

# Climate Change

## Climate Change and Economic Development in Sub-Saharan Africa

AERC Senior Policy Seminar X  
Addis Ababa, Ethiopia  
7–9 April 2008

### **Seminar Report**

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The *African Economic Research Consortium* (AERC), established in 1988, is a public not-for-profit organization devoted to the advancement of economic policy research and training. AERC's mission is to strengthen local capacity for conducting independent, rigorous inquiry into problems facing the management of economies in sub-Saharan Africa. There are two principal approaches to this: learning by doing research in thematic, collaborative and other modalities, and support for postgraduate training through collaborative master's and PhD programmes.

Networking – the linking of individuals and institutions in a knowledge sharing, experience sharing framework – is the key strategic instrument for implementing AERC's activities. The network approach links economists within and outside the region and promotes professional esprit de corps.

The Consortium is itself a network of 16 funders who support a commonly agreed programme of research activities, its dissemination and the training of future potential researchers. The Board of Directors sets broad policy, provides support for a multi-year programme of activities, approves annual work programmes and budgets, and appoints the Consortium's international staff. An independent Programme Committee sets the research agenda, advises on scientific matters, and reviews and approves proposals for research and training grants. Academic Boards for the collaborative master's and PhD programmes oversee the implementation of their respective programmes. A small Secretariat, based in Nairobi, Kenya, manages the programme and provides technical support to researchers, students and participating institutions. This organizational structure allows for ownership of AERC activities by the network of local researchers, an independent determination of the research agenda, and a programme of activities that is responsive to the professional and policy needs in the region, while at the same time ensuring accountability to funders.



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ii

# Contents

List of Abbreviations	iv
Acknowledgements	v
Climate Change ... Seminar Rationale	1
Climate Change and Economic Development – Issues, Challenges and Opportunities for Africa	4
Food Security and Sustainable Agriculture: The Challenges of Climate Change in SSA	8
Climate Change, Trade and Competitiveness	11
Climate Change and Economic Growth in SSA: An Assessment of Climate Risk	14
Lessons and Policy Options	16
Impact of Climate Change on Economic Development	16
Lessons Learnt from Other Parts of the World	17
Opportunities Presented by Climate Change for Economic Development	18
Challenges Presented by Climate Change for Economic Development	18
Strategies and Policy Options for Managing the Impact of Climate Change	19
Policy Relevant Research Issues Based on Identified Challenges	20
Closing	20
Annexes	
A Seminar Papers	21
B Seminar Participants	22
C Seminar Programme	31

# Abbreviations

AERC	African Economic Research Consortium
AfDB	African Development Bank
AIDS	Acquired immune deficiency syndrome
AU	African Union
CDM	Clean Development Mechanism
CH <sub>4</sub>	Methane
CO <sub>2</sub>	Carbon dioxide
DRC	Democratic Republic of Congo
FAO	Food and Agriculture Organization
ECOWAS	Economic Community of West African States
GDP	Gross domestic product
GHG	Greenhouse gas
HIV	Human immuno-deficiency virus
IIASA	International Institute for Applied Systems Analysis
ICT	Information and communication technology
IDRC	International Development Research Centre
IPCC	United Nations Intergovernmental Panel on Climate Change
MDGs	Millennium Development Goals
NAPAs	National Adaptation Programmes of Action
N <sub>2</sub> O	Nitrous oxide
PRSP	Poverty reduction strategy paper
SPS	Senior Policy Seminar
SSA	Sub-Saharan Africa
SST	Sea surface temperature
UNECA	United Nations Economic Commission for Africa
UNFCCC	United Nations Framework Convention on Climate Change

## Acknowledgements

As projections of the adverse impacts of climate change and global warming continued to worsen, we at the African Economic Research Consortium realized that we needed to be more proactive in identifying the economic policy issues underlying the problem – and the solutions. That realization, reinforced by requests from policy makers, was the genesis of the choice of theme for our tenth Senior Policy Seminar. This is a new area for us, and enlisting the necessary expertise required looking beyond our traditional network.

AERC is immensely grateful to the Government of Ethiopia for welcoming us to the country. We also appreciate the cooperation of the United Nations Economic Commission for Africa - UNECA - for hosting the event at their headquarters. We are especially thankful to the scholars who were more than willing to share the results of their research in this forum, and to the policy makers who joined us for discussions. Their interest was manifest throughout the proceedings, making for dynamic discussions. We thank them all.

We also thank Prof. Olu Ajakaiye, AERC Research Director, Charles Owino, Communications Manager, and Lydiah Auma, Publications Administrator, for their tireless efforts in planning and implementing the seminar. And we acknowledge Jacqueline Macakiage, Resource Mobilization Manager, Dr. Damiano Manda, Thematic Research Manager, and Dr. Felix N’zue, Collaborative Research Manager, for their role as rapporteurs. Miriam Rahedi, Publications and Communications Assistant, assisted with the preparations; Winston Wachanga, Information Resources Administrator, worked on promotional materials, Damaris Michoma, Human Resources Administrator, assisted with logistics, and Margaret Crouch, publications consultant, edited and designed the report. To all of these and the many others who were involved, AERC extends its sincere appreciation.

*William Lyakurwa*  
Executive Director  
African Economic Research Consortium



# Climate

## Climate Change... Seminar Rationale

This is the word on everyone's lips these days, as it portends potentially massive alterations in weather patterns around the world and disruptions to economic growth in many regions. Coping with the impact of climate change is a major policy challenge, especially in Africa, which is projected to bear the brunt of adverse effects even though its contribution to the phenomenon has so far been minimal.

