

# **Trip Report:**

## **Advanced Training**

## **Decision Maker's Workshop**

## **Follow-up Activities**

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## **Introduction**

In continuation of the Clark University component of the Malawi Environmental Monitoring Program (MEMP) under the Agricultural Sector Assistance Plan (ASAP), a team consisting of Dr. Ron Eastman and Mr. James Toledano visited Malawi from June to August 1995 for the final phase of the technology transfer activities under ASAP I. The activities included: 1) the final advanced training session on GIS for Environmental Monitoring, 2) a Workshop on GIS for Environmental Monitoring for senior level decision makers from each of the MEMP participating agencies and other interested departments, and 3) follow-up activities with selected agencies on development of GIS projects and research applications.

This trip concludes the funding support for the GIS activities under ASAP I for MEMP. Original funding was provided from the Bureau for Africa with contribution from the Malawi Mission. This report concludes with broad recommendations for continuing GIS activities in Malawi.

## **Discussion of Activities: June - August 1995**

### ***The Advanced Training Program***

The GIS training component of MEMP was conducted in two streams with three courses for each stream; introductory, intermediate, and advanced. The advanced course for the first stream was conducted in January 1995. With this visit, the advanced course was conducted for the second group. As with the earlier course, primary topics included; geodetic principles of georeferencing, multi-criteria / multi-objective decision making, and time series analysis for long term monitoring. In total, eighteen government officers have completed the GIS training sequence. Appendix I lists those officers attending the June training and Appendix II is a complete list of officers from both streams.

In addition, the June group was introduced to the new version of the IDRISI GIS software system for the Windows environment. Interestingly, the participants found the Windows environment to be very ease to use. Time was also spent working with several of the participants on their research/pilot projects for presentation at the decision maker's workshop detailed below.

### ***The Workshop on GIS for Environmental Monitoring***

The objective of the two-day seminar was to bring together environmental decision makers within the Government of Malawi in order to become familiar with the concept of GIS technology for environmental decision making. Over the past year government officers have been training and experimenting with GIS for use in environmental management activities such as forest monitoring, water quality, watershed planning, rainfall monitoring, and landuse planning. The seminar was a venue for assessing the progress thus far and to elicit the needs of Malawi's environmental decision makers for implementing GIS in Malawi for environmental monitoring.

The Workshop was held in Mangochi on June 27 and 28. Appendix III provides a complete listing of all those attending. The Workshop was initially opened with a demonstration and an overview of GIS technology followed by a discussion of GIS for environmental decision making, particularly related to MEMP activities and the long-term implications of technology transfer. Eight pilot projects and research activities ongoing within the participating agencies were presented to the participants by representatives from each of the agencies. Appendix IV discusses these selected presentations. The demonstrations concluded with a landuse mapping and project planning case study presentation for Kamunde Catchment, Mangochi. This case study illustrated the effective use of GIS for decision making. Appendix V details this presentation.

As a final introduction to GIS technology, important elements of GIS system design were presented and discussed. In short, this session stressed the importance of planning for the implementation of any innovations, especially GIS, within organizations. By this stage of the workshop, most participants were comfortable with the technology in terms of being able to converse and discuss appropriate needs and recommendations for GIS activities within their respective agencies. The final and most important aspect of the workshop was to give each of the agencies the opportunity to discuss and present their needs as an agency and as well as their plans for implementing GIS to address environmental management concerns within their agencies. Appendix VI is a summary table of each of the agency presentations regarding needs for GIS and possible implementation.

### ***Agency Follow-up***

After the June Decision Maker's Workshop, James Toledano continued working with selected agencies on research topics for GIS. Given the limited time for both the TA and the availability of government officers, four activities were undertaken during July and into August.

First, a copy of Desktop Mapping Software (DMS) was acquired for the Department of Surveys (DOS) in order to experiment with the concept of softcopy photomapping. This is a relatively new technology that incorporates traditional photogrammetric mapping into a computerized/digital framework. Mr. Mzembe at DOS was identified as the primary individual to explore possible uses of the software. He was given preliminary instruction on the use of the software and a successful test mapping application was completed for a selected area in Blantyre. Mr. Mzembe will continue to explore more detailed application for planimetric and landuse mapping activities.

Work also continued with the Department of Meteorology (MET). MET has continually expressed interest in using NDVI and Cold Cloud Duration (CCD) data which they receive dekadally from Harare. Up until now, MET has not been able to convert these data into useable formats. MET can now convert these data into Idrisi format which can be used in their rainfall monitoring and reporting bulletins. Appendix IV shows the preliminary use of the CCD for this purpose. Further exploration is needed for future modeling applications using both NDVI and CCD, but for now, they are readily capable of converting this data and incorporating them into their monthly bulletins.

A considerable amount of time was spent working with Land Resources and Conservation Branch (LRCB) and Mr. Mkandawire (Lilongwe) and Mr. Jere from Mzuzu Agriculture Development Division (ADD). As a demonstration research project, these officers developed landuse maps for Mpamba EPA, Mzuzu ADD. Appendix VII shows the 1990 landuse map developed using Thematic Mapper (TM) data which is available for the whole country at the Department of Forestry. Although dated, the 1990 landuse map characterizes the current landuse/landcover in Mpamba suggesting that this data is still extremely valuable for environmental mapping and management.

## **Recommendations for the Continuation of Implementation of GIS**

The past eighteen months has afforded the GOM and the technical advisors a unique opportunity to assess the implementation and adoption of GIS technology in Malawi. Although broader awareness of the technology is still greatly needed, demonstration of GIS is becoming routine in many of the participating agencies. For example, DOS is implementing plans to routinely demonstrate GIS to small groups within Surveys in order to increase awareness. Also, Mr. Mkandawire and Mr. Jere from LRCB made a computerized demonstration of GIS and for landuse mapping at the annual planning meeting for the Ministry of Agriculture. A presentation was also made in front of the donor community which has begun to generate interest and awareness outside the GOM.

