CLIMA EA 2001

Research Proposal-Climatic Change Impact Assessment in Eastern Africa.

TABLE OF CONTENTS

CAPACITY BUILDING TO EVALUATE AND ADAPT TO CLIMATE CHANGE-INDUCED VULNERABILITY TO MALARIA AND CHOLERA IN THE LAKE VICTORIA REGION.

1.0   Project Summary

The focus of this project is to improve the understanding of the relationship between climate change parameters (precipitation and temperature) and the incidences of malaria and cholera in the Lake Victoria region (Kenya, Uganda and Tanzania). It will identify priority risk groups based on exposure potential, work with pilot populations (representative of priority risk groups) to distinguish risk management strategies and select preferred options to inform policy. From the experiences gained the project will implement preferred adaptation strategies to strengthen local coping capacity and monitor performance.

The project will start with characterization of baseline temperature and precipitation variability and apply existing General Circulation Models (GCM) (IPCC, SRES and other appropriate models), in order to estimate possible perturbations to these conditions. GIS layers will be constructed using historical data on climate, malaria and cholera incidences in order to select pilot sites. Time series analyses will be used to correlate the relationship between climate and disease incidences. Identification and engagement of stakeholders using participatory methodologies will be used to assess vulnerability of pilot groups. This will be supplemented with analyses from socio-economic surveys and data on water resources and time activity patterns of the pilot population. Use will be made of the retrospective and prospective data analysis to estimate the excess risk of malaria and cholera that may be attributable to future climate change. The project will incorporate capacity building in global change research in all its activities, by engaging stakeholders and scientists in the region.

2.0   Introduction
2.1   Background

The Lake Victoria region straddles the equator in eastern Africa (Fig. 1) and the Lake itself is the second largest fresh-water lake in the world. The region has a population of at least 30 million (Kenya, Uganda and Tanzania). However, it has been experiencing dynamic changes caused by both natural forces and human activities. The lake is home to several species of fish, birds and other animals. It has a total area of 68,800 km^2 with 6, 51 and 43 percent of its area being in Kenya, Tanzania and Uganda respectively. It drains approximately 181,000 km^2 in the three countries plus Rwanda and Burundi. The lake is also one of the sources of the River Nile upon which Sudan and Egypt depend for their livelihood. Because of the ecological and economic significance of the region, any changes in climate have the potential to cause far-reaching consequences.

The ecological sustainability and vulnerability of water resources in the Lake Victoria region may be particularly sensitive to climate change. Kenya has several rivers that drain into the lake, Tanzania and Uganda have two and one major rivers respectively that are the sources of water for the lake. The following factors have been identified as contributing to the emergence and spread of infectious diseases such as malaria and cholera: environmental change, socio-economic change; health care; food production; and microbial adaptation and change. (Mc Michael (1996), Levins (1994), Morse (1991, 1995) Epstein (1992, 1995).
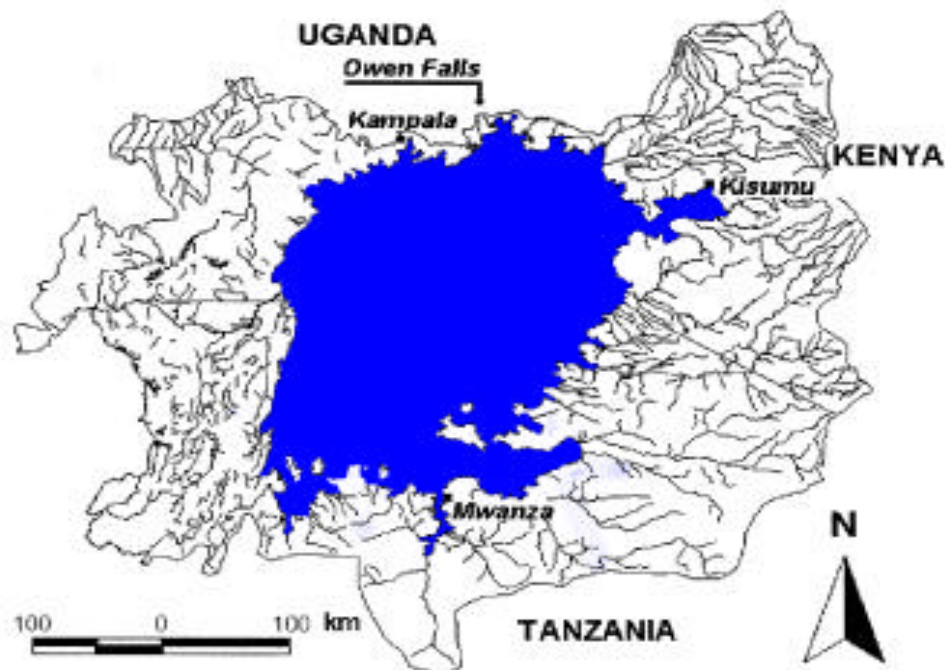
Figure 1: Lake Victoria and its catchment on Kenya, Tanzania and Uganda.

2.2   Climate Change and Health

Malaria is endemic to the region and has been creeping upwards from the lowlands to the highlands. Climate variability and change combined with land use changes and human population may aggravate the malaria and diarrhoeal diseases in the lake region. Outbreaks of highland malaria infection have become a yearly event in Kenya with loss of hundreds of lives.

IPCC conclusions show that most of the (90%) global mortality due to malaria occurs in Africa (IPCC 2001, Mc Micheal (1996)). It is the leading cause of infant mortality (20%) in Africa and constitutes ten per cent of the continent's overall disease burden (WHO, 2002). Malaria is one of the most climate sensitive vector-borne disease (Epstein, 1995; Morse, 1995). In recent years the number of epidemics of this disease have increased in the East African region with devastating effects. In the two warming periods in the 1930s to 1940s and the late 1980s (IPCC, 1998), malaria epidemics were observed in the East African region (Roberts 1964, Githeko and Ndegwa 2001). However, it was not until recently that there have been attempts to attribute the malaria epidemics to these warming events (Githeko et al., 2000).

Cholera is caused by *Vibrio cholerae* and results in intestinal infection leading to watery diarrhoea in one to five days after infection. Cholera is a medical emergency, which can result in death within a few days from the onset if not properly managed. The bacteria are often found in aquatic environment, brackish water, estuaries and are associated with algae blooms, all of which are influenced by

temperature (WHO, 1998). Cholera outbreak has been associated with both frequency of drought and floods, environmental emergencies and rising temperatures (Mc Michael, 1996).

During the second warm phase, starting from about 1988, there has been a number of disease outbreaks in the East African region and these include malaria, cholera, Rift Valley Fever and meningitis, all of which are attributed to climate variability ((IPCC 2001), Linthicum, et.al. (1999)). These epidemics have been most noticeable during the strong El Niño years such as the 1982-3 and the 1997-8 events which cause flooding, and widespread distribution of micro biological contamination of water resources.

As well as geophysical variables, other risk factors include drug resistance of the plasmodium, lack of vaccines, food insecurity and socio-economic decline. Policy changes such as cost sharing have reduced the number of people attending government health facilities and this may have equally increased the impact of disease. Furthermore, in several countries in Africa, a drop in health facility utilisation of over 30% has been reliably recorded following the policy of cost sharing (Waddington et al., 1989). The treatment of cholera has been affected by the drug resistance of the bacterium, for example in a study to assess the antibiotic resistance patterns for *Vibrio cholerae* and *Shigella* causing diarrhoea in East Africa, isolates from Tanzania and Rwanda were 100% resistant to tetracycline (Materu et al., 1997). Malaria and cholera epidemics have occurred to varying degrees in the East African region in the last decade. Therefore, it is essential to determine future trends and sustainable adaptive strategies that can be used to mitigate against the incidences of malaria and cholera.

2.3   Water Resources and Health

Scientific evidence shows that climate variability has taken place in the East African region (Verschuren et al., 2000). Both climatic and environmental changes may result in deterioration of water quality and quantity (Hulme, 1996). A time series of the interannual variability of precipitation in East Africa from 1901 to 1985 shows that most of the peaks in rainfall correspond to Pacific ENSO years, e.g. 1941, 1951, 1957, 1963, 1968, 1972, 1978 and 1982 (Nicholson, 1996). One characteristic of the interannual variability is its extreme magnitude in individual years, for example the conditions of 1961, a year in which Lake Victoria rose several meters and reached levels unattained since the nineteenth century (Nicholson, 1996). The spectrum for rainfall for the East African region is dominated by a strong peak at 5 to 6 years, but significant peaks at about 3.5 and 2.3 years are also evident (Nicholson, 1996).

Freshwater resources, such as Lake Victoria and changes therein constitute some of the most important global change issues in sub-Saharan Africa (Gash et al., 2001). Global climate change will affect the water supply (Hulme, 1996) although non-climatic changes such as water policy and management practice may have significant effects. Changes in rainfall patterns will affect surface and groundwater.

Access to safe drinking water is determined primarily by socio-economic factors. Currently the World Health Organization estimates that more than one billion people are without access to safe drinking water and that every year as many as four million die prematurely because they do not have access to