For all these reasons, climate change was chosen as the topic for the tenth Senior Policy Seminar to be convened by the African Economic Research Consortium (AERC). The theme is a major departure for the Consortium, but the policy connection compels AERC's involvement in this issue. Thus the seminar addressed the physical, socioeconomic and global impacts of climate change with reference to sub-Saharan Africa, particularly in terms of poverty reduction measures since agriculture forms the backbone of the continent's economies and the livelihoods of Africa's poor. Nearly 80 participants from 21 countries came together for the event. They included top African policy makers and advisors, scholars, resource persons, and directors of various research institutes.

To policy makers who feel that poverty issues are more pressing than climate change, Prof. Richard S. Odingo, one of the presenters, pointed out that "we can't solve poverty until we stop climate change". This was the challenge facing the participants at this seminar. That many of them also found the challenge compelling can be seen in the attendance of six full ministers and two assistant ministers who remained partners in the proceedings throughout.

Discussions at the seminar revolved around four major areas:

- ◆ Climate change and economic development – Issues, challenges and opportunities for Africa
- ◆ Climate change, agriculture and food security
- ◆ Climate change, trade and competitiveness
- ◆ Climate change and economic growth

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Nearly all of the impacts of climate change – in Africa and elsewhere – are exacerbated by inappropriate policy choices.

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Also on the programme was a screening of the award-winning documentary, *An Inconvenient Truth*, produced by former U.S. vice-president Al Gore. Mr. Gore shared the 2007 Nobel Peace Prize with the Intergovernmental Panel on Climate Change (IPCC) for their efforts to “change the world’s consciousness” about the challenges of global warming.

## Opening Session

Welcome: William Lyakurwa, Executive Director, AERC  
Welcome: Lalla Ben Barka, Deputy Executive Director, UNECA  
Keynote: Louis Kasekende, Chief Economist, AfDB,  
Programme Overview: Olusanya Ajakaiye, Director of Research, AERC

In his introductory remarks, William Lyakurwa highlighted the aims of AERC’s tenth Senior Policy Seminar (SPS). Through the focus on climate change and economic development in sub-Saharan Africa, Professor Lyakurwa explained, “It is expected that policy makers in the seminar would spell out a proactive stance for African policy makers in general, particularly as the international community prepares to arrive at global consensus on managing climate change. The tenth SPS is aimed at making a strong and positive contribution to the policy making process for the long term-benefit of sub-Saharan African countries by increasing awareness among national and regional policy makers on climate change”. He pointed out that it is important to keep in mind that nearly all of the impacts of climate change – in Africa and elsewhere – are exacerbated by inappropriate policy choices, often those taking a short-sighted view of what is best for some definition of economic development. Such choices arise from the “they-did-it-why-can’t-we” syndrome, as well as from the idea that business may suffer if controls are put in place. Or simply from the failure to recognize the importance of sound urbanization, population, agriculture, land use and water policies in overall economic development.

Lalla Ben Barka, Deputy Executive Director of the United Nation Economic Commission for Africa (UNECA), which hosted the event, followed Professor



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Climate change is always associated with economic gains as well as losses. If the losses outweigh the gains, the human population will be at risk.

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Lyakurwa with welcoming remarks on behalf of the UNECA Executive Secretary, Abdoulie Janneh. Ms. Ben Barka acknowledged the significance of climate change to African economies and congratulated AERC for taking the initiative of mainstreaming climate change into its research agenda. Climate change is also important to UNECA, she said, which has taken steps to establish a Climate Policy Centre to build the capacity of African policy makers who participate in international discussions on climate change.

Louis Kasekende's keynote address stressed the need for an African voice in the international arena. This requires stronger collaboration between research institutions (such as AERC) and continental bodies (such as the AfDB and UNECA). It is in the search for such collaboration that three organizations (AfDB, UNECA and AERC) arrange the annual African Economic Conference, which brings in African researchers including those in the diaspora. Dr. Kasekende pointed out that climate change is always associated with economic gains as well as losses. If the losses outweigh the gains, the human population will be at risk. It is therefore necessary to minimize the risks associated with climate change by trying to limit cost to around 1% of GDP, rather than permit costs to reach 20% of GDP, a level and more that is possible if the impacts are not minimized. Moreover, he said direct and indirect impacts of climate change threaten to reverse decades of economic development efforts.

By bringing together renowned African scholars, the seminar intended to explore ways of sensitizing the region's governments to advise their communities to take a proactive stance to climate change in order to reduce vulnerability to the vagaries of drought and flooding.

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One can't talk about economic growth in sub-Saharan Africa without addressing agriculture, and one can't address agriculture without considering climate change. The policy issues are intertwined and have major potential for impact on poverty reduction efforts.

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To date, little effort has been made to mainstream climate change into countries' economic planning.

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## Climate Change and Economic Development – Issues, Challenges and Opportunities for Africa

Chair: Prof. William Lyakurwa, Executive Director, AERC, Nairobi, Kenya

Presenter: Prof. Richard Odingo, Vice Chair, Intergovernmental Panel on Climate Change (IPCC); and Distinguished Professor of Hydrology, Geography Department, University of Nairobi, Kenya

**A**nthropogenic – human induced – climate change is the culprit in the global warming phenomenon seen today, according to Professor Odingo, mainly through agriculture and fossil fuel use. Although Africa's contribution to climate change problems is minimal, he said, the continent will suffer enormous adverse impacts, and yet very little empirical evidence is available to date on the impact of African countries' development plans on climate change. One result, he said, is that little effort has been made to mainstream climate change into countries' economic planning. Consequently, one of the challenges facing the continent today is simply to undertake empirical studies in this field, which have been left so far to Western countries. Professor Odingo presented findings from research conducted under the IPCC. Among others, he pointed out the following:

- ♦ Atmospheric concentrations of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) have increased significantly as a result of human activity. These are among the greenhouse gases contributing to the phenomenon of global warming.
- ♦ Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level.
- ♦ Changes in precipitation, increased drought and more frequent extreme weather events, have become common.

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As long as the CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and other greenhouse gases continue to be released into the earth's atmosphere, global warming will not only persist but all the consequences associated with it will happen globally and in the African region.

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Professor Odingo called for policy makers and the general public to build a better understanding of climate change and its causes (specifically the anthropogenic causes). He argued that the attribution to human activity arises because most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. Discernible human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns.

The observed widespread warming of the atmosphere and ocean, together with ice mass loss, support the conclusion that it is extremely unlikely that the global climate change of the past 50 years can be explained without external forcing, and very likely that it is not due to known natural causes alone. Anthropogenic forcing is also likely to have contributed to changes in wind patterns as well, affecting extra-tropical storm tracks and temperature patterns in both hemispheres. Temperatures of the most extreme hot nights, cold nights and cold days are likely to have increased. Projections of future changes in climate, according to IPCC data, include the following:

- ♦ For the next two decades a warming of about 0.2°C per decade is projected for a range of emission scenarios. Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected and continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would *very likely* be larger than those observed during the 20th century.
- ♦ Snow cover will contract. There will be widespread increases in thaw depth over most permafrost regions. The glaciers on Mt. Kilimanjaro and Mt. Kenya may be gone by 2020. Sea ice will shrink in both the Arctic and the Antarctic. Arctic late-summer sea ice will disappear almost entirely by the latter part of the 21st century. It is very likely that hot extremes, heat waves and heavy precipitation events will continue to become more frequent.
- ♦ Results from a range of climate models indicate that it is likely that future tropical cyclones (typhoons and hurricanes) will become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical sea surface temperatures.

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Current research shows that 70% of the emissions now found in the atmosphere have taken place in just the last 30 years – since 1970.

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- ♦ It is very likely that the meridional overturning circulation (MOC) of the Atlantic Ocean will slow down during the 21st century. Temperatures in the Atlantic region will increase despite such changes as a result of the much larger warming associated with projected increases of greenhouse gases.
- ♦ The population at risk of increased water stress in Africa is projected to be between 75 million and 250 million people by 2020, rising to 350–600 million people by 2050.

Moreover, Professor Odingo reported, anthropogenic warming and sea level rise would continue for centuries because of the timescales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilized. Contraction of the Greenland ice sheet is projected to continue to contribute to sea level rise after 2100.

The continent's already bad situation of water resources will be exacerbated. Climate variability and change, coupled with human induced changes, may also affect ecosystems (mangroves and coral reefs), with additional consequences for fisheries and tourism.

Rising sea level would increase flooding in low lying coastal areas, which will in turn increase the physical and socioeconomic vulnerability of coastal cities. Climate change, interacting with human drivers such as deforestation and forest fires, are a threat to Africa's forest ecosystem. For example, by 2020, the ice cap on Mt. Kilimanjaro could disappear; others like Mt. Kenya and Mt. Ruwenzori will equally suffer. Countries like Kenya, Guinea and Eritrea will suffer crop losses and infrastructure damage because of the rise in sea level. Flood risks and water-borne diseases in low-lying regions (coastal areas), as well as coral reef bleaching as a result of climate change, could have a negative impact on tourism. The latter would also affect the productivity of fisheries.

In sum, anthropogenic climate change will negatively affect human health in Africa. Indeed, by 2100, areas of dense human population in Zimbabwe that were previously unsuitable for distribution of malaria will become suitable for transmission. Previously malaria-free highland areas in Ethiopia, Kenya, Rwanda and Burundi could also experience modest changes that would make them suitable to malaria by the 2050s, with conditions for transmission becoming highly suitable by the 2080s.

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Mt. Kilimanjaro's iconic ice cap could disappear by 2020, so too could the glaciers on Mt. Kenya and Mt. Ruwenzori.

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The professor called on African leaders to undertake "common sense mitigation" – efforts that would cost little or nothing – and not to wait for the western world, which has been reluctant to fulfil promises to help vulnerable African countries since the signing of the United Nations Framework on Climate Change (UNFCCC) in 1992. He urged Africans to continue the development of coping strategies to adapt to climate change. The factors that determine the adaptive capacity of a nation or a continent include: technology, education, information, skills, infrastructure, access to resources, and various psychological factors and management capabilities. Africa is very poor in most of these areas.

Discussions following Professor Odingo's presentation pointed out that:

- ◆ Poverty eradication initiatives must be linked with policies to address climate change.
- ◆ Africa needs to have a holistic view of climate change since it is a cross cutting issue. It should therefore be integrated into development strategies across ministries – water, energy, environment, disaster risk, health, finance, economy and planning.
- ◆ How can Africa take maximum benefit of the opportunity presented by climate change? For example, how will the continent's forest ecosystems be valued as compared with alternative uses, especially since Africa contributes the least to GHG? What will be the opportunity cost to economic development of saving these forest ecosystems?
- ◆ Poverty eradication initiatives must be linked with policies to address climate change.
- ◆ Carbon capture and storage, which extracts carbon dioxide from industries and stores them in the earth, is a promising technology for those countries that are geologically stable. Carbon can also be stored under the sea bed. The first country to use this method was Algeria, which is storing carbon in oil wells that are no longer in use.

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Kenya, Guinea and Eritrea will suffer crop losses and infrastructure damage because of the rise in sea level.

