

UNEP/GEF/START/TWAS: Assessment of Impacts of and Adaptations to Climate Change in Multiple Regions and Sectors (AIACC)

AF42: IMPACTS OF CLIMATE CHANGE, VULNERABILITY AND ADAPTATION CAPACITY IN THE LIMPOPO BASIN OF SEMI-ARID LAND SOUTHERN AFRICA: THE CASE OF EASTERN BOTSWANA.

Progress Report: January-June 2003

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A. ABSTRACT

Progress was made over this Phase with regard to interaction with stakeholders particularly in the North District study site located at the border with Zimbabwe. Rural communities showed great interest on the prospects of investigating eco-tourism, particularly the cultural aspects, as an adaptation strategy. Village leaders have agreed to help arrange small group meetings between the AF42 researcher and the village elders and with cultural organisations to explore further the potential of ecotourism. While on the water supply sub-sector attempts are ongoing to use Artificial Neural Network technique to model the complex interaction between the changes in climate and land cover. There are also emerging developments towards producing publications on the work that has been accomplished so far under different sub-components, for example, on the water sector, institutions and policy issues and the fire components. Postgraduate students continue to join the project while some of the AF42 researchers with Master degrees are preparing to advance their work under AF42 work to into PhD projects. However, the project is behind with respect to establishing greater interaction with climate scenarios. It is hoped that this will be addressed over the next phase. Further, for the crop production sub-sector this was the second phase of limited progress. The landcover, livestock and wildlife and the Forestry and veld products also need to improve over the next phase.

B TASKS PERFORMED AND OUTPUTS PRODUCED.

Introduction

There is a progress move from purely historical data to preparing for integration with field based data. There are plans for more contact with stakeholders in rural areas. The next stage will no doubt point to the need to link with climate scenarios to project future changes. However, there are various attempts and plans for publications of results that have been established so far. Other AF42 researchers have secured scholarship to advance their investigations to the PhD level. The project has also enlisted one PhD student. Details of the project activities are as noted below.

NETWORKING, LINKS AND COMMUNICATIONS

AIACC Regional Meeting

Pauline Dube, Naomi Moswete and B.P. Parida attended the AIACC Africa Regional Open Meeting and the workshop 10th - 13th March, 2003 held in South Africa. Pauline gave an overall presentation of the project while Naomi gave a talk on ecotourism and Parida on water supply in the Limpopo basin. The presentation on ecotourism as a potential adaptation

strategy generated lively discussions while in water supply a number of participants were keen on the use of the Artificial Neural Network technique and some suggested that AF42 look into organising a training workshop on this technique.

Global Environmental Change and Food Systems (GECAFS)

Pauline Dube attended the GECAFS Southern Africa “Issue Identification” Workshop held in Johannesburg, 10 - 11 April 2003. GECAFS is a new interdisciplinary research project concerned with strengthening policy formulation for reducing vulnerability to global environmental change (GEC) at national to sub-continental scales; and providing tools and analyses to undertake assessments of trade-offs between food provision and environment in the context of global change (www.gecafs.org). It was therefore most appropriate for AF42, which is also concerned with food issues to be represented at this early “Issue Identification workshop for Southern Africa. The meeting provided an opportunity to meet with various key experts and policy makers on food production, food security, distribution and so forth over Southern Africa. Representatives from the SADC office shared their experience on food marketing in general and food distribution over drought period with particular reference to water, road and rail transport over Southern Africa

United Nations Office for Outer Space Affairs (UNOOSA)

On the 5th to 6th June 2003 Pauline Dube attended the UN OOSA Expert Meeting on “Low to Medium Resolution Satellite Sensors and Disaster Monitoring” in Pretoria, South Africa. A presentation of the AF42 project was made as an example of one area where a regional collaborative project could be designed to address disasters over the Limpopo basin.

International Geosphere-Biosphere Programme (IGBP)

Pauline Dube was invited to give a talk on "The New IGBP: A decadal perspective and some personal views" at the Third IGBP Congress and National Committee meeting, Banff Canada 19-24th June 2003. This presentation covered activities of the Botswana Global Change Committee (BGCC) (an IGBP National Committee currently chaired by Pauline Dube under the Department of Environmental Science) and this included the AIACC AF42 project. BGCC received positive recognition for its performance in advancing understanding of global change in Botswana and Southern Africa as a whole.

Extending AIACC AF42 to PhD

Sennyé Masike, a researcher for the Water demand sub-section has received a University of Botswana PhD scholarship. Sennyé intends to extend his AF42 work into a PhD project at the University of Waikato.