safe drinking water and sanitation (WHO 2000). Although, the quality of water is an important factor in the transmission of water-borne diseases, the condition of sanitation is an even more important determinant of the prevalence of cholera. Following Bradley (1972), a reanalysis of domestic water use in East Africa indicates that although more homes are supplied with piped water, the supply is not constant and as a result water is sought from alternative sources many of which are not treated (Thompson and Cairncross, 2002). This therefore enhances the exposure risk to cholera.
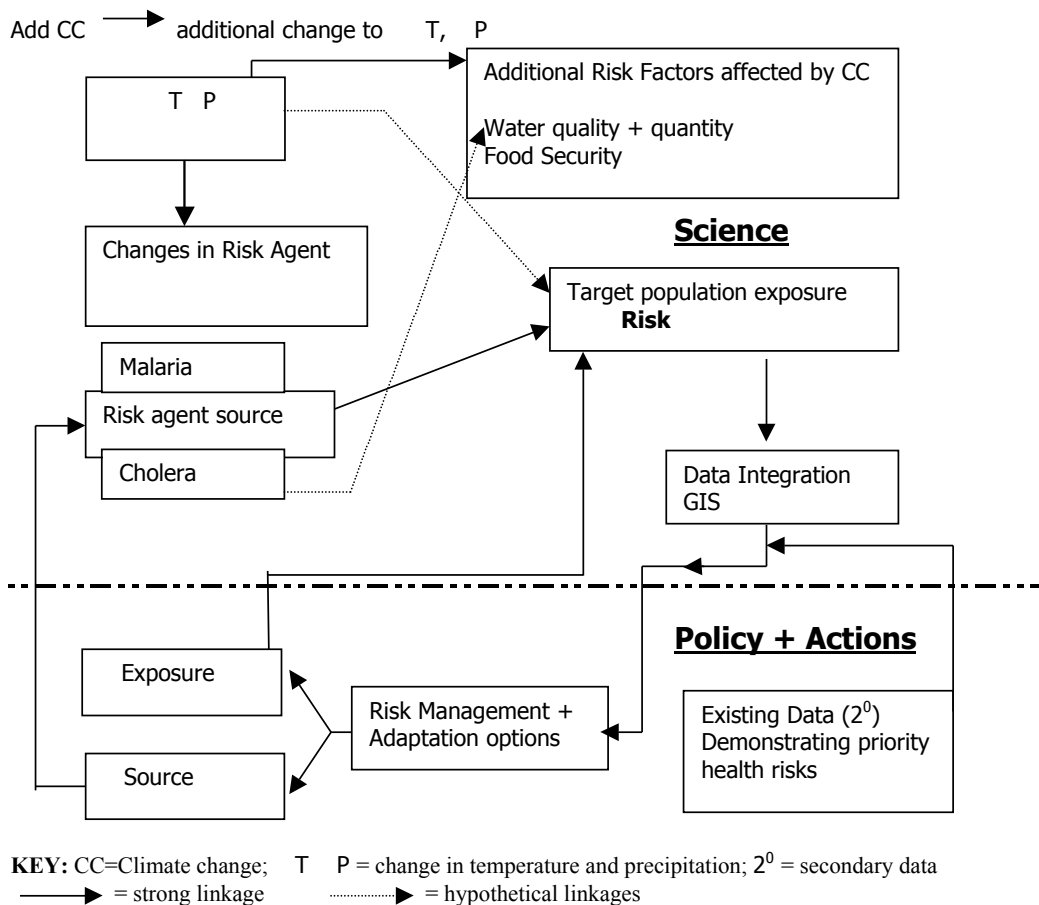
Figure 2: Project Conceptual Framework showing how the relationship between climate change, risk sources, receptor population and adaptation/mitigation strategies

3.0   Project Description
3.1   Conceptual Framework

The project seeks to examine the relationship between climate change and the incidence of malaria and cholera. The conceptual framework (Figure 2) envisages that the project has a science component that can be integrated into policy and mitigation strategies. The science will inform policy by identifying the risk of the target population and their coping mechanisms. The relationship between precipitation and temperature to malaria and cholera will be explored hypothetically; the hypothetical linkages in Figure 2 indicate this. The project encompasses integrated vulnerability assessment, adaptation policy and implementation over five stages as an adaptive process (Figure 3).

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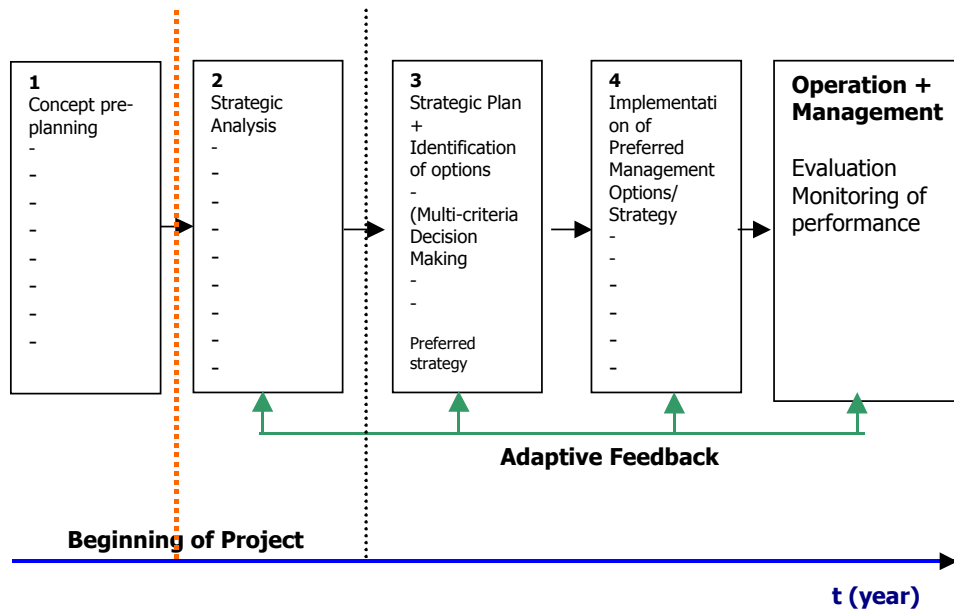
KEY: - = see workplan (section 5.0) for detailed activites in each stage; t= time in years.
Figure. 3. Project Implementation Stages

3.2 Problem Formulation

Malaria and cholera are major problems in tropical regions. They have significant impacts on health, quality of life and economy. There has been an increase in the frequency of outbreaks of malaria and cholera in the Lake Victoria area. There is a gap in our knowledge on how climate variability and change may contribute to the epidemics. Secondly, there are no management and adaptation strategies that are effective at the community level.

3.3 Research Questions

1. What is the possible range of climate variables (scenarios) indicated by different climate change models in the Lake Victoria region? (see Figure 4) (Application of existing models)
2. What is the relationship of malaria and cholera to climate variability (temperature and precipitation) in the Lake Victoria region?
3. Which target groups are most vulnerable, i.e. how are sources of vulnerability differentiated within the population of the Lake Victoria region?
4. What excess risk could be attributable to climate change? i.e. What are the possible ranges of malaria and cholera in the region given the different possible scenarios and what excess malaria and cholera risk could be attributable to these climate change scenarios?
5. What are the existing and coping adaptation mechanisms and how can these be strengthened at the community level to cope with the possible range of excess risk? i.e. What are the possible adaptation strategies at the community level?

3.4   Working Hypothesis

Climate change in the Lake Victoria region has the potential to cause significant excess malaria and cholera risk that is beyond the existing adaptation/coping capacity.

3.5   Objectives

3.5.1   General Objective

To understand the potential impact of climate change on the vulnerability (exposure and susceptibility to risk and adaptation capacity) of target populations to malaria and cholera in the Lake Victoria Region.

3.5.2   Specific Objectives

i.)   To characterize baseline temperature and precipitation variability and apply existing climate change models to the region in order to estimate possible perturbations to those conditions.

ii.)   To improve our understanding of the dynamic relationships between changes in temperature and precipitation, and changes in malaria and cholera risk.

iii.)   To understand the sources of vulnerability (time-activity exposure to risk agents, socio-economic risk factors, access to health facilities, water etc.) in order to identify which target groups are most vulnerable.

iv.)   To estimate the excess risk of malaria and cholera that may be attributable to climate change.

v.)   To integrate data and knowledge types in a geographic information system to inform local and national policy making, and enhance stakeholder awareness.

vi.)   To work with risk groups in the pilot communities to assess existing adaptation and coping strategies for malaria and cholera, and to identify alternative strategies that can accommodate the possible changes in risk.

vii.) To implement priority strategies to prevent and mitigate existing and potential risks, monitor the performance of the strategies, and adapt to changing conditions.

3.6   Pilot Sites

Suitable pilot sites are those exhibiting high variability in both climate and disease indicators. It is anticipated that two sites in each country (Kenya, Uganda and Tanzania) will be selected one to investigate malaria sensitivity and one for cholera sensitivity.

3.7   Justification

Previous studies have attempted to assess climate variability and change impacts in Eastern Africa. For example, Mwandosya et. al. (1998) carried out an assessment on vulnerability and adaptation to climate variability and change but this was limited to Tanzania. Reid et. al. (1999; 2000a) linked human population growth and land use change to tsetse fly population dynamics and generated future scenarios using a GIS-based model for the year 2040. A similar study on land use and land cover dynamics in response to changes in climatic, biological and socio-political forces was carried out in Southwestern Ethiopia (Reid et. al. 2000b). This study examined the land responses from a historical perspective, but did not attempt to make future projections. However, very few studies on climate and water resources impacts on health have been undertaken in the East African region. This project will therefore help fill the gap. It will assess vulnerability of communities to climate variability and change

and adaptation mechanisms that can be incorporated in policy. Further, it will enhance the capacity of scientists and institutions to undertake climate change research.

4.0 Methodology

This section outlines the methodology according to the specific objective, which is also presented in the Workplan.

4.1 To characterise baseline temperature and precipitation variability and apply existing climate change models to the region in order to estimate possible perturbations to those conditions.

- Climate data (rainfall and temperature) covering the period 1961 to the present will be collected from meteorological stations in the Lake Victoria basin.
- A statistical analysis will be run of the time series data in order to estimate the probability distribution functions for temperatures and precipitation for each decade (baseline variability for 1960-70, 1970-80, 1980-90, 1990-2000). Descriptive statistics will be determined (mean, mode, median, standard deviation). Baseline is the state before any climate change variability is imposed.
- Selected climate change models will be used to estimate possible changes to baseline conditions i.e. perturbations to temperature and precipitation.
- The possible envelope of future climate scenarios will be drawn paying attention to extremes and if possible the relative probability of different scenarios (see Figure 4).
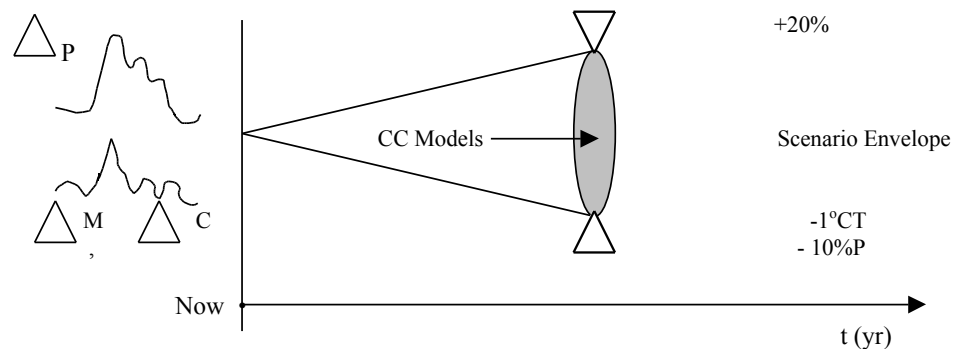
Where :

△ P = historical changes in precipitation

△ M = historical changes in malaria

△ C = historical changes in cholera

Fig. 4. Climate change scenario envelope and historical data

4.2 To improve our understanding of the dynamic relationships between changes in temperature and precipitation, and changes in malaria and cholera risk.

- Historical data on malaria and cholera incidences will be obtained from medical centres in the Lake basin region.
- GIS layers will be constructed to provide the spatial distribution of key variables; temperature (T), precipitation (P); malaria (M) and cholera (C) incidences. These maps will allow us to

select the candidate pilot sites – those sites demonstrating high variability in climate and disease indicators.

- The temporal relationship between the variables will be explored by comparing time series data of P and T for each station and M and C incidence for the areas surrounding each station. Daily values will be plotted and compared in order to capture the signal coupling between climate and disease data.
- For malaria, data on vector habitat, numbers and distribution changes will be collected and incorporated into a GIS layer. This will allow us to explore the relationship between these vector-related parameters, climate parameters and disease indicators.
- For cholera, data on location of water bodies (streams, rivers, lakes) and wetlands (swamps) will be plotted on a GIS layer using existing maps and remotely sensed imagery as appropriate. Relevant cholera habitat indicators such as water temperature and quality (alkalinity, algal blooms) will also be plotted on a GIS layer. Existing hydrological data on river flooding will be collected and plotted on a GIS layer. This is because river flooding is also a risk factor for cholera.

4.3　To understand the sources of vulnerability (time-activity exposure to risk agents, socio-economic risk factors, access to health facilities, water etc.) in order to identify which target groups are most vulnerable.

- Identification and engagement of stakeholders (local communities and regional health institutions and development infrastructure) using participatory approaches will be undertaken.
- Secondary data will be first collected to identify data gaps; these gaps will be filled by primary data from representative samples of the pilot populations. This information will be used to identify the target risk groups within the pilot populations, for example, by age, occupation or gender.
- Socio-economic surveys by means of participatory approaches, focused group discussions, household interviews, field surveys and key informant interviews will be used to collect the relevant data.
- The previous information about climate and disease relationships will be used together with the following socio-economic data to better understand sources of vulnerability and adaptation capacities:
  - Awareness, perceptions and attitudes of stakeholders from local institutions and communities to climate-related human health problems especially malaria and cholera.
  - Anecdotal data on historical coping mechanisms, adaptation strategies and traditional knowledge of pilot communities.
  - Socio-economic characteristics of pilot communities (household resource endowments, poverty levels). This will be obtained from Household Welfare Monitoring Studies, Census and Statistical Bureaus and participatory interviews).
  - Data on water sources (wells, rivers, springs), water availability, use and management strategies at household level and hygiene practices.
  - The daily time activity patterns of the pilot communities.

4.4 To estimate the excess risk of malaria and cholera that may be attributable to future climate change.

- Combining results from the analyses in 4.1 (baseline variability and future climate change scenario) and 4.2 (relationship between climate and disease), it will be possible to estimate the change in incidence of malaria and cholera attributable to climate change. In other words it will be possible to say by how much the incidence of malaria and/or cholera may change with a given change in T and/or P.

4.5 To integrate data and knowledge types in a geographic information system to inform local and national policy making, and enhance stakeholder awareness.

- Using the results from the GIS layers obtained in 4.2 it will be possible to represent future disease scenarios for presentation to policy makers.

4.6 To work with risk groups in the pilot communities to assess existing adaptation and coping strategies for malaria and cholera, and to identify alternative strategies that can accommodate the possible changes in risk.

- In each pilot community, a working group representing the target risk groups will be formed and together evaluate the alternative adaptation and coping strategies for malaria and cholera. Multi-criteria decision making will be used to compare the different alternatives and select preferred adaptation strategies.
- Design Strategic Action Plans (SAPs) for the preferred adaptation strategies.

4.7 To implement priority strategies to prevent and mitigate existing and potential risks, monitor the performance of the strategies, and adapt to changing conditions.

- Meetings will be held with the national and regional government and local communities in order to present SAPs and mobilise resources to implement them.
- Apply a "practice and attitude" pre-survey to a sample of the pilot population before implementation of SAPs.
- Implement SAPs in each pilot community.
- Monitor and evaluate performance of the strategies. Future incidences of malaria and cholera will be used as indicators of the effectiveness of the preferred strategies.
- Carry a post implementation "practice and attitude" survey.
- Present performance results to the policy makers and local communities and modify and or adapt accordingly.

5.0 Detailed Workplan

No.	Mo.	Activity	Method
Year 1 Planning and Analysis			
1	1	First coordination meeting	Workshop
2	1-2	Procurement of equipment	Administration
3	2	Recruitment of research assistants (postgraduate RAs)	Administration
4	3	Training of RAs	Training Workshops
5	2-3	Develop socio-economic questionnaire	Formulation of quantitative and qualitative questions
6	2-3	Develop health questionnaire	Formulation of quantitative and qualitative questions
7	2-3	Field test questionnaires	Pilot surveys
8	2-4	Climate data gathering (2° data) – precipitation (P) and temperature (T)	Secondary data collection from meteorological stations
9	2-4	Malaria (M) and cholera (C) data gathering (2°)	Secondary data collection from health institutions
10		Habitat, risk agent numbers and distribution data gathering (2°)	Secondary data collection from research institutions
11	2-4	Socio-economic data gathering (2°)	Secondary data collection from national statistical bureaus and social and economic ministries
12	3-4	Identification of candidate pilot sites	GIS layers and data from socio-economic surveys
	11-12	Year 1 report writing	Summary of results from project activities by PIs
13	5	Visit candidate sites and select final pilot sites	Fieldwork
		Present project objectives and sensitize pilot communities.	Participatory methodologies
14	5	Field test questionnaires	Pilot fieldwork
15	5-6	Climate data gathering (1° data)	Time series and statistical analysis, Descriptive statistics & Model testing
16	5-6	Malaria (M) and cholera (C) data gathering (1°)	Time series and statistical analysis Descriptive statistics Model testing
17	5-6	Socio-economic data gathering (1°)	Participatory methodologies, socio-economic surveys, focused group discussions, household interviews, field surveys and key informant interviews
18	6-8	Statistical analysis of climate data (P, T) and health data (M, C)	GIS and regression analysis
19	7-9	Time series analysis, climate-disease correlations and parametric modeling	Time series and correlation analysis, and parametric modeling
20	10	Validation and sensitivity testing	Correlation and parametric modeling
21	10-11	Interpretation of results	Evaluation
22	11-12	Integrate baseline data in GIS format	GIS
23	12	Research group meeting to discuss results and flag data gaps	Workshop
Year 2 – Analysis and Planning			
24	13-15	Apply existing climate change models to estimate T and P scenarios	Model testing
25	14-16	Estimate changes in risk magnitude using statistical model of P, T, vs. M, C (activity 18)	Risk analysis
26	15-18	Estimate changes in risk distribution from habitat changes (activity 10)	Model testing
27	18	Uncertainty analysis of estimated risk scenarios	Model testing and correlation analysis
28	15-20	Draft manuscript 1 for journal article 1	Result compilation
29	19	Workshop with key policy makers and international agencies (e.g. UNEP, WHO)	Workshop

30	20	Meeting with pilot communities to present results and initiate strategic planning	Participatory stakeholders meeting
31	20	Formation of local working groups	Participatory stakeholders meeting
32	21	Identification of all possible community-based M, C risk adaptation/mitigation strategies	Evaluation
33	21	Feasibility assessment to identify viable short list of strategies	Pre- "practice and attitude" survey of target risk groups
34	22	Multi-criteria evaluation of viable strategies to identify preferred adaptation options (PAOs)	Participatory workshop using multi-criteria decision making
35	22-23	Produce strategic action plans (SAPs) for pilot community adaptation	Design SAPs with the representatives of target risk groups
36	20-24	Draft manuscript 2 for journal article 2	Result compilation
37	24	Follow-up meeting with key policy makers to mobilize resources	Workshop
38	23-24	Year 2 report writing	Summary of results from project activities by PIs
Year 3 – Implementation and Evaluation			
39	25-36	Implementation of priority adaptation/mitigation actions from SAPs	Implementation using participatory approaches
40	31-33	Monitoring and evaluation	Post- "practice and attitude" survey
41	34-36	Modification of actions as required	Adaptive feedback
42	30-36	Field manual: "Integrated capacity building for community-based adaptation to climate-induced malaria and cholera health risks"	Publication
43	30-34	Draft manuscript 3 for journal article 3	Result compilation
44	34	Dissemination workshop	Workshop
45	35-36	Final report writing	Summary of results from project activities by all team members

6.0   Collaboration and Partnerships

Name	Institution	Expertise	Role
Prof. S. O. Wandiga	National Academy of Sciences, P. O. Box 39450 Nairobi, Kenya e-mail: knas@iconnect.co.ke	Environmental Chemist	Project co-ordination
Prof. P. Yanda	University of Dar es Salaam, P. O. Box 35097 Dar es Salaam, Tanzania e-mail: yanda@ira.uds.ac.tz	Geographer/Conservation ecologist	Principal Investigator Country co-ordinator Socio-economic analysis
Prof. P. Mugambi	Makerere University, P. O. Box 7062 Kampala, Uganda e-mail: ppmugambi@yahoo.co.uk	Applied Mathematics	Principal Investigator Country co-ordinator Model testing
Dr. M. Opondo	University of Nairobi, P. O. Box 301970 Nairobi, Kenya e-mail: maggie@swiftkenya.com	Geographer/Socio-economist	Participatory and socio-economic analysis
Dr. A. Githeko	Kenya Medical Research Institute, P. O. Box 54540 Kisumu, Kenya e-mail: Agitheko@kisian.mimcom.net	Medical Entomologist/ Parasitologist	Health analysis
Dr. D. O. Olago	University of Nairobi, P. O. Box 30197 Nairobi, Kenya e-mail: dolago@uonbi.ac.ke	Geologist/Water Specialist	Climate and water analysis
Dr. R. Kangalawe	University of Dar es Salaam, P. O. Box 35097 Dar es Salaam, Tanzania e-mail: rkangalawe@hotmail	Geographer/Quaternary Geologist	Participatory and socio- economic analysis
Dr. E. Kirumura	Makerere University, P. O. Box 7062 Kampala, Uganda e-mail: ppmugambi@yahoo.co.uk	Socio-economist	Participatory and socio-economic analysis
Dr. Timothy Downs	Clark University, 950 Main Street, Worcester, MA 01610-1477 USA e-mail: tdowns@clarku.edu	International Development, Community and Environment	Collaborator
Postgraduate student (to be identified)	Kenya	Student	Data collection and fieldwork
Postgraduate student (to be identified)	Kenya	Student	Data collection and fieldwork
Postgraduate student (to be identified)	Uganda	Student	Data collection and fieldwork
Postgraduate student (to be identified)	Tanzania	Student	Data collection and fieldwork

7.0 Expected Outputs

1. Databases on climate (rainfall and temperature), water resources, malaria and cholera incidences and socio-economic profiles will be developed.
2. Improved understanding of the relationships among climate variability and incidence of malaria and cholera.
3. Baseline information on vulnerability and adaptation strategies of the target groups constructed.
4. Identification of effective adaptation strategies.
5. Policy briefs.
6. Field manual: "Integrated capacity building for community-based adaptation to climate-induced malaria and cholera health risks"

7. Recommend sustainable adaptation mechanisms with respect to malaria and cholera outbreaks in the face of climate change.
8. Publish material in journals and articles.
9. Capacity building in the region enhanced.
10. Identification of knowledge gaps for further research achieved.

8.0 Relevance to decision making

The whole process of project implementation and evaluation will involve full participation of policy/decision makers' at local and national levels through consultation and seminars. The aim is to enable grassroot participation and ownership. The preferred adaptation strategies with sustainable attributes will form a base for policy recommendations to decision-makers.

9.0 Capacity Building

Students undertaking Masters degrees in relevant fields will be identified to participate in the project and hence build capacity in the region. The collaborating institutions will provide administrative and supervisory facilitation. The project will purchase three dedicated workstations and three cameras, one for each country. An additional computer will be required at the Kenya National Academy of Science for the PI. Furthermore the project will involve pilot risk stakeholders in its execution and implementation of preferred adaptation strategies.

10.0   References

A.J. McMichael, A. Hames, R. Scooff and S. Covats (eds). Climate Change and Human Health: An assessment prepared by a Task Group on behalf of the World Health Organization, the World Meteorological Organization and the United Nations Environment Programme. WHO, Geneva 1996.

Epstein PR (1995). Emerging diseases and ecosystem instability: new threats to public health. American journal of public health. 85 (2), 168 – 172.

Epstein PR (1992) Cholera and Environment. Lancet, 339, 1167 – 1168.

Gash, J.H.C., Odada, E.O., Oyebande, L. and Schulze, R.E. (2001). Freshwater Resources in Africa.. Proceedings of a Workshop, Nairobi, Kenya, October 1999. BAHC International Project Office, Potsdam.

Githeko A. K., and Ndegwa, W. (2001). Predicting malaria epidemics in the Kenyan Highlands using climate data: a tool for decision makers. Global change and Human Health. 2, 54-63.

Githeko A. K., and Lindsay, S. W. and Confalonieri, U, and Pnatz, J. (2000). Climate Change and Vector borne diseases: A regional analysis. Bull. World Health Org . 78, 1136-1147. IPCC (2001): *Summary for Policy Makers: Climate Change 2001: Impacts, Adaptation, and Vulnerability:* Report of Working Group 11 of the Intergovernmental Panel on Climate Change.

Hulme, M. 1996. Climate Change and Southern Africa: an exploration of some potential impacts and implications in the SADC region. Climate Research Unit, University of East Anglia, Norwich, UK

Levins R. et al. (1994) The emergence of new diseases. American Scientist, 82, 52-60.

Linthicum, K. J. A. Anyamba, C. J. Tucker, P. W. Kelley, M. F. Meyers, C. J. Peters (1999). Climate and Satellite indicators to forecast Rift Valley Fever epidemic in Kenya. Science 285, 297- 400.

Materu, S. F., Lema, O. E., Mukunza, H. M., Adhiambo, C. G., Carter J. Y., (1997) Antibiotic resistance pattern of *Vibrio cholerae* and *Shigella* causing diarrhoea outbreaks in the eastern Africa region: 1994-1996. *East Africa Medical Journal* 74: 193-7

Mbooera, L. E. G. and Andrew Y. Kitua (2001). Malaria epidemics in Tanzania: an overview. *African health sciences* 8: 17-23

Morse S.S. (1995) Factors in the emergence of infectious diseases. Emerging infections diseases, 1:7-15.

Nicholson, S. E. (1996). *A review of Climate dynamics and climate variability in Eastern Africa*. In: T. C. Johnson and E. O. Odada (eds). The Limnology, Climatology and Palaeoclimatology of East African Lakes, pp. 25-56. Gordon and Breach Publishers, Australia.

Roberts, J. M. D. (1964). Control of epidemic malaria in the highlands of Western Kenya, Part III. After the campaign. J. Trop. Med & Hgy. 67, 230-237.

Reid, R.S., Kruska, R.L., Thornton, P.K. 1999. Will human population growth and land-use change control tsetse during our life times? in OAU/STRC Publications. no. 119. in International Scientific Council for Trypanosomiasis Research and Control. Twenty fourth meeting. OAU/STRC. OAU, Lagos (Nigeria). Scientific, Technical and Research Commission International Scientific Council for Trypanosomiasis Research and Control, Nairobi (Kenya). Nairobi (Kenya). p. 563-577.

Reid, R.S., Kruska, R.L., Deichmann, U., Thornton, P.K., Leak, S.G.A. 2000a. Human population growth and the extinction of the tsetse fly. in Agriculture Ecosystems and Environment (The Netherlands). v. 77(3). p. 227-236.

Reid, R.S., Kruska, R.L., Muthui, N., Taye, A., Wotton, S., Wilson, C.J., Mulatu, W. 2000b. Land-use and land-cover dynamics in response to changes in climatic, biological and socio-political forces: the case of southwestern Ethiopia. in Landscape Ecology (The Netherlands). v. 15(4). p. 339-355.

Shapiro, R. L., Muga, R. O., Adock, M. P., Penelope, A. Philip-Howard, W. A., Kumar, L., Waiyaki, P., Nahlen, B. L., and Slutsker, L. (1999). Transmission of epidemic *Vibrio cholerae* 01 in rural western Kenya associated with drinking water from Lake Victoria: an environmental reservoir of cholera? *American journal of. Tropical. Medicine. & Hygiene.* 60: 271-276

Song, Y., Ssemazzi, H.M. and Xie, L. (in press). Development of a coupled regional climate simulation model for the Lake Victoria basin. In: E.O. Odada and D.O. Olago (eds.) The East African Great Lakes: Limnology, Palaeolimnology and Biodiversity. Advances in Global Research Book Series, Kluwer Academic Publishers, Amsterdam.

Thompson, J. and Cairncross, S. (2002). Drawers of Water: assessing water in Africa. Bull. World Health Org. 80, 61-61

WHO (1999) Outbreak news

WHO (2000) "Cholera", website: www.rbm.who.int

WHO (2002) "Roll Back Malaria", website: www.rbm.who.int

WHO (2000). Global water supply and Sanitation Assessment 2000 Report. Yohe, G., and Tol, R. S. J. (2001). Indicators of social economic coping capacity – Moving towards a working definition of adaptive capacity. *Unpublished*

11.0   PROJECT BUGDET

11.1   Narrative Summary of Budget

The total project cost is estimated at USD. 284,800 of which USD 224,800 is requested.

Personnel: This includes the honoraria for principal researchers. DSA for principal researchers is needed for them to go to the field, introduce students and research assistants, assign duty, teach research assistants on data collection and supervise work.
Materials and Supplies: This will cover the purchase of maps, imageries, and data sets from various sources.
Equipment: Computers will be required to manage the database and perform the data analysis. Cameras are needed to capture socio-economic activities and environmental condition in the study sites.
Capacity Building: Include workshops for stakeholders in each country and review meetings for all the researchers including students.
Communication costs cover telephone, e-mail, internet and fax.
Publication and information dissemination: these costs will involve journal publications and policy briefs and information leaflets.
Transportation: Costs will facilitate the undertaking of field data collection since the study site in the Lake Victoria region are located several hundred kilometers from the institutional bases of the participating researchers. These study sites are not easily accessible.
Field Work: The following persons will participate in field work for 24 person days per year at rates indicated:
4Graduate Students @ USD 40 for 40 person days.
6 Research assistants @USD 40 for 39 person days.
6 Field assistants @USD 15 for 39 person days.
8 Principal Researchers @USD 69 for 15 person days.

Stakeholders Workshops: A 2-3 days workshops for stakeholders is planned in each country as follows:
Year 1 at 12th Month

Year 2 at 19th month – visit by Principal Investigators in each country to UNEP, UNICEF, WHO, Ministries of Health, Environment and Finance and Planning at Central and Provincial levels to explain research objectives and preliminary findings as well as seek support.

Year 2 at 20th Month:
Year 2 at 24th Month:
Year 3 at 34th Month:

Representative of the following will be invited to these meetings:
NGO/CBO
1 active civil society in area

local leaders
2 women
2 men   Opinion makers
2 youth

Private Organizations

1 Private Hospital
1 Private Company in area
1 cooperative groups representative

<u>Government</u>

1 Ministry of Health
1 Ministry of Environment
1 Ministry of Finance and Planning
1 Municipal or country council
Chiefs,
Assistant chiefs

<u>Review Meetings:</u> The following review meetings are planned:

Year	**Period**	**Participants**
One	1st Month	9 Principal Researchers 4 Graduate Students 4 Consultants/ Experts
	12th Month	(Same)
Two	21st Month	(Same)
Three	35 – 36 Month	This will be conducted by e-mail or teleconference.

Each review meeting will last 3 – 5 days.

11.2   Project Budget Estimates

AIACC Proposal budget template

	Year 1		Year 2		Year 3	
	AIACC funds	**Collateral funds**	**AIACC funds**	**Collateral funds**	**AIACC funds**	**Collateral funds**
Personnel						
Prof. S. O. Wandiga (Kenya, project coordinator)	3000	0	3000	0	3000	0
Dr. A. Githeko (Kenya)	2500	0	2500	0	2500	0
Dr. D. 0. Olago (Kenya)	2500	0	2500	0	2500	0
Dr. M. Opondo (Kenya)	2500	0	2500	0	2500	0
Prof. P. Yanda (Tanzania project coordinator)	3000	0	3000	0	3000	0
Dr. R. Kangalawe (Tanzania)	2500	0	2500	0	2500	0
Prof. P. Mugambi (Uganda)	3000	0	3000	0	3000	0
Dr. E. Kirumura (Uganda)	2500	0	2500	0	2500	0
Dr. Tim Downs (Northern collaborator)	0	5000	0	5000	0	5000
Capacity building (training)	0	0	0	0	0	0
Graduate Student (Kenya)	0	2000	0	2000	0	2000
Graduate Student (Kenya)	0	2000	0	2000	0	2000
Graduate Student (Tanzania)	0	2000	0	2000	0	2000

Graduate Student (Uganda)	0	2000	0	2000	0	2000	
Stakeholder Workshops (Kenya, Uganda & Tanzania)	4000	0	4000	0	4000	0	
3 Review Meetings (Kenya, Uganda, Tanzania)	8000	0	8000	0	8000	0	
Materials & Supplies	0	0	0	0	0	0	
Maps, photographs, imageries Office consumables (Kenya, Tanzania & Uganda)	4500	0	3000	0	2100	0	
Data collection and analysis (climatic, health and socio-economic data) (Kenya, Tanzania & Uganda)	3000	0	3000	0	3000	0	
Office accomodation and facilities		4000		4000		4000	
Equipment	0	0	0	0	0	0	
4 Computers with UPS (Kenya, Tanzania & Uganda)	4620	0	0	0	0	0	
4 Printers (Kenya, Tanzania & Uganda)	2000	0	0	0	0	0	
3 Digital Cameras	1500	0	0	0	0	0	
Specialised software	1000	0	0	0	0	0	
Communications (Kenya, Tanzania & Uganda)	3000	0	3000	0	2400	0	
Secretarial services	0	3000	0	3000	0	3000	
Publication & information dissemination	0	0	2000	0	3000	0	
Transportation	0	0	0	0	0	0	
Vehicle hiring for fieldwork (Kenya, Tanzania & Uganda)	3000	0	3000	0	1500	0	
Data collection (DSA for 4 Graduate students) (Kenya, Tanzania & Uganda)	6400	0	6400	0	0	0	
Data collection (DSA for 6 research assistants) (Kenya, Tanzania & Uganda)	9360	0	9360	0	0	0	
Data collection (DSA for 6 field assistants) (Kenya, Tanzania & Uganda)	3510	0	3510	0	0	0	
Data collection (DSA for 8 principal researchers) (Kenya, Tanzania & Uganda)	6120	0	6120	0	0	0	
	0	0	0	0	0	0	
2 Research Assistants (Kenya, Tanzania & Uganda)	0	0	0	0	0	0	
2 Research Assistants (Kenya, Tanzania & Uganda)	0	0	0	0	0	0	
Contingency (Kenya, Uganda, Tanzania)	1500		1500		1500		
Incidentals		3000		3000		3000	
Overheads	8306		7444		4650		
Sub-total 1	**91316**	**20000**	**81834**	**20000**	**51650**	**20000**	
Sub-total 2 AIACC + Collateral						**224800**	**60000**
GRAND TOTAL							**284800**

11.2   AIACC Funds

All funds will be received by the Kenya National Academy of Science as the main contractor.

Kenya: Kenya National Academy of Sciences
Utalii House, Utalii Street
Room 812
P.O. Box 39450, Nairobi, Kenya
(Mrs. Noel L. Abuodha – Administrator)

Subcontractors will include the following:

Uganda: Makerere University
P.O. Box 7062, Kampala, Uganda

Tanzania: University of Dar-es-Salam
                 P.O. Box 35097, Dar-es-Salame, Tanzania

.APPENDICES

Appendix 1
12.1   Curriculum Vitaes

(a) Shem Oyoo Wandiga

EDUCATION: Ph. D., Case Western Reserve University (1972)
                  M. S., University of Maryland (1972)
                  B.S., Howard University (1967)

RECENT ACHIEVEMENTS:
Professor of Chemistry in the University of Nairobi. Past Deputy Vice-Chancellor
(Administration and Finance) of the University. Co-ordinator of the Policy and
Planning Task Group of the Ministry of Education (1991), Kenya's Representative to
the Executive Board of UNESCO (1995), member of the General Committee (1997)
and Advisory Committee on Environment (1999) of the International Council of
Scientific Union (ICSU). Currently Chair of the Kenya National Academy of
Sciences, an ICSU – World Summit on Sustainable Development (WSSD) Task Force
and Foundation for the Development of Chemistry in Africa (FoDeCa). Author of a
large number of publications in scientific and educational fields and has chaired
several national committees on university education and been a consultant on World
Bank, UNESCO and UNEP projects undertaken in Kenya and eastern Africa.

SCHOLARLY ACTIVITIES

SELECT JOURNAL/BOOK PUBLICATIONS
Termites: A potentially large source of atmospheric methane, carbon dioxide and
molecular hydrogen. (1982). P. R. Zimmerman, J. P. Greenberg, S. O. Wandiga and
P. J. Crutzen, Science 218, 563

Methane emissions by tropical termites feeding on soil, wood, grass and fungus
Combs (1987). S. O. Wandiga and James A. Z. Mugedo. Kenya Journal of Sciences
(A) 8 (1-2).

The fate of ^{14}C-DDT in Kenyan tropical soils (1994). J. O. Lalah, F. N. Acholla and
S. O. Wandiga. J. Env. Scie.Health B29 (i), 57_64

Biofuel availability and domestic use patterns in Kenya (2001). Evans Kituyi,
Lackson Marufu, Shem Wandiga, Isaac O. Jumba, Meinrat O. Andreae and Gunter
Helas. Biomass and Bioenergy. 20. 71-82.
Biofuel consumption rates and patterns in Kenya (2001). Evans Kituyi, Lackson
Marufu, Beate Huber, Shem O. Wandiga, Isaac O. Jumba, Meinrat O. Andreae and
Gunter Helas. Biomass and Bioenergy. 20, 83-99.

Books

1.   *Capacity Building and Institutional Development in Higher Education in Kenya.* S.O. Wandiga,
        (1997) International Institute for Educational Planning (IIEP) UNESCO 1997.

2. Effects of botanical composition, soil origin and composition on mineral concentrations in dry season pastures in Western Kenya. Jumba I.O., Suttle, N.F, Hunter, E.A. and Wandiga, S.O. (1996). *In: Environmental Geochemistry and Health*. Eds. J.O. Appleton, R. Fuge and G.J.H. Mc Call. Geological Society special publication No. 113. Geological Society Publishing House, U.K.

3. Research Training: The Kenyan Experience. S.O. Wandiga. (1996). In: *Research Training for Development*- Proceedings of conference on Research Training for countries with limited Research Capacity. Eds. Erik. W. Thulstrup and Hans D. Thulstrup. Roskilde University Press p.145-152.

4. *Environment and Development*: Proc. of a Public Lectures series of Kenya National Academy of Sciences (KNAS). S.O. Wandiga and N.L. Abuodha (Eds.) Kenya National Academy of Sciences Press, 1996.

5. Shem O. Wandiga and Eric Odada (2001). Science and Society: Africa's perspective. In: *Our Fragile World: Challenges and Opportunities for Sustainable Development*. Ed. M.K. Tolba. (EOLSS). In CD only

6. Eric O. Odada and Shem O. Wandiga (2001). The effects of Global Warming on Rangelands. In: EOLSS "Encyclopaedia of Life Support Systems". Theme 1.4.2.3 Natural Resources System Challenge II: Climate Change, Human Systems, and Policy. UNESCO Publication. In Press.

7. Role in atmospheric change Biomass Burning and opportunities for emission mitigation. E. Kituyi, S.O. Wandiga, M.O. Andreae and G. Helas. (2001). In: *Climate Change, Science and Policy for Africa*. Ed. Pak Sum Law. Book in preparation.

8. S.O. Wandiga, (1999). Interview. In: *21 Scientists in the 21st Century*. Ed. Andra's Erd'elyi. Tertia Publishers Budapest, Hungary.

9. Pesticides in Kenya: In: "Distribution, fate and effects of pesticides in tropical coastal zones". Wandiga, S.O., P.N. Kaigwana, J.O. Lalah (1997). Book manuscript in press.

(b) Andrew Karanja Githeko

NAME: **ANDREW KARANJA GITHEKO, DR**
.
EDUCATION HISTORY
B.Sc (Hon)   University of Nairobi, 1981, (Chemistry / Zoology)
M.Sc   In Applied Parasitology and Medical Entomology
                         Liverpool School of Tropical Medicine, 1985,
Ph.D   In Medical Entomology
                         Liverpool School of Tropical Medicine, 1992
                         University of Liverpool.

Publications.
Sabwa, D. M and **Githeko, A. K.** (1985). Faecal contamination of urban community water supplies and its public health implications. *East Africa Medical Journal 62: 794-801*

Beier, C. J., Oster C, N., Koros J. K., Onyango F. K. **Githeko A. K**. Rowton E., Koech D. K., & Roberts C.R. (1989). Effect of human circumsporozoite antibodies in *Plasmodium*-infected *Anopheles* (Diptera: Culicidae). *Journal of Medical Entomology, 26, 547-553*.

Githeko, A. K., Brandling-Bennett, A. D., Beier, M., Atieli, F., Owaga, M. and Collins, F. H.(1992). The reservoir of *Plasmodium falciparum* malaria in a holoendemic area of western Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 86, 355- 358.*

Githeko, A. K., Brandling-Bennett, A. D., Beier, M., Atieli, F., Owaga, M., Juma, F and F. H. Collins (1993). Confirmation that *Plasmodium falciparum* has a periodic infectivity to *Anopheles gambiae*. *Journal of Medical and Veterinary Entomology, 7, 373-376.*

Githeko A. K., Service, M. W., Atieli, F., Hill, S., and Crampton, J. M. (1993). Field-testing of an enzyme-linked synthetic oligonucleotide probe for identification of *An. gambiae s.s.* and *An. arabiensis*. *Annals of Tropical Medicine and Parasitology. 87, 595-601 .*

Githeko, A. K., Service, M. W., Mbogo, C. M, Atieli, F. K., and Juma, F. O. (1993). *Plasmodium falciparum* sporozoite and entomological inoculation rates at the Ahero rice irrigation scheme and the Miwani sugar-belt in western Kenya. *Annals of Tropical Medicine and Parasitology. 87, 379 - 391.*

Githeko, A. K., Service, M. W., Mbogo, C. M., Atieli and Juma, F. O., (1994) Sampling *Anopheles arabiensis, A. gambiae sensu lato* and *A. funestus* (Diptera Culicidae) with CDC light-traps near a rice irrigation area and a sugar-cane belt in western Kenya. *Bulletin of entomological Research, 84, 319-324*

Githeko, A.K., Service, M.W., Crampton, J.M., Hills, S, Knapp, T., and Atieli F.K. (1992). Identification of *Anopheles gambiae s.s.* and *Anopheles arabiensis* larvae using an enzyme-linked oliogonucleotide DNA probe. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 86, 340*

Karanja, D.M.S., **Githeko**, A. K., and Vulule, J. M., (1994). Small-scale field evaluation of the monomolecular surface film 'Arosurf MSF' against *Anopheles arabiensis* Patton. *Acta Tropica, 58, 365-369*

Oloo, A.J., Mudegu J. V., Ngare, D., Ondijo, S., Odada, P., Adungo, N. I., **Githeko**, A. K., Ekisa, W., and Mahadevan, S. (1993). The effect of permethrin impregnated sisal curtains on vector densities and malaria incidence. Results of a pilot -study. *East African Medical Journal*, *7, 475-477.*

Githeko, A. K., Service, M. W., Mbogo, C. M., Atieli, F. K. and Juma, F.O. (1994). Origin of blood meals in indoor and outdoor resting malaria vectors in western Kenya. *Acta Tropica 58, 307-316*

Githeko, A. K., Service, M. W., Mbogo, C. M., and Atieli, F. K (1996). Resting behaviour, ecology and genetics of malaria vectors in large-scale agricultural areas of western Kenya. *Parassitologia, 38, 481-490*