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## Food Security and Sustainable Agriculture: The Challenges of Climate Change in SSA

Chair: Louis Kasekende, Chief Economist, African Development Bank

Presenter: Mahendra Shah, International Institute for Applied Systems Analysis (IIASA), Austria

Discussant: Shyam Nath, Professor of Economics, Department of Economics, University of Mauritius

Comparative costs related to action and inaction in response to climate change formed the core of Dr. Shah's presentation, which summarized methodological approaches used in conducting the research. The approach uses a specific methodology (agro-ecological zone) developed by the Food and Agriculture Organization (FAO) and International Institute for Applied Systems Analysis (IIASA) since 1976. It provides an inventory of land resources (soils, terrain, population) and matches the crop models best suited for that land. The framework has 18 country models, including Kenya, Nigeria and Egypt.

Findings from these models showed, among other things, that:

- ♦ Bio-fuel production in a country like Democratic Republic of Congo (DRC) will deplete the forest cover and upset the ecological rain catchment balance. It may result in import dependence as climate change continues to negatively affect the production of maize and wheat.
- ♦ Neither China nor India (nor Africa combined) will catch up with the US in terms of cumulative carbon emissions in the next 50 years.
- ♦ Sub-Saharan Africa does not have the arable land necessary to extend agricultural production. It therefore needs to increase yield per hectare.

Arguing that since Africa and developing countries in general do not have the necessary financial resources to engage in mitigation, Dr. Shah said the first and foremost priority for these countries should be to focus on adaptation

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Sub-Saharan Africa, accounting for 10% of the world's population, has contributed less than 2.5% of global GHG emissions from fossil fuels and about 3.5% from agriculture and deforestation.

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methods. Moreover, he pointed out that developing countries that have contributed the least are the worst affected by climate change and that every developed country has used IPCC results to analyse the impacts of climate change on their economies. It is therefore time for developing countries in general and Africa in particular to also use those IPCC results to assess climate change impacts on their economies and estimate the cost of adaptation.

Under the guidance of Professor Nath, the floor discussions highlighted the following concerns:

- ♦ Governments must not wait for disaster to strike before they react.
- ♦ Multinational companies are now seeking to buy land from poor Africans to produce biomass for bio-fuels, and African governments need to make policy decisions to ensure that the poor are not further impoverished.
- ♦ Models on climate change were for the benefit of the North. There is therefore need for Africa to develop African energy data.
- ♦ In certain African countries, water holes used by cattle and wildlife are drying up faster today than previously. They used to last for around three months after the end of the rainy season, but now dry up within two months, and this with a decline in the number of cattle. Investigations showed that temperatures are increasing and evaporation is much faster.
- ♦ There is the need to establish meteorological infrastructure across the continent to monitor climate change.
- ♦ Africa needs to develop capacity to do the research, make the policy decisions and implement the actions related to the impacts of climate change.
- ♦ Current data for estimating the impacts of climate change on individual SSA countries are based on global models. Africa-specific models are needed to estimate the costs of climate change and adaptation technologies.

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There is a strong correlation between per capita incomes, the level of industrialization and greenhouse gas emissions. In sub-Saharan Africa – the region with the lowest average per capita income – agriculture accounted for an average of 30% of GDP, with some countries' share being as high as 50%. And between 1990 and 2005, the share of manufacturing in most African countries had declined, contrary to expectations of most growth theories.

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Neither China nor India will catch up with the US in terms of cumulative carbon emissions in the next 50 years.

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- ♦ Africa needs to invest in climate forecasting and individual countries have to be willing to invest in research and development.
- ♦ Although the arguments for adaptation are unassailable, anticipation, preparation and dissipation are equally important. African institutions need to be effectively placed and structured to cope with climate change. This calls for governments to strengthen existing institutions and to build new ones where such institutions do not exist.

Summing up, Dr. Shah made several additional points: He said Africa would be better off working with the best and worst climate change scenarios, rather than the averages, and noted the need for Africa to be careful about the diversion to bio-fuels. African countries must also look at achieving some measure of self-sufficiency, for example by revitalizing extension services and utilizing daily radio programmes to provide information on weather conditions, when to plant, when to sell, etc. To move forward, Dr. Shah recommended that every African country should look at its resource base, climate change information and remote sensing data. He assured participants that IIASA would be willing to help in building capacity of African scientists in the area of climate change.

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The Kyoto Protocol provides for a measure known as the Clean Development Mechanism (CDM) that allows a country with an emission-reduction or emission-limitation commitment under the Protocol to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO<sub>2</sub>, which can be counted towards meeting their Kyoto targets. CDM project activity might involve a rural electrification project using solar panels or the installation of more energy-efficient boilers. The mechanism aims to stimulate sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets. There are currently 850 CDM projects in 49 developing countries, but only 23 are in Africa. There is therefore a need to broaden the scope (e.g., inclusion of agricultural practices) and coverage of the CDM.

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Climate change is a reality that must be confronted even if one still doubts its links with human activities.

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## Climate Change, Trade and Competitiveness

- Chair: Hon. Prof. Ephraim Kamuntu, Minister for Tourism, Trade and Industry, Uganda
- Presenter: John Asafu-Adjaye, Associate Professor of Economics, University of Queensland, Australia
- Discussants: Dominique Njinkeu, Executive Director, ILEAP, Canada  
Adolf Mkenda, University of Dar es Salaam, Tanzania

John Asafu-Ajaye investigated the impact of climate change on trade and competitiveness in sub-Saharan African countries and addressed the implications for managing the impacts, including the options for mitigation and adaptation. In his presentation, Professor Asafu-Adjaye outlined various reasons as to why climate change is a serious threat to sub-Saharan Africa. First of all, SSA countries are already warmer compared with other non-tropical countries. Moreover, most SSA economies are predominantly based on agriculture, which is the most climate sensitive sector, while the region's prevailing low per capita incomes and persistent poverty present a major challenge for adapting to climate change and variability. In addition, developing responses to climate change, urgent as the need is, could further slow progress towards the achievement of the Millennium Development Goals (MDGs) in the region.