Naomi Moswete, a researcher for the Tourism adaptation strategy sub-section has secured a Kellogg Foundation Learn Study Grant for a 4-year PhD study in any institution in Southern Africa. Her PhD will focus on Eco-tourism as an adaptation option.

Both Sennyé and Naomi hope to commence their studies in January 2004. These two scholarships will make it possible to extend the AF42 investigations beyond the AIACC life span and are expected to lead to more intensive investigations on issues of climate change, food and water.

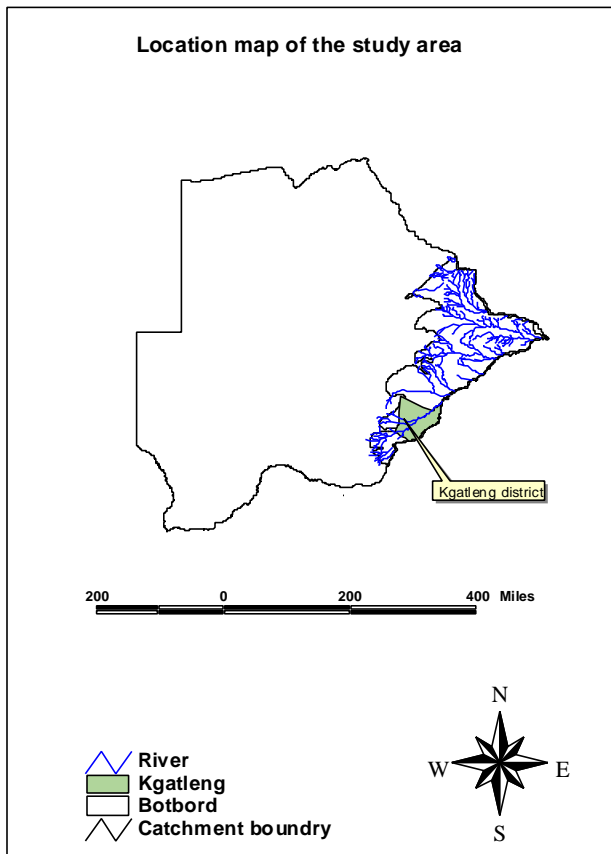
WATER SECTOR

B. P. Parida and Sennyé Masike

Water Supply Component

B.P. Parida

A detailed study on the water availability in the Limpopo basin covering the Kgatleng district study site has been undertaken during the period, for a better possibility of implementation of the adaptation strategies in future. This District located in the upper reach covers about 10% of the area of Limpopo catchment and bears importance from being in close proximity to the Gaborone City (Capital City of Botswana). The Limpopo River starts in this District at Sikwane village at the confluence of Marico and Crocodile rivers. Then it runs along the Botswana- Republic of South African border towards the eastern side of the country.



Water balance Study for the District was undertaken using about 30 years of available monthly rainfall and Evaporation record in and around the District. The water balance model has then been optimised using the observed flow records at Buffel's drift. The model was used to determine the runoff coefficient for this district. To arrive at a reliable figure of the runoff coefficient for this study area, another model, which uses the land cover and climatic parameters such as annual average rainfall and annual average temperature, has been undertaken and is currently continuing. Concurrently we have started working on use of Artificial Neural Network technique to model the complex interaction with the changes in climate and land cover to find its impact on the runoff coefficient. We hope to complete the latter two parts of the study by the time of reporting for next progress report and a detailed report on these will find its way then.

Water Demand Component

Sennyé Masike

Collection of data on water consumption in the Limpopo area is continuing to construct water accounts. For Mochudi accounts have been constructed revealing that the domestic sector is the major consumer. For the other study sites such as the Bobonong area accounts construction is going on.

Two articles are under preparation for submission to the AIACC Working Paper series over the next phase. One article on:

Assessing the impacts of climate change on water demand/consumption on the urban sector using seasonal variability

While the second draft is focusing at the rural sector taking Mochudi over the Kgatleng site as a case study.

The objectives of these articles are:

- To determine how household water consumption varies with seasons
- To determine which activities are sensitive to seasonal changes.
- To extrapolate the long-term effects of climatic change

For the first paper Gaborone City which falls within the Limpopo Basin is used as a case study for urban water demand. Assessment of available rainfall and temperature over the last 30 year has been carried out to determine the level of variability over time. This is being used to assess the relationship between climate variability (including seasonal variability) and water consumption. Water consumption data is provided by Water Utilities Co-operation.

In addition to the above significant literature review has been done covering climatic change and its implications on the water demand. Water supply has been intensively researched over the years but what has lacked behind are the linkages and implications of water demand and climatic variability. A survey on water demand that examined the effects of climate variables on residential/municipal use (Scheffer, undated), showed that the estimated temperature and precipitation elasticities of the demand for water varied widely depending on the region, season, and whether the estimates differentiated between indoor and outdoor or urban and suburban uses. The elasticity estimates suggest that a 1% rise in temperature would increase residential water use from 0.02 to 3.8% and a 1% decrease in precipitation would increase residential water use from 0.02 to 0.31%.

FOOD SECTOR

Ben Acquah, M.B.M Sekhwela and B. Kgabung

Crop Production Component

Ben Acquah

The last progress report reported lack of progress in this section and there has not been a progress report submitted for this Phase either. This completes a year of no progress in this section. The co-investigator will be required to present a progress report to the PI mid-way of the next phase that is by end of August 2003. If no progress is reported then there will be need to consider remedial measure given the importance of this sector in the AF42 project.

Forest and Forest Products

Mogodisheng Sekhwela

This sector continues to seek longitudinal data from secondary sources wherever it exists. Existing Government trade statistics report since 1980s were consulted for *Phane* export data, and some inconsistent were found in the combined entries that include *Phane*. This has been difficult to resolve and efforts are still being made to seek other alternative data sources as the original export forms are destroyed after compiling the statistics. In addition some limited secondary data on other products such as fuelwood that have been shown to provide a fallback for income generation during drought, have also been compiled. Quality checks are still to be done.

Plans and logistics for field data collection to supplement secondary data are in place, and the work will start by end of July.

Livestock/Wildlife Component

Bothepha Kgabung

Work covered in the past six months was basically in the form of preparation activities for the detailed field surveys task, which is to commence in mid July this year (2003). The main activity undertaken, in addition to documentary analysis, was a reconnaissance trip to the Masunga (North East District) case study site. Field survey data collection sampling sites have been established for both the private farms/ranches and the communal areas. The key reference points are water points, which are mostly in the form of boreholes, rivers/streams and dams. It has also been possible to identify the target groups to be interviewed and these constitute mainly livestock farmers in both the communal and private farms but also game ranchers and relevant local authorities linked for instance, to the Department of Animal Health and Production, and Department of Wildlife and National Parks.

INFLUENTIAL FACTORS: LAND COVER/USE, LAND DEGRADATION AND FIRE

Reuben Sebege and O. P. Dube

Land use /land cover component

Reuben Sebege

A reconnaissance visit to the North East District study site, which is the furthest from Gaborone City, was organised over this Phase. Historically the North-East District is dominated by the freehold tenure system. These farms initially belonged to the Tati Company linked to the colonial settlers (Kinlund, 1996). But local entrepreneurs have since bought some of the farms. Land use in the farms is slowly being diversified as few of them have been turned into wildlife camps and leisure lodges, chicken and dairy farms.

The communal areas in the north-east are squeezed between the private farms with shortages of land. As a result mixed land used where, cultivation, communal grazing for all types of livestock are all carried out within the vicinity of the villages. Villages are very close to each other thereby imposing a limitation on the size of individual land holding.

In addition land cover classification of the Kgatleng District study site has been completed but the classification results are yet to be validated.

Land degradation and the fire components

Opha P. Dube

a. Ms Boitshwarelo Katholo, the research assistant working under these components was able to attend a training course on Erdas Imagine software and other ESRI GIS packages, which were conducted as part of measures to upgrade the geo-spatial skills of the Department of Environmental staff. This has helped speed up process of satellite data under the Limpopo project. Boitshwarelo has been able to perform radiometric standardisation of images of different dates and perform preliminary classification of part of the North East and Bobirwa sub-District study sites.

b. A PhD student, Mr Mainah from Kenya in the University of Botswana, Department of Environmental Science has been recruited to work on:

Woody vegetation dynamics in semi-arid region of Botswana under variable Rainfall, fire and herbivore: A case of Limpopo Basin in Central District, Botswana.

Mr Mainah will determine past and present records of fire assess relationships between rainfall and land degradation and the processes leading to the spread of woody plants. It is expected that this will help to make an in-depth analysis of both fire and land degradation with respect to climate variability. The student has been reviewing literature, developing objectives, hypothesis and the methodology.