Githeko, A. K., Adungo, N. I., Karanja, D. M., Hawley, A. W., Vulule, J. M., Seroney, I. K., Ofulla, O. V. A., Atieli, F. K., Ondijo, S. O., Genga, I. O., Odada, P. K., Situbi P. A. and Oloo, A. J. (1996). Some observations on the biting behaviour of *Anopheles gambiae s.s., Anopheles arabiensis* and *Anopheles funestus* and their implications for malaria control. *Experimental Parasitology: 82, 306 - 315*

Githeko, A. K., Mbogo, C. N. M., Curtis, C. F., Lines, J., and Lengeler (1996). The entomological monitoring of large-scale vector control intervention. *Parasitology Today 12, 127-128.*

Oloo, A., **Githeko, A.**, Adungo, N., Karanja, D., Vulule, J., Kisia-Abok, Seroney, I., Ayisi J., Ondijo S., Koech, D.K., and Abdalla, M.S. (1996). Field trial of permethrin impregnated sisal curtains in malaria control in western Kenya. *East African Medical Journal 73, 735 - 740.*

Walker. T. W., Robert L. L., Copeland, R. A., **Githeko A. K**. Wirtz, R. A., Githure, J. I., and Klein, T. A., (1996). Field-evaluation of arthropod repellents, deet and piperidine compound, ai3-37220,

against *Anopheles funestus* and *Anopheles arabiensis* in western Kenya. *Journal of the American Mosquito Control Association. 12 (Pt1): 172-176*

Karanja D. M. S., Alaii, J., Abok, K., Adungo, N. I., **Githeko, A. K**., Seroney, I. K., Vulule, J. M., Odada, P. K. and Oloo A. J., (1999), Knowledge, and attitude to malaria control and acceptability of permethrin impregnated eaves curtains. *East African Medical Journal 76, 42-46*

Githeko A. K. Lindsay S. W. Confalonieri U, and Partz J. (2000) Climate changes and Vector borne diseases: A regional analysis *Bulletin of the World Health Organization 78 :1136-1147*

McMichael T., Confalonieri U., **Githeko A.,** Martens P., Kovats. S., Partz J., Woodward A., Haines A Sasaki A., (2000) Human Health. In: Metz B., Davidson O. R., Martens JW., Rooijen SNM., McGrory LW. (eds.) *Methodological and Technological Issues in Technology Transfer. A Special Report of the IPCC Working Group III pp 331-345*, Cambridge University Press.

Githeko AK, and Ndegwa W. (2001) Predicting malaria epidemics using climate data in Kenyan highlands: a tool for decision makers, *Global Change and Human Health. 2: In press*

Climate Change 2001; Impacts, Adaptations and Vulnerability of Climate Change: Scientific-Technical Analysis. Contribution of working Group II to the Second Assessment Report of the Inter-governmental Panel on Climate Change. Ed. McCarthy JJ. Canziani OF., Leary N.A., Dokken DJ. & White KS., Cambridge University Press

Contact Address: Centre for Vector Biology and Control Research, P. O. Box 1578 Kisumu Kenya, Tel. (Work) 254 35 22902, 22983, 22924, (Home 22900, Fax: 22903, 22981, Email: andrew@kenya.cdc.gov   or **AGitheko@kisian.mimcom.net**

(c) Pius Zebhe Yanda

Education

1983-1986:	B.Sc.(Geology), University of Dar-es-Salaam
1987-1989:	M.Sc. in Natural Resources Management at Agricultural University of Norway (Ås),
1991-1995:	Ph.D in Physical Geography, Stockholm University

Present Position and Duties

Senior Research Fellow at the University of Dar es Salaam where I have taught since 1988. I have attended several professional training courses in soil conservation, remote sensing education, soil and water conservation in dryland areas, database analysis and design, introduction to GIS and remote sensing, analysis, interpretation and modelling, the role of Geographic Information Systems (GIS), remote sensing, image processing systems and decision support systems for industrial development. I have been involved in many regional environmental related programs and has acted as a consultant to many several ecological conservation and environmental projects.

Select Scholarly Activities

Publications

1. Mwalyosi, R.B.B. and Yanda, P.Z. (1989): Water Potentials in the Lake Manyara Catchment Basin. *I.R.A., Research Paper No. 20.* July, 1989. 36p.
2. Yanda, P.Z. and Mohamed, S.A. (1990): The Environmental Impact of Irrigation Schemes: The case of Mto wa Mbu, Arusha, Tanzania. A reconnaisance survey. *I.R.A. Research Paper No. 24.* January, 1990. 27p.
3. Yanda, P.Z. (1991): Soil erosion as a major contributing factor to the degradation of arable land in the Kondoa District, Central Tanzania-the case of Mwisanga Catchment area. *EDSU Working Paper No.7*, School of Geography, Stockholm university, 16p.

4. Shishira, E.K. and Yanda, P.Z. (1994): The Mtera Reservoir Ecosystems: Towards Assessment of the Landuse Factor. *IRA Research Report No 93,* University of Dar es Salaam, December, 1994.
5. Mung'ong'o, C.G. & Yanda, P.Z. (1993): The potentials and limitations of sustainable land management in the semi-arid Kondoa Irangi Hills, Central Tanzania. In: Ganry, F. & Campbell, B. (Eds.): *Sustainable land management in African semiarid and subhumid regions*, Dakar, p.301-311.
6. Yanda, P.Z. (1995b): *Classification of Soil Degradation Intensity as a Basis for Soil and Water Conservation Strategy in semi-arid and Sub-humid Areas: The Case of Mwisanga Catchment, Kondoa, Central Tanzania*. A paper presented at the International Workshop on Soil and Water Conservation and Dryland Farming. Yangling, China. 4th-23rd September, 1995.
7. Yanda, P.Z. (1995): *Status of Soil Degradation, Monitoring Programmes and Techniques in Tanzania* A paper presented at the SADC Workshop on Soil Erosion and Degradation Monitoring Methods and Techniques, Harare, Zimbabwe, 4-7th December, 1995.
8. Yanda, P.Z. (1996): Soil Erosion and the Fate of Ntomoko/Mwisanga Water Supply Scheme in Kondoa District, Central Tanzania. In: Christiansson, C. and Kikula, I. S. (Eds.); *Changing Environment: Research on Man-Land Interrelations in Semi-Arid Tanzania*, Regional Soil Conservation Unit (SIDA), Nairobi*, **Report No. 13***; *46-53.*
9. Kikula, I. S., Charnley, S. and Yanda, P.Z. (1996): *Ecological Changes in the Usangu Plains and Their Implications on the Down Stream Flow of the Great Ruaha in Tanzania*. *IRA Research Report No 99,* University of Dar es Salaam, September, 1996.
10. Katima, J.H.Y, Yanda, P.Z., Senzota, A.S. and Lemmens, A.M.C., 1996: *Inventory of the Monitoring Activities, Needs and Possibilities for the Key-Environmental Issues in Tanzania*. Eindhoven University of Technology, The Netherlands.
11. Dejene, A., Shishira, E.K., Yanda, P.Z. and Johnsen, F. (1997*): Land Degradation in Tanzania; Perception from the Village:* **World Bank Technical Paper No. 370**.
12. Yanda, P.Z. (1997): Classification of Soil Degradation Intensity as a Basis for Soil and Water Conservation Strategy in semi-arid and Sub-humid Areas: An example from Mwisanga Catchment, Kondoa, Central Tanzania. In ; *Journal of the Geological Society of Tanzania*, **Vol. 1(1997)**
13. Shishira, E.K., Yanda, P.Z. and Lyimo, J., (1998): Vegetation Dynamics and Management Implications in the Pugu and Kazimzumbwi Forest Reserves, Tanzania. *Coenoses 13 (3): 149-158.*
14. Yanda, P.Z. and Mung'ong'o, C.G, (1999): *Farming Systems of Kasulu District, Western Tanzania, A Case Study of Buhoro, Ruhita and Titye Villages,* **IRA Research Paper No. 45**, Institute of Resource Assessment, Dar es Salaam
15. Yanda, P.Z. and Shishira, E.K. (1999): *Land Cover Changes and Driving Forces in Tanzania*. In Ravichandran, V. (Ed.): Regional Land Cover Changes, Sustainable Agriculture and their Interactions with Global Change (with focus on sub-saharan African Countries). COSTED, Chennai
16. Yanda, P.Z. (1999): *Water Infiltration Rates on Degraded Soils in Mwisanga Catchment, Kondoa, Central Tanzania*. Chapter 6 in a book tittled "Sustainable Agriculture in Semi-arid Tanzania, Dar es Salaam University Press (DUP), Dar es Salaam.
17. Stromquist, L., Yanda, P., Lindberg, C., Msemwa, P., and Simonsson-Forsberg, L., (1999): The extended baseline perspective – Utilising land information to analyse and predict environmental change. A Tanzanian example. *Ambio Vol. 28,* **No. 5**; 436-443.

Yanda, P.Z. (2000): Use of Soil Horizons for Assessing Soil Degradation and Reconstructing Chronology of Degradation Processes: The case of Mwisanga Catchment, Kondoa, Central Tanzania. *Geomorphology*; Volume/Issue **34/3-4**; 209-225.

(d) Mary Magdalene Opondo

PERSONAL DATA

NAME	:	Mary Magdalene Opondo
DATE OF BIRTH	:	8 October 1959
PLACE OF BIRTH	:	Siaya (Kenya)

MARITAL STATUS	:	Single
ADDRESS	:	P. O. Box 13704, 00100 GPO Nairobi, KENYA
CONTACT TELEPHONE	:	Office +254 2 33 42 44 Ext. 28230
	:	Private +254 2 71 30 39
E-MAIL ADDRESS	:	maggie@swiftkenya.com
LANGUAGES	:	Literate and orally proficient in English, German, Kiswahili, Luo and Luhya

EDUCATIONAL BACKGROUND

- PhD (1997)

  University of Duesseldorf, Germany,
  Economic Geography (Major Subject)
  Political Science and Sociology (Minor
  Subjects).

- MA (1989)

  Kenyatta University, Nairobi, Kenya,
  Economic Geography and Advanced
  Quantitative Methods in Geography.

- B.Ed (Hons) (1983)

  University of Nairobi, Nairobi,
  Geography and Literature
  Education (Psychology, Sociology, Curriculum
  Development, Administration, Economics and
  Planning).

PROFESSIONAL EXPERIENCE

- 1998 to date

  Departmental Representative of the Postgraduate
  Studies Committee

- 1990 to date

  Lecturer, Department of Geography, University
  of Nairobi in Industrial, Economic and Practical
  Geography, and Research Methodology.