With all that, the impact of climate change on trade and competitiveness in SSA is apt to be severe in many aspects. Climate change has already led to average crop losses: At least four countries have losses of 100% and another three have losses exceeding 50%. By the 2080s, average losses for SSA are projected to be about 28% on average, without carbon fertilization and about 18% with carbon fertilization.

As a way to reduce the impact of climate change, countries should try to adapt to climate change and to mitigate the impacts. There are major constraints to adaptation, however. These include lack of information, institutional deficiencies, biophysical deficiencies (e.g., ecosystem degradation), future development in energy markets including bio-fuels, financial constraints, and the various types of adaptation costs, such as transition costs and equilibrium

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Agricultural lobbies are the weakest lobbies in Africa, and yet agriculture is responsible for at least 30% of GDP, in contrast to the developed countries.

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costs, which are often unknown making it difficult to plan effective adaptation strategies.

Professor Asafu-Adjaye made a number of recommendations for ways that SSA could deal with the impact of climate change. At the global level, he said Africa should push for expansion of the scope of the Clean Development Mechanism (CDM) to include agricultural practices. He also said that post Kyoto negotiations should include the aspect that SSA is the lowest polluter and has contributed the least to global warming. Moreover, it is necessary to intensify and improve negotiations for economic partnership agreements (EPAs) and the next Doha Round as a means of improving Africa's advantage in the medium term.

Nationally and regionally, SSA countries could take such steps as investing in public mass transportation systems and improving urban planning, as well as reviewing lifestyles in relation to the consumption of water and electricity use and how the two are priced. Governments could also consider giving tax breaks to firms and households that are environmentally friendly. A review of the possibility of climate insurance through public-private partnerships was also suggested. It is necessary to change the top-down approach of National Adaptation Programmes of Action (NAPAs) to a bottom-up approach by including citizens in the decision making and focusing on livelihoods rather than on sectors. Other recommendations were that SSA should build adaptive capacity, set up early warning systems, improve water storage and farming systems, invest in rural infrastructure and marketing institutions, improve physical infrastructure, and construct defensive structures such as mangrove belts, tree shelterbelts and others.

Dr. Njinkeu and Dr. Mkenda led discussions that made the following observations:

- There is need to take a wider view by discussing key trade items beyond agriculture, such as minerals and oil. It is also necessary to incorporate policy issues arising from trade competitiveness.
- With regard to institutional and governance issues, it is crucial to factor in coordination of efforts towards climate change. There must also be timeliness in responses to disasters. Funding of such activities may have to come from other processes and a fund could be set up for this.

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Governments could consider giving tax breaks to firms and households that are environmentally friendly.

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- ♦ What exactly does “mainstreaming” mean in terms of climate change? The issue should stand on its own within national policies and programmes.
- ♦ There should be emphasis on regional coordination. There are many advantages in tapping the regional initiatives that Africa has, especially in exploiting trans-boundary resources such as rivers and lakes. Beyond coordination at regional level, there must be exchange sharing between the regions. SSA countries should take steps to remove the obstacles to trade promotion and reduce inflation.
- ♦ There is more potential for CDM to enhance competitiveness of African industries and hence the need for SSA countries to take advantage of CDM technologies. On sectoral responses, it would be interesting to get some perspectives on the possibility of SSA gaining an offensive in the Doha Round. Climate change is a good opportunity for SSA to do this. As for multinationals moving operations into Africa, their emissions potential should be reviewed against the need for local companies to be at par as well as ensuring that the local firms can eventually take over.
- ♦ SSA countries underestimate the tax value of natural resources, e.g., how the demand for diamonds, oil and tanzanite will be affected by climate change in 2080. How will trade in our products be affected as a result of climate change? There is need to propose cleaner development practices in manufacturing and to compute how much SSA would save in terms of environmental destruction.
- ♦ Africa has a strong case to put forward, and the case for climate change is a big bargaining chip, which it could utilize to its advantage.

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Uncertainty about future projections requires a climate risk management approach, and managing current variability is the foundation of adaptation.

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## Climate Change and Economic Growth in SSA: An Assessment of Climate Risk

- Chair: Essowe Ouro-Djeri, Vice Minister, Environment, Tourism and Forest Resources, Togo
- Presenter: Casey Brown, Associate Research Scientist, International Research Institute for Climate and Society, USA
- Discussants: Edwin Muchapondwa, Senior Lecturer, School of Economics, University of Cape Town, South Africa  
Ephraim Kamuntu, Minister for Tourism, Trade and Industry, Uganda

**M**uch remains unknown in terms of climate change projections for SSA, Dr. Brown reported in his presentation, in part because many climate change impact projections are based on statistics from North America and India and extrapolated to other countries. Nevertheless, drought is the single largest cause of death due to natural disasters, at approximately 50% of the global total, and floods account for the highest property loss. Exposure to these disasters has doubled over the past 15 years, and quadrupled over the past 25 years. As examples he said that the impact of droughts and floods has reduced economic growth in Ethiopia by one-third according to a 2006 World Bank study, and Kenya's annual GDP was reduced by 10–16% from 1998 to 2000 because of El Niño-related drought and flooding. Globally, as much as 25% of GDP (US\$3 trillion) is directly or indirectly affected by climate extremes. IPCC scenarios suggest that such disasters will occur with increasing frequency in developing regions.

Citing econometric analyses used to study the sensitivity of GDP to climate change, Dr. Brown reported that results show that about a half of all the countries have significant climate effects. Precipitation extremes (especially drought) have the most important climate effect on economic growth, with about one-third of countries showing significant negative impact from drought. Temperature effects are less significant.

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Drought is the single largest cause of death due to natural disasters, at approximately 50% of the global total, and floods account for the highest property loss.

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Climate risk management focuses on current pressing issues while factoring in projected changes in climate. Protecting against climate hazards is therefore essential, according to Dr. Brown. Interventions that provide benefits regardless of climate changes and reduce current climate vulnerabilities are a first step in adaptation. Climate risk management will then require that countries invest in climate information systems/early warning systems; diversification of crops and livelihoods; financial risk transfer (e.g., index insurance); and market development, transportation and storage.

Dr. Brown concluded with the following observation: Adaptation planning must be based on an understanding of climate impacts. In SSA, drought is the dominant climate impact. Uncertainty of future projections requires a climate risk management approach, and managing current variability is the foundation of adaptation. Noting that most current efforts are ad hoc and fragmented, his main recommendation was that governments should mainstream climate change risk assessment into all aspects of policy planning.

Floor discussions guided by Dr. Muchapondwa and Professor Kamuntu highlighted the following issues:

- ♦ Governments should mainstream climate change risk into all aspects of policy planning.
- ♦ South Africa – even though a full signatory to the Kyoto protocol – is ranked 15th among the top emitters of GHG in the world because of its significant dependence on coal as a source of energy. They have to date ensured climate change alignment with the country's sustainable development.
- ♦ Greater effort is needed to align the economic data with climate data in terms of seasonality.
- ♦ There is also need to identify the best methodology for capturing the impact of climate change given data issues in sub-Saharan Africa.
- ♦ Mitigation is important and should not be ignored.

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At most, we have a 30-year window of opportunity to deal with the threats of climate change; if we wait any longer, it will be too late.

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## Lessons and Policy Options

Following the presentations, participants were divided into four groups by region: Eastern Africa Region, the Sahel Region of West Africa, West Africa/Forest Region and Central Africa, and Southern Africa Region. The groups were charged with continuing and refining discussions according to the following structured terms of reference:

- Impact of climate change on economic development
- Lessons learnt from other parts of the world that may be applicable to this region
- Opportunities and challenges presented by climate change for economic development
- Strategies and policy options for managing the impact of climate change
- Policy relevant research issues based on identified challenges

Results of the separate discussions were considered in the plenary, and prioritized according to issues that were found to be common in the four groups. The following presentation arranges the main points according to categories.

### ***Impact of Climate Change on Economic Development***

The groups noted that climate change was a reality in all four regions. Its impact is evident in terms of sharp reduction and uneven distribution of rainfall across the region, e.g., prolonged drought in some areas and very heavy rains leading to floods in others, shifts in precipitation, high evaporation, temperature rises of up 3°C, excessive high dry winds associated with erosion, and encroaching sand dunes in desert areas. These have an impact on many economic activities. Along the coastal areas rising water levels affect tourism and higher water temperature affects fish stocks.

There has also been an impact on agriculture in sub-Saharan Africa generally as prolonged drought leads to crop failure and affects livestock, hence resulting in food insecurity. Floods are associated with water-borne diseases and epidemics in the affected areas. Both drought and floods also affect tourism

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There is need to build capacity at the national level to analyse the costs and impacts of climate change in SSA.

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through their impact on wildlife and the destruction of the supporting infrastructure. The decline in rainfall amounts also affects the energy sector, especially hydroelectricity generation.

### ***Lessons Learnt from Other Parts of the World***

Studies undertaken in other areas show the need for integrating environmental policies with development policies, and promoting private sector participation including farmers from elsewhere to invest in agriculture. This should be implemented cautiously, however, so that the indigenous farmers do not lose their ancestral land. The prime actor should thus remain the government, held in check by the citizenry, and governments should invest in infrastructure. There is a need for better storage and use of water in dams to stabilize agricultural production for perennial irrigation. Among issues, countries' crop selection should reflect areas of comparative advantage and dykes may be needed to control flooding and sea creep.

In addition, emphasis should be on developing alternative energy sources, for example a focus on using solar energy in Africa, particularly for households, as it could go a long way towards solving household energy problems. Construction of dams in flood prone areas, which will also contribute to the production of hydroelectric energy. There is also need to build capacity at the national level to analyse the costs and impacts of climate change in SSA.

In coastal areas, a number of steps can help deal with the effect of climate change. These include non-structural approaches such as avoiding construction at the river channels and the removal of mangrove swamps and discouraging settlement on coastal lands. Since sea walls have been found to be less than effective, other approaches are needed to prevent sea encroachment and soil erosion. Of critical importance is to improve awareness of the challenges among coastal communities. Coastline studies, as done in West Africa, should be emulated elsewhere in the continent.

Other lessons imply the following actions:

- ♦ Ensuring decisive but gradual responses to uncertainty and providing quality information for people to assist them to adapt.
- ♦ Giving farmers the means to adapt, for example access to credit and insurance, and involving people by enabling them to participate.

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Climate change is already a reality in all four regions of sub-Saharan Africa, with sharp reduction and uneven distribution of rainfall, prolonged drought in some areas and very heavy rains leading to floods in others, shifts in precipitation, high evaporation, and so on.

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- ♦ Developing early warning systems, which are necessary to enable countries to deal with some of the effects of climate change.