The Decision Maker's Workshop did much to heighten this awareness and generate support. But perhaps more importantly, the workshop allowed the agencies to present a structured assessment of the technology transfer program thus far and their needs for the future. These needs and recommendations give support for the recommendations summarized below.

The progress and successes over the past eighteen months are strongly associated with the overall design of the technology transfer program, a design that should be maintained in any future activities. Basically, the approach has tried to remain flexible in order to address the ever changing, but crucial, institutional issues surrounding technology adoption, i.e., capacity building and organizational issues. The approach has also been decentralized which has tried to incorporate the multi-agency approach adopted by MEMP in general. All aspects of this approach should be maintained in the future.

One of the most significant barriers to the adoption of GIS over the last two years has been the lower than anticipated level of technical expertise of the participating trainees and their level and lack of capacity to initiate, conceptualize, articulate and conduct independent scientific research within their agencies, especially research design related to environmental management. Although these trainees have been adept at acquiring the fundamentals of GIS, a much broader range of skills are needed to efficiently employ these new technologies. Emphasis must be placed in future involvement at enhancing this crucial institutional capacity within each of the participating agencies.

Although awareness and interest in geographic technologies has been increasing, it has been slow which has resulted in a slow diffusion and adoption process, as well as, a heightened lack of commitment and continuity of trainees and their respective agencies. Although GOM officers are

well trained to carry out their respective tasks, a broader level of awareness is needed to adequately commit those participating and to ensure a more effective use of the technology within their respective agencies. This could be accomplished by including senior level researchers and scientists from each agency to be involved in GIS training as well. These would be scientists within each of the agencies who can articulate and initiate research agendas. This would complement the currently trained technicians from ASAP I who are now able to carry out fundamental data development and analysis. Given the time constraints of the senior level officers, the attempt should be to make them GIS literate in the shortest amount of time, possibly through a two week intensive sensitization. This would also aid in enhancing the use of GIS for environmental research overall.

To continue on the theme of building awareness and support within the government, a major conclusion of the Decision Maker's Workshop was the need to begin sensitization at a much higher political level within the GOM. It will be important that at a minimum, the level of the Principle Secretary should be made aware of GIS technology and its opportunities within the GOM. It was best thought that a similar format as the Decision Maker's Workshop should be scheduled for those at this level, although, with a much shorter time frame.

During the first phase there has also been success in working with government officers in the ADDs. These government officers are closer to the local resource problems and thus seem better to articulate research agendas that have immediate impact on environmental monitoring and, mitigation. The landuse mapping analysis for the Mpamba EPA found in Appendix IV will do much to increase awareness at this level and the need for GIS at all levels of environmental monitoring.

Over the long-term there will also be a need for a sustainable GIS education and training process to be instituted in Malawi. The Head of Research for the University of Malawi, Dr. Chiota, was consulted for suggestions for this institutionalization process. Two committees, the Post-Graduate Research and the Academic Planning committees must be involved in any long-term curriculum planning including the identification of suitable sites for initially housing a 'GIS Lab' and training center. It was also suggested that during the months of August and September, University faculty are free to attend refresher courses, an appropriate time for offering GIS training for faculty in order to expose and identify suitable faculty as long-term trainers in GIS. It is clearly evident, however, that there is lacking any local expertise to develop curriculums and training programs in GIS. As such, one of the colleges should have posted a long-term TA/faculty member with the responsibility of developing GIS curriculum, research and training programs. This can be initiated in conjunction and in coordination with the GIS trainings during ASAP II in order to build and institutionalize local level capacities.

Finally, the GIS component of MEMP was always intended to feed into a national level system. This should not be deviated from and should be given additional attention during ASAP II. In brief, GIS can play an important role in coordinating data and analysis for environmental management, even more so at a National level. The decentralized process of the technology transfer program initiated under ASAP I is essential to the multi-agency demands for environmental management and in the eventual culmination of an environmental information

system. A draft framework of what a decentralized and multi-sectoral national level system would look like can be found in the document presented to USAID and MoREA in April 1994<sup>1</sup>.

Thus, there is a need to continue the intensive training process for GIS technicians in order to ensure a continued stream of GIS analysts within the agencies currently participating in MEMP, as well as for any agencies wishing to participate in the future. This will also ensure that the awareness of GIS and its current uses for environmental management continues. Minimally, three trainings should be conducted over any 12 month period for government officers. These trainings should also include follow-on advanced sessions specifically targeted to applications and areas of technological interests that address agency specific problems and mandates. These could be conducted through short to medium term technical advising.

A possible scenario for a twelve month training program would entail a 14 day introductory training in January followed by six day intermediate training and pilot project development in May and concluding with two weeks advanced training in October. The intermediate and advanced trainings can also be followed by advanced topics workshops related to monitoring and specific agency applications, each 5 days in May and October.

In addition to these recommendations, it should be added and emphasized that the implementation of GIS for environmental management and monitoring in Malawi will require a long-term commitment by both the GOM and the donor community. Although many of the technical barriers to implementation can be initially identified and addressed, long-term institutionalization of the technology will require coming to grips with and overcoming the issues and barriers related to developing the human and organizational capacities to absorb these new technologies. The one tangible success that this report can conclude with is that the GOM is now aware that the implementation of GIS is more than just the procurement of hardware and software that is so often associated with GIS, and that in order to move forward toward sustainable technology transfer, a much heightened level of involvement is needed by both the participating agencies, the GOