategies for increasing human resilience in Sudan: Lessons for Climate Change Adaptation in the Sahelian Africa  Discussions	<b>Chair:</b> Dr. Evans Kituyi- UoN  Dr. Faustin Maganga- Institute of Resource Assessment University of Dar es Salaam  Dr. Sumaya Zakiideen- HCNER-Sudan
<b>1:00 – 2:00 pm</b>	<b>Lunch</b>	

<p>2:00 -2:45 pm</p>	<p><i>Climate change &amp; development in East Africa: key issues from the scoping exercise</i></p> <p>Open floor discussion</p>	<p><b>Chair:</b> Dr. Saleemul Huq</p> <p>Victor Orindi- ACTS</p> <p><b>Key Discussants:</b>  Paul Isabirye-Uganda  Daniel Nkondola- Tanzania  Dr. Andrew Githeko- KEMRI/CDC  Dr. Daniel Olago-Pan-African START Secretariat  Dr. Gilbert Ouma-ICPAC</p>
<p>2.45-3.30pm</p>	<p><i>Climate Change Activities Review</i></p>	<p>Victor Orindi</p>
<p><b>3.30: 4:00 pm</b></p>	<p><b>Tea/Coffee Break</b></p>	
<p>4:00 -5:30 PM</p>	<p><b>Session II</b></p> <p>Panel discussion on regional research priorities: national and regional scope science and technology and funding priorities</p> <p>Open floor discussion</p>	<p><b>Chair:</b> Dr. Saleemul Huq IIED</p> <p><b>Key discussants</b></p>
<p><b>5.30PM</b></p>	<p>Concluding remarks</p> <p>Vote of Thanks</p>	<p>Dr. Simon Anderson, DFID</p> <p>Victor Orindi</p>