### ***Opportunities Presented by Climate Change for Economic Development***

- ♦ Possibility of gaining income by reducing emissions from deforestation and degradation is one of the positive features of the climate change scenario. The World Bank is carrying out studies on carbon stocks potential so that countries can enter the carbon market. Countries that can participate may make some economic gains.
- ♦ Climate change offers an opportunity to strengthen regional integration in Africa. There is a lot of potential for the Congo and Cameroon river basins, for example, and well developed regional economic communities like ECOWAS can help integrate power resources in West Africa.
- ♦ The need to cope with climate change will oblige African countries to plan their economies for the long term (10–20 years time).
- ♦ Demands for adaptation and mitigation compel countries to take steps that have, arguably, been postponed for too long, such as:
  - Developing alternative sources of energy.
  - Diversifying agricultural production.
  - Identifying and investing in alternative livelihoods and diversifying trade.
  - Conserving available resources by rain and running water harvesting, among others.

### ***Challenges Presented by Climate Change for Economic Development***

- ♦ Lack of funds for dealing with the problems wrought by climate change like increased flood and drought.
- ♦ Uncertainty about the actual impacts of climate change, rendering it difficult to make informed decisions on agriculture.
- ♦ Lack of political will to take measures to respond to climate change.
- ♦ Mobilization of cross-sector collaboration to respond to climate change.
- ♦ Changing the mindset, e.g., moving towards nuclear power.



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The newness of the climate change concept as a policy issue, and the long-term nature of the projections, mean that it is not easy to integrate into development processes.

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- ♦ Mistrust among countries across the region or within subregions, which may hinder a common approach to dealing with the issues of climate change.
- ♦ Provision of enough resources to maintain a system of information distribution to farmers.
- ♦ Newness of the concept, and the long-term nature of the projections, which means that it is not easy to integrate into development processes.
- ♦ Lack of appreciation of future risks, despite the widespread publication of the projections.
- ♦ High cost of technology to adapt.
- ♦ Low stock of knowledge and inadequate research and capacity to develop viable clean development mechanisms (CDMs).
- ♦ The need to reconcile poverty reduction with sustainable development.

### ***Strategies and Policy Options for Managing the Impact of Climate Change***

- ♦ Adapt/adopt crops resistant to the vagaries of weather
- ♦ Improve water storage.
- ♦ Improve food storage and post harvest management generally.
- ♦ Develop infrastructure, especially in rural areas.
- ♦ Articulate and implement national irrigation policies and strategies.
- ♦ Develop alternative sources of energy.
- ♦ Address issues of clean technology.
- ♦ Increase productivity, and the quality and traceability of products.
- ♦ Add value to products.
- ♦ Discourage consumption of goods that pollute the environment.
- ♦ Develop efficiency of production lines.
- ♦ Enhance skills (human resource capacity).
- ♦ Promote research and development to support the production of other types of crops and provide guidelines for adapting to climate change.
- ♦ Develop and emphasize intra regional trade to reduce reliance on international trade.
- ♦ Use more eco-friendly sources of energy in production, e.g., solar and wind power.

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Mistrust among countries across the region or within subregions may hinder a common approach to dealing with the issues of climate change.

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- ♦ Mainstream environmental issues in economic policies.
- ♦ Encourage the use of mass transportation and discourage the import of used vehicles.
- ♦ Retain the use of simple and cheap technologies, e.g., diesel water pumps, to increase agricultural production.
- ♦ Invest in bio-technology and early warning systems.

#### ***Policy Relevant Research Issues Based on Identified Challenges***

- ♦ Impact of climate change on the economy, particularly on the costs of climate to the economy and agricultural sector.
- ♦ Climate change mitigation and adaptation.
- ♦ How to enhance resilience of specific food crops – and agriculture in general
- ♦ Determinants of the vulnerability of nations to climate change.
- ♦ Risk management and risk-sharing mechanisms.
- ♦ More studies specific to Africa to link climate change, trade and competitiveness.

## Closing

Professor Lyakurwa closed the seminar by thanking everyone for participating so fully in the discussions. He said that only with the full attention of policy makers would sub-Saharan Africa be able to counter or adapt to the impacts of climate change. He pledged AERC's continuing interest in supplying the evidence base for policy decisions, and noted that the Consortium was exploring ways of mainstreaming climate issues into its research agenda even as policy makers mainstreamed them into poverty reduction and other frameworks.

## ANNEX A

# Seminar Papers

*Climate Change and Economic Development – Issues, Challenges and Opportunities for Africa in the Decades Ahead*, by Richard Samson Odingo, Vice Chair, Intergovernmental Panel on Climate Change (IPCC), and Distinguished Professor of Hydrology, Geography Department, University of Nairobi

*Food Security and Sustainable Agriculture: The Challenges of Climate Change in Sub-Saharan Africa*, by Mahendra M. Shah, Senior Scientist, Land Use Change and Agriculture Programme, Dean of Young Scientists Summer Programme and Coordinator of UN Science and Policy Relations, International Institute for Applied Systems Analysis (IIASA), Austria; Guenther Fischer, Programme Leader, Land Use Change and Agriculture Programme, IIASA; and Harrij van Velthuizen, Senior Scientist, Land Use Change and Agriculture Programme, IIASA

*Climate Change, Trade and Competitiveness in Sub-Saharan Africa*, by John Asafu-Adjaye, Associate Professor of Economics, University of Queensland, Australia

*Climate Change and Economic Growth in Sub-Saharan Africa: An Assessment of Climate Risk*, by Casey Brown, Associate Research Scientist, International Research Institute for Climate and Society, USA, and Assistant Professor, Department of Civil and Environmental Engineering, University of Massachusetts, Amherst; Robyn Meeks, Research Assistant, Kennedy School of Government, Harvard University; and Kenneth Hunu, Research Assistant, Department of Civil and Environmental Engineering, University of Massachusetts, Amherst.

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## ANNEX C

# Seminar Programme

### Monday, 7 April

09:00–10:40hrs

Session Chair

Opening Remarks:

Welcome:

Keynote Address:

Programme Overview:

#### Official Opening

William Lyakurwa, Executive Director, AERC

William Lyakurwa

Lalla Ben Barka, Deputy Executive Director, UNECA

Louis Kasekende, Chief Economist, AfDB

Olu Ajakaiye, Director of Research, AERC

10:40–11:00hrs

Tea break

11:00–13:00hrs

#### Climate Change and Economic Development – Issues, Challenges and Opportunities for Africa

Session Chair:

Presenter:

William Lyakurwa, Executive Director, AERC

Richard Odingo, Vice Chair, Intergovernmental Panel on Climate Change (IPCC); Distinguished Professor of Hydrology, Department of Geography and Environmental Studies, University of Nairobi

*Floor Discussion*

13:00–14:00hrs

Lunch break

14:00–16:00hrs

#### Climate Change, Agriculture and Food Security

Session Chair:

Presenter:

Discussant:

Louis Kasekende, Chief Economist, AfDB

Mahendra Shah, Senior Scientist, International Institute for Applied Systems Analysis, Austria

Shyam Nath, Professor of Economics, Department of Economics, University of Mauritius

*Floor Discussion*

16:00–16:15hrs

Tea break

18:00hrs

#### Opening Cocktail

**Tuesday, 8 April**

09:00–10:40hrs

Session Chair:

Presenter :

Discussants:

**Climate Change, Trade and Competitiveness**

Ephraim Kamuntu, Minister for Tourism, Trade and Industry, Uganda

John Asafu-Adjaye, Associate Professor of Economics, University of Queensland, Australia

Dominique Njinku, Executive Director, ILEAP, Canada  
Adolf Mkenda, Senior Lecturer, University of Dar es Salaam, Tanzania

*Floor Discussion*

10:40–11.00hrs

Tea break

11:00–13.00hrs

Award-winning documentary: “An Inconvenient Truth”, by Al Gore

*Former US Vice President Al Gore shared the 2007 Nobel Peace Prize with the IPCC for efforts to “change the world’s consciousness” about the challenges of global warming*

13:00–14:00 hrs

Lunch break

14:00–16:00hrs

*Floor Discussion*

16:00–16:15hrs

Tea break

16:15–17:00hrs

Working Group Discussions

**Wednesday, 9 April**

09:00–10:40hrs

Session Chair:

Presenter:

Discussants:

**Climate Change and Economic Growth**

Ouro-Djeri Essowe, Vice Minister, Environment, Tourism and Forest Resources, Togo

Casey Brown, Associate Research Scientist, International Research Institute for Climate and Society, USA

Edwin Muchapondwa, Senior Lecturer, School of Economics, University of Cape Town, South Africa  
Ephraim Kamuntu, Minister for Tourism, Trade and Industry, Uganda

*Floor Discussion*

10:40–11.00hrs

Tea break

11:00–13:00hrs

Working Group Discussions

13:00–14:00 hrs

Lunch break

14.00–15.00hrs

Presentation of Working Group Reports

15.00–15.30hrs

**Closing Session**

Wrap Up:

Closing:

Olu Ajakaiye, Director of Research, AERC

William Lyakurwa, Executive Director, AERC

19:00

**Closing Dinner**

## Working Group Sessions

Three main topics, in four regional groupings:

1. Climate Change, Agriculture and Food Security
2. Climate Change, Trade and Competitiveness
3. Climate Change and Economic Growth

### Group A - Eastern Africa

Chair: Peter Msolla - *Tanzania*  
Secretary: David Obong  
AERC rapporteur: Charles Owino  
Henry Igaga Bidasala  
Onesimus Muhwezi  
Johnson Owaro  
Bernard Bashaasha  
Ernest Debrah  
Isabella Masinde  
Buriani Batilda  
Clifford Nkomo Jabavu  
Robinson Kinuthia Ngugi  
Ephraim Kamuntu  
Adolf Mkenda  
Joseph Karugia  
Mahendra Shah  
Swai Invocavit  
Patrick Ndaki  
Joseph S. Qamara  
John Mungai  
David Kahuria

### Group B - West Africa - Sahel Region

Chair: Bah N'diaye - *Mali*  
Secretary: Doumbia Ibrahima  
AERC rapporteur: Felix N'zue  
Abdallah Samba  
Omar Diaw  
Abdou Salam Kane  
Fatima Denton  
Marcel Nwalozie

Moussa Diallo  
Amadou Diallo  
Cisse Souleymane  
Adamu Muhamma Sani  
Adamou Ibrahim  
Ibrahima Harouna

### Group C - West Africa - Forest Region & Central Africa

Chair: Joseph Sam Sesay - *Sierra Leone*  
Secretary: Gregoire Mebada  
Mebada  
AERC rapporteur: Jacqueline Macakiage  
Sesi Akoeno  
Laurence K. Bropleh  
Lekan Oyebande  
Haman Unusa  
Jean-Christophe Bongou Bazika  
Joseph Gabriel Mokima  
Muta Kishimba Robert  
Muen Kabeya Ntombi  
Hippolyte Nsimundele  
Dominique Njinkeu  
John Asafu-Adjaye

### Group D - Southern Africa

Chair: Vera Tembo Chiluba - *Zambia*  
Secretary: Shangula Kalumbi  
AERC rapporteur: Damiano Manda  
Chiseche Mutale  
Angela Katongo Kabuswe  
Innocent Matshe  
Muchapondwa Edwin  
Bibi Ameenah Rojoa  
Yahya Pathel  
Yeti Nisha Madhoo  
Shyam Nath  
Lilia Rabeharisoa  
Lemao Nteo  
Casey Brown