Papers/articles:

c. An extensive literature review on climate change in Southern Africa was conducted and this is being used to produce a review paper for the local journal of Botswana Notes and records. The title of the paper is:

Impacts of climate change, vulnerability and adaptation options: Looking into Botswana within Southern Africa - A review.

The paper will be submitted by end of July. One of the aims of the review is to provide locally accessible background information to guide policy on climate change preparedness, and for preparation of the second National Communication report to the UNFCCC.

d. Also under preparation is a chapter on:

Veldfires: magnitude, impacts and management in Botswana

for an edited book on "Integrated and sustainable environmental resource management in Botswana". E. N. Toteng who is involved with the vulnerability aspect of AF42 will be part of the editors of this book.

e. A Conference paper was prepared for the 3rd International Wildland Fire Conference and Exhibition to be held in Sydney Australia, 3-6th October 2003. The title of the paper is: Southern Africa Fire Network (SAFNet) of the Global Observation of Forestry Cover: A collaborative Effort towards developing capacity for operational fire monitoring and management systems in Southern Africa. The paper is a report on the activities of SAFNet which also cover the AF42 fire component.

f. AIACC Notes, the newsletter for the AIACC project: an article on:

Was co-authored with Naomi Moswete for the Newsletter.

VULNERABILITY AND ADAPTATION STRATEGIES

Elisha Toteng and Naomi Moswete

Tourism Potential Component

Naomi Moswete

Meeting with Stakeholders: A reconnaissance field trip was undertaken to the Northeast District and places visited included the city of Francistown, and villages of Mosojane, Masunga, Moroka, Ramokgwebana, Tshesebe, Butale and Matsiloje. The purpose was to introduce researchers and the AF 42 study to stakeholders.

Brief meetings were held with the following key local stakeholders in the different villages:

- Kgosi (Chief) Fredah Mosojane – chief of Mosojane village.
- Kgosi Bose Butale – Chief of Butale village.
- Kgosi Seleka Moipolai – Chief of Matsiloje village
-

The chiefs highly appreciated efforts by the AF42 project to investigate issues of cultural tourism to help stimulate future growth in tourism as an adaptation strategy the Northeast District where the performance of conventional agriculture is poor and there is acute shortage of land. The chiefs promised to inform their people about the project during Kgotla meetings. Follow up meetings by AF42 researchers to address the villagers and carry out intensive interviews will be arranged in future.

Kgosi (Chief) Mosojane and Butale have agreed to arrange small group meetings between the AF42 researcher and the village elders and also with cultural organisation such as Ngwao Boswa (identified group in Mosojane) to discuss issues regarding the village history and cultural assets that form elements of ecotourism potential of these villages. A long-term link is to be established with these communities in order to make them aware of the economic potential of cultural tourism and expose them to new ways of venturing in an ecotourism business.

In addition other stakeholders were also contacted:

- One of the stakeholders contacted was an Ecotour operator near Butale village, Mr Green who owns Modumela Lodge. This meeting provided insights on Ecotour operations in the Northeast District.
- Contact was also made with Mrs Kgomo, a Community Extension Officer in the Department of Wildlife and National Parks in Francistown
- Operators of Supa Ngwao Community Museum in Francistown were also visited.

More intensive interviews with the identified stakeholders will be made in July 2003.

Research Assistants:

- A research assistant was engaged during the past semester to help with literature review and interviews in the Kgatleng. Interviews were carried out at the Phuthadikobo Museum with the Director and with managers of Sedibelo motel and Rasesa Lodge.
- An MSc student looking at the potential of tourism in the Bobirwa AF42 research site has just returned from the field to begin analysis of his data. Details of his work will be reported in the next phase.

Vulnerability and Adaptation Capacity

Elisha Toteng

There are two Msc students contributing to this sub-sector. *One student*, Mr Kevin Gichangi is working on:

Assessment of policy and institutional framework on vulnerability and adaptation capacity to drought in eastern Botswana: the case of the Kgatleng District.

This study is substantially complete (about 85% of the work is completed). Several field trips to Kgatleng District to collect data were undertaken since our last report in January 2003. It is expected that the student will be able to graduate in October 2003. The report will be part of the AF42 substantive scientific report in December 2003 and attempts will be made to look into producing a paper for submission to the AIACC Working Paper Series.

The second Msc student, Mr Donald Mookodi is working on:

Assessment of the vulnerability and adaptation capacity of rural livelihoods to climate change in eastern Botswana.