- 1990 – 1997

  Assistant Lecturer, Department of Geography,
  University of Nairobi

- 1989 – 1990

  Tutorial Fellow, Department Geography,
  Kenyatta University

- 1983 – 1986

  Graduate Teacher, Teachers Service
  Commission

AREAS OF SPECIALIZATION

- Industrial Transformation and Global Environmental Change
- Food Security
- Socio-Economic Development

RESEARCH EXPERIENCE (1995 - to date)

- 2001 – to date   Gender and Tobacco Contract Farming in Kenya
- 1999 – to date   International Trade and Gender in East Africa
- 1993-1996   Ph.D. Research on "The Food
                          Processing Industries in Kenya"

- 1995-1996   Contract Farming in Nakuru and Vihiga
                               Districts

PUBLISHED WORKS (1997-2001)

- "The Human Dimensions' Studies on the East African Lake Regions : A Review", IDEAL Volume No. 3, Forthcoming in *Advances in Global Research* Bookseries, Kluwer Publishers (2001).

- "Socio-Economic and Ecological Impacts of the Agro-Industrial Food Chain on Kenya the Rural Economy in Kenya", in *AMBIO* Vol. XXIX No. 1, February 2000)

- *The Dynamics of the Agro-Industrial Food Chain in Kenya*, Band No. 6, Institute of African Affairs, Hamburg, Germany (1997).

POSTERS AND PAPERS PRESENTED IN SEMINARS, WORKSHOPS AND CONFERENCES (1998 – 2001)

- "The Human Dimensions : A Review of Studies done in the East African Lake Regions", IDEAL 2nd International Symposium (10th – 13th of January 2000 – Club Makokola, Malawi).

- "Problems of Scale and Industrial Transformation in Africa" and "The African Perspective of Industrial Transformation", Industrial Transformation Open Science Meeting, (24th –26th of February, 1999 – Amsterdam, Netherlands).

- "Impact of the Globalization of the Agro-Industrial Food Chain on the Rural Economy in Kenya", (Poster Presentation), Fifth Meeting of the Scientific Advisory Council (SAC-V) and Fifth National Committee Meeting of the International Geosphere-Biosphere Programme (IGBP), (1-7th September 1998 – Nairobi, Kenya).

AWARDS

- Mobil Oil (Kenya) Ltd. Merit Award as the best Candidate in Geography (1984)
- 2000 Start Young Scientist Award for the paper entitled "The socio-economic and ecological impacts of the agro-industrial food chain on the rural economy in Kenya" published in AMBIO (2000)

EXTRA-CURRICULAR PROFESSIONAL ACTIVITIES

Member of:

❧ GENIe (**G**lobal **P**roblematique **E**ducation **N**etwork **I**nitiativ**e)**

❧ International Geographical Union (IGU)

❧ International Human Dimensions Programme on Global Environmental Change (IHDP)

(e) Daniel Ochieng' Olago

Name: Dr. Daniel Ochieng' Olago (D.Phil., Oxon)
Position: Lecturer in Geology
Address: Department of Geology, University of Nairobi, P.O. Box 30197, Nairobi, KENYA
Date of Birth: 3rd November, 1965
Nationality: Kenyan
Sex: Male
Marital Status: Married with two children
Languages: English, French, Swahili

A. Education

1. University of Nairobi, Nairobi, Kenya, 1986 - 1992:

(i) B.Sc. (First Class Honours, 1989)
ii) M.Sc. (Geology) by coursework and thesis, 1992

2. University of Oxford, Oxford, UK, 1992-1995:
    Degree of Doctor of Philosophy (D.Phil., 1996)

B. Research Interests

1. Quaternary geology and geochronology
2. Quaternary palaeoclimatology and palaeoenvironments
3. Sedimentology and Organic Geochemistry
4. Palaeontology and Palynology
5. Surface and sub-surface water chemistry and dynamics
6. Human impact on the environment: past and present

C. Employment and Administrative Experience

a) Employment:
1. Research Assistant, Dept. of Geology, University of Nairobi, July to September, 1988.
2. Assistant, the British Geothermal Project in Kenya, March, 1989.
3. Lecturer, Department of Geology, University of Nairobi, 1996-

b) Administrative Experience:
1. Research Scientist, PAGES Africa Regional Centre, June 1996-
2. Programme Officer, Pan-African START Secretariat, January 1997-
3. Examinations Officer, Department of Geology, September 1997-
4. Permanent Representative of the Dean of Faculty of Science in the Law of the Sea (LOS) Committee, 1998-1999.
5. Coordinator, Common Undergraduate Courses, Course CCS 005, Environmental Science, September 1998-1999.
6. Secretary, Faculty of Science Income Generation Unit, Research and Training Section, March 1999-
7. Chairman of Common Undergraduate Courses Syllabus Review, Faculty of Science, 1999-2000.

E. Consultancy Experience

1. Investigations on the impact of salt and sand harvesting activities on groundwater resources, Malindi District (1998).
2. Environmental impact assessment for NOCK construction in industrial area, Nairobi (1999)
3. Nairobi Rivers Water Assessment Study (1999).
4. Elangata Wuas Environmental Management Project, Kajiado District, Kenya (2000-2001).

F. Scholarship and Fellowship Awards

1. DAAD Scholar, University of Nairobi, 1989 to 1990.
2. RHODES Scholar for Kenya, 1990, University of Oxford, UK.
3. 1998 International START Young Scientist Award.

G. Professional Associations

1. Member, East African Natural History Society (EANHS), 1996-
2. Member, Geological Society of Kenya (GSK), 1997-
3. International Scientific Steering Committee Member, International Geosphere-Biosphere Programme - Past Global Changes Programme (IGBP-PAGES SSC), 2000-2002.
4. Member, Rhodes Scholarship Selection Committee for Kenya, December 1995-

H. Publications

1. **Olago, D. O.** and Odada, E.O. (1996). The physical and chemical dynamics of the North Basin, Lake Turkana, Northwest Kenya. In: T.C. Johnson and E.O. Odada (eds.), <u>The Limnology, Climatology and Palaeoclimatology of the East African Lakes</u> pp.413-431, Gordon and Breach Publishers, Amsterdam.

2. Street-Perrott, F.A, Huang, Y., Perrott, R.A., Eglinton, G., Barker, P., Khelifa, L., Harkness, D.D. and **Olago, D.O.** (1997). Impact of lower atmospheric carbon dioxide on tropical mountain ecosystems. Science, Vol. 278, pp.1422-1426.

3. Ficken, K.J., Street-Perrott, F.A., Perrott, R.A., Swain, D.L, **Olago, D.O.** and Eglinton, G. (1998). Glacial/interglacial variations in carbon cycling revealed by molecular and isotope stratigraphy of Lake Nkunga, Mt. Kenya, East Africa. Organic Geochemistry, 29 (No.5-7), pp. 1701-1719.

4. **Olago, D.O.**, Street-Perrott, F.A., Perrott, R.A., Harkness, D.D., Ivanovich, M. and Parkes, A. (1999). Late Quaternary glacial-interglacial cycle of climatic and environmental change on Mount Kenya, Kenya. Journal of African Earth Sciences, Vol. 29, No.3, pp. 593-618.

5. **Olago, D.O.**, Street-Perrott, F.A., Perrott, R.A., Ivanovich, M. and Harkness, D.D. (2000). Late Quaternary primary tephras in Sacred Lake sediments, north-east Mount Kenya, Kenya. Journal of African Earth Sciences, Vol. 30, No.4, pp. 957-969.

6. **Olago, D.O.** and Odada, E.O. (2000). An interbasinal study of the sedimentology of late Holocene sediments in the rift valley Lake Turkana, Kenya. Journal of African Earth Sciences, Vol. 31, No.2, pp. 237-252.

7. **Olago, D.O**, Odada, E.O., Street-Perrott, F.A., Perrott, R.A., Ivanovich, M., and Harkness, D.D. (2000). Long-term temporal characteristics of palaeomonsoon dynamics in equatorial Africa. Global and Planetary Change Vol. 26 /1-3: 159-171.

8. Opiyo-Akech, N., **Olago, D.O.**, Dindi, E.W., Ndege, M.M. and Njue, F. (2000). Investigation of the impact of salt and sand harvesting activities on the Timboni Wellfield, Gongoni, Malindi District, Kenya. Environmental Geology Vol. 40, 1/2: 99-110.

9. **Olago, D.O.** (2001). Vegetation changes over palaeo-time scales in Africa. In: Journal of Climatic Research, Vol. 17(2): 105-121.

10. Odada, E.O. and **Olago, D.O.** (submitted, 2000). Holocene climatic, hydrological and environmental oscillations in the tropics with special reference to Africa and their significance for the future. Invited keynote paper, 31st IGC, Rio, Brazil, August 2000.

11. Contributing Author, Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), Chapter 10, Africa (in press).

M. Short Courses Attended

1. African-GAIM Modelling Workshop, March 3 to 12, 1997, Mombasa, Kenya. Funded by IGBP-GAIM (Awarded Certificate of Attendance).

2. Regional Training Workshop on GIS Applications for Management of Earth Resources Data and Information, University of Nairobi, Kenya, 1-7 February 1999. Funded by START/University of Nairobi/UNESCO (Awarded Certificate of Attendance).

(f) Paul E. T. Mugambi

Name	:	Paul Edward Tebakyagenda Mugambi
Date of Birth	:	25th August 1935
Place of Birth	:	Bukedea, Uganda
Nationality	:	Ugandan

SCHOOLS ATTENDED

(i) Bukedea Primary School 1942-1948
(ii) Makerere College School 1948 – 1950
(iii) King's College Budo 1951 – 1955

UNIVERSITIES ATTENDED

(i)   Makerere University 1956 –1961

(ii)   Southampton University 1961 – 1963
           Obtained M.Sc. by thesis on "L_1^6 Energy Levels" (a group theoretical study)

(iii)   University of Rochester (U.S.A) 1965-1970 (on a Rockefeller Fellowship)
           Obtained a Ph.D., thesis on the "Theory of Nuclear Level Densities with Residual Interactions."

APPOINTMENTS

(All posts held at Makerere University)

1963:   Assistant Lecturer
1965:   Special Lecturer and awarded a Rockefeller Fellowship for Ph.D. study at the
         University of Rochester (U.S.A).
1970:   Lecturer
1971:   Senior Lecturer
1975:   Associate Professor and Head of Department of Mathematics.
1976:   Professor of Mathematics and Head of Department of Mathematics for 11 years.
1987:   Dean of Faculty of Science for 2 years.
1989:   Dean of Faculty of Science for 4 years.
         1991:   Appointed as Main Coordinator of projects for the Norwegian Committee of Universities (NUFU) for Research and Development. This involves 6 projects in the faculties of Agriculture and Forestry, Science and Technology. In this capacity I am the Chairman of the Coordinators Committee for one project in the Faculty of Science and also overall Manager of NUFU office and NUFU House.
1996:   Acting Associate Director, Institute of Computer Science up to the present.

MEMBERSHIP OF PROFESSIONAL BODIES

1.   Uganda Mathematical Society.
2.   Chairperson of the Uganda National Academy of Sciences (UNAS) 2000 –
3.   Associate Fellow of the Institute of Mathematics and its Applications
4.   Biometric Society
5.   Member of the Editorial Board of "Africa Mathematics" the journal of the African Mathematical Union, 1987 – 1995.
6.   American Mathematical Society.

MEMBERSHIP OF PUBLIC BODIES

1.   Uganda National Council of Science and Technology, serving as a member of its Executive Committee, 1991 – 1995 and again from 1996 up to 2000.

2.   Chairman of the National UNESCO Intergovernmental Informatics Programme (IIP), 1991 –

3.   Deputy Chairman, Board of Governors, Old Kampala Secondary School, 1980 –

4.   Chairman, Resistance Council II, Muluka I, Makerere University, 1988-1992.

AWARDS

1.   1954, the Kisosonkole Memorial Prize for the greatest contribution to the School at King's College Budo.

2.   1954, Phyllis Manning Memorial Prize for Piano Players at King's College Budo.

3.   1958, the Shell Exhibition prize for being one of the best student in the Faculty of Science in the University of London Intermediate Examinations.

4.   1991, Medal by the African Mathematical Union at the 3rd Pan African Congress of Mathematics in August in special recognition of pioneering contribution to the development of Mathematics in Africa.

I was one of the only three African Mathematicians honoured for the first time in the history of the African Mathematical Union.

5.   1999, Certificate of Merit for meritorious 25 years' service to Makerere University.

RESEARCH AND PUBLICATIONS

1.   Research interest in the area of applications of Group Theory in Nuclear Physics, in Classical Mechanics, and Nonlinear Dynamics.

2.   "On the Angular Momentum dependence of the variance of projected Hartree-Fock wave functions" S.K. Sharma and P.E. Mugambi (ICTP) report No. IC/75/70, 1975.

3.   Inaugural lecture on "Mathematics and its role in our Society" 10th January, 1979.

4.   During academic visits to the University of Tubingen, West Germany in 1980 and 1985 I gave seminar papers on Nuclear Level Densities.

5.   Read a paper on "Mathematisation" at the Mathematics Subject Meeting of the departments of Mathematics in East Africa and Arusha in 1985.

6.   Read a paper on "The Challenge of Training in Mathematics for Development" at the African Mathematical Union Symposium, Arusha, September, 1989.

7.   Read a paper on "Teaching of Mathematics to Biologists" at the Biometric Society meeting, Nairobi, July, 1990.

8.   Read a paper prepared by Prof. J. Mugerwa, Mr. Muhammad Mayanja and myself on "Research Planning and Administration in NUFU Principal Partner Universities, September, 1995, Addis Ababa.

9.   I am writing a monograph on "Notes and Problems in Mechanics" arising out of my long teaching experience.

PROFESSIONAL EXPERIENCE

1.   Served as a writer with the Entebbe New Mathematics Project for Africa, 1964 to 1965. I was a member of the Project Steering Committee.

2.   Since 1965 I served as an examiner in Mathematics with the East African Examinations council and consequently with the Uganda National Examinations Board.

3.   I was the founder Chairman of the Uganda Mathematical Society when it was founded in 1972 and continued to serve on its Executive Committee for many years.

4.   Served on the drafting committee for the constitution of the African Mathematical union, 1973.

5.   I was the Chairman of the division of Physical Sciences and Mathematics in the Uganda Academy of Science and Technology.

6.   Appointed as Associate Member of the International Centre of Theoretical Physics (ICTP), Trieste, Italy, and visited the centre in 1974 and 1976 for a duration of three months on each occasion.

7.   I have extensively served as External Examiner in Applied Mathematics at the University of Dar-es-salaam, Kenyatta University, and the University of Nairobi.

8.   Under the German Academic Exchange Service (DAAD) I visited the University of Tubingen as a Research Professor in 1980 and 1983 for three months on each occasion.

9.   In 1976 toured University computer centres in the U.S.A under the sponsorship of the IBM Corporation.

10.   I attended the International Congress of Mathematicians in 1978 in Helsinki, Finland.

11. In 1984, for two months, carried out study tour of University computer centres U.K under the sponsorship of the Association of Commonwealth Universities. I read a paper in London on "Computers in Africa" to members of the British Computer Society.

12. Served as a UNESCO Consultant in 1990 in the UNESCO Project of Assessment of Education Research in Basic Sciences and Science and Technology in Africa.

13. I was the Coordinator of Theoretical physics area at the Pan-African Congress of Mathematicians of the African Mathematical Union held in March, 1986 at the University of Jos, Nigeria.

14. I have served as the Chairman of the Task Force of the Uganda National Council of Science and Technology for the National Information and Communication Technology (ICT) Policy Framework. The Task Force completed its work in August 2001 and for the first time in Uganda an ICT Policy Framework document was produced for Government consideration and adoption.

15. My teaching experience has been involved in teaching in a whole range of courses from Pure and Applied Mathematics especially during the severe staff shortages of the 1970s. My special interest is in Classical Mechanics and in recent years I have introduced the teaching of the modern topic of Nonlinear Dynamics both to undergraduate and postgraduate students. I have completed supervising an M.Sc. student in the area of Nonlinear Dynamics.

ADMINISTRATIVE EXPERIENCE

1. As Head of Department of Mathematics I was responsible for establishing for the first time postgraduate training in the department.

2. As Dean of Faculty of Science I was responsible for:
   (a) The EEC rehabilitation programme of most of the buildings in the Faculty.
   (b) The construction of a new building by a Japan Government grant.

3. I have served as Chairman of the University Senate Library Committee, 1988-1994.

4. As Acting Director, Institute of Computer Science, I was the Main Coordinator of the IDRC Project which introduced and established for the time the use of e-mail in the University and the country at large in 1991.

5. As Chairman of the National UNESCO IIP Committee I was responsible for the grant of US $120,000 for the Project "Sensitisation in Informatics for Decision Makers and Information Specialists", the project was successfully completed and received high appreciation by UNESCO. Further I am now involved in implementing a UNESCO Regional Informatics Network for Africa (RINAF) project for e-mail networking. In 1997 I coordinated the $36,000 UNESCO (IIP) Project on "Establishment of a National Data Communication Network for selected district administration units in Uganda." In 1999 – 2001 I coordinated the $50000 UNESCO (IIP) Project on "Creating Learning Networks for African Teachers" which resulted in a CD-ROM disc for distribution to all African educators.

6. From 1997-1999 I was Chairman of the Uganda National Council of Science and Technology Task Force investigating the problems in training in Mathematics in Uganda and produced a report on "The State of Mathematics Training in Uganda."

CONFERENCES AND WORKSHOPS

(a) As the coordinator of the RINAF project and Chairman of the National UNESCO IIP Committee, I have attended the following conferences and workshops:

1. "African Regional Symposium on Telematics for Development" at Addis Ababa, Ethiopia, 3rd to 7th April 1995 and presented a paper on "Electronic Communication: Uganda Experience."

2. "Second International Congress on Education and Informatics: Educational Policies and New Technologies (EI '96) at Moscow, Russia, 1st to 5th July, 1996 and presented a national report concerning informatics education.

3.   UNESCO-AFRALTI (The African Advanced Level Telecommunications Institute, Nairobi, Kenya) Training Workshop on the Internet and Intranet with Group Ware held in Nairobi Kenya with good hand-on experience, 20th to 25th January, 1997.

(b)   I organized a first scientific conference of the Uganda National Academy of Science with the theme "Sciences for Sustainable Development", October, 2001.

HOBBIES

1.   Music, I play the piano and the church organ. I sing with Kampala Singers of which I am Chairman.

2.   I jog and I used to play squash.

CURRICULUM VITAE.

h. NAME: **Edward Kasujja KIRUMIRA**

KEY QUALIFICATIONS:

Doctorate in Sociology with special bias to population and health research

Training in Programme Development and Impact Assessment; and in Research Methodology

EDUCATION:	1996: Ph.D. in Sociology (1996), from the University of Copenhagen, Denmark, in collaboration with Harvard University, USA.
	1987: Master of Arts in Population Research (Exeter University, UK.)
	1987: Certificate in Population Programs Impact Evaluation(London School of Hygiene and Tropical Medicine (Univ. of London).
	1981: Bachelor of Arts (Hons) in Sociology (Makerere University, Kampala).
LANGUAGES:	English: excellent Luganda and Runyankole: excellent Kiswahili: Good Working knowledge: Rutooro, Lugbara, Soga local Ugandan languages Reading ability: Danish and French

WORK EXPERIENCE

Lecturer at Makerere University since 1987 to date in the Department of Sociology, Faculty of Social Sciences. Currently Senior Lecturer and Head of the Department of Sociology, Faculty of Social Sciences.

14 years working experience in programme development, project/programme monitoring and evaluation, in Sub-Saharan Africa countries including Kenya, Tanzania, Zambia, Zimbabwe, Lesotho, Swaziland, Republic of South Africa, Ethiopia, and Mauritius.

Provided training in research skills and technical assistance for Institutions and organisations like ministries, NGOs, and academic institutions in Uganda and abroad.

OTHER ACADEMIC/PROFESSIONAL ACTIVITIES

Participated in over 30 International Conferences and varied National workshops/seminars, as facilitator, paper presenter, or/and discussant.

Professional bodies: Member of the Population Association of Uganda (PAU); member of the GRHPP Research network; member of SOMANet; Founder member, Uganda National Academy of Sciences and current member of its Executive, member of the HIV/AIDS & Agriculture Research Network (HASNET). Affiliated to the International Union of the Scientific Study of Population (IUSSP), and the Harvard University Family Demography Working Group (Department of Population and International Health). Serving on a number of Advisory bodies both locally and internationally.

ASSIGNMENTS AND CONSULTANCIES

Acted in various consultacy capacity as Trainer, Programme development, monitoring and evaluation, resource person, national counterpart on International missions, as well as team leader. Such international bodies include WHO, UNFPA, IPPF, The Rockefeller Foundation, CARE International, Population Council, NORAD, Danida, and SIDA/Sarec.

RESEARCH EXPERIENCE:

The main field of expertise and research experience has been in the area of population and health especially HIV/AIDS and other communicable diseases including malaria. Other research activities have included needs assessment, programme review and impact assessment in the areas of agricultural sector development, resettlement and rehabilitation programmes, health related programmes, and community development.

I have supervised and back-stopped research teams on resettlement programs; the informal sector; rural development; and housing and urban development. This has involved developing research instruments and training research section/teams personnel.

PUBLICATIONS:
Since 1985, published several articles in refereed journals in the area of population and reproductive health, sexuality and HIV/AIDS impact assessment, institutional change in sub-Saharan African societies, policy formulation and programmes evaluation.