However, progress for this second area has been slow. Mr Mookodi is also involved with the PI on establishing a mechanism of working with Bruce Hewitson in Cape Town to produce climate scenario data for Botswana for use by different components of the AF42 project.

C. DIFFICULTIES ENCOUNTERED AND LESSONS LEARNT

Difficulties that have been noted in the previous reports continue to influence progress in AF42. However, there been significant improvements in the administration of the University of Botswana in general, providing a consistent and harmonious working environment with not sudden disruptions.

One of the difficulties encountered is with locating secondary data on products that are considered insignificant in national economic accounts such on Phane caterpillar under the Forestry and veld products sub-sector. Most of these products play a major role in rural economies and some are actually the back borne of such economies that are regarded as informal and 'invisible' in the formal national economic transactions.

Another difficulty from the past report has to do with limited interaction with climate change scenarios among the different components of the project. Attempts are ongoing to address this limitation.

D. CONNECTIONS WITH PREPARATION OF NATIONAL COMMUNICATIONS UNDER UNFCCC.

Connections with preparations of National Communications under UNFCCC continue to be largely through the link between the Botswana Global Change Committee and the Botswana National Committee on Climate Change (NCCC) as noted in the previous report.

E. DESCRIPTION OF TASKS TO BE PERFORMED IN THE NEXT SIX-MONTH PERIOD.

- Complete drafts of papers noted in the various sub-sections above and see at least one MSc student completing his thesis on a sub-section focusing on vulnerability and adaptation.
- Integrating historical and field data will dominate the activities of nearly all the sub-Components over the next phase.
- Meeting various stakeholders in the different study sites will also continue.
- From the previous Phase - Secondary data analysis and the field surveys will provide the basis for detailed sites of land cover/use change assessments. Air photographs and SPOT data will be acquired to commence detailed mapping on the selected sites to produce land cover/use change information that can be used by the different components, for example runoff assessments and land degradation.
- From the previous phase - Efforts will be made to pilot the integration of information on climate scenarios in the different components of AF42. This will be achieved mainly through establishing collaborative links with outside experts where appropriate. An invitation will be extended to the Department of Meteorological Services to participate in the areas related to climate scenarios and help in making climate data available for validating for example, regional scenarios. This link will also assist to make information on the project available for national Communications.

F. ANTICIPATED DIFFICULTIES IN THE NEXT SIX-MONTH PERIOD

Difficulties noted during this phase regarding Internet and IT services, acquisition of data at the basin scale and heavy teaching loads will continue to influence progress over the next phase.

REFERENCE

Kinlund, P. 1996. Does land degradation matter? Perspectives on environmental change in north-eastern Botswana. PhD thesis. Department of Human Geography, Stockholm University, Sweden.

Adaptation to Climate Change in the Caribbean. AFP Adaptation Policy Framework. AIACC Assessments of Impacts and Adaptations to Climate Change. APA Alpine Pearls Association. APELL Awareness and Preparedness for Emergencies at the Local Level.Â European Forum on Integrated Environmental Assessment. EIAs. Environmental Impact Assessments. EPSRC Engineering and Physical Sciences Research Centre. EPZ Environmental Protection Zone (EPZ). The Global Environment Facility (GEF) is the international entity entrusted with the operation of the financial mechanism of the UNFCCC. Until recently, the focus of the GEF has been primarily on mitigation of climate change but following COP-3 and COP-4 adaptation has risen on the priority ladder.Â â€¢ Stage Iâ€”Planning, which includes studies of possible impacts of climate change, to identify particularly vulnerable countries or regions and policy options for adaptation and appropriate capacity buildingÂ â€¢ Assessment of policy frameworks for implementing adaptation measures andÂ One such project that has received GEF funding under Stage II is â€œAssessments of Impacts of and Adaptation to Climate Change in Multiple Regions and Sectorsâ€ (AIACC) Presentation on theme: "Assessments of Impacts and Adaptations to Climate Change in Multiple Regions and Sectors: Filling Gaps in Scientific Knowledge and Capacity Peter McGrath."â€” Presentation transcriptÂ AAS is currently implementing a project with START (TWASâ€™s AIACC partner) to offer fellowships to young scientists from sub-Saharan Africa in the area of climate change science. 19 19 Trieste: TWAS and Networks of Academies of Science Statements: Joint statement by academies of G8 countries and NASAC to G8 summit in Scotland in June 2005. NASAC statement to AU summit in Addis Ababa, Ethiopia, in January 2007. NASAC statement to G8 summit in Germany in June 2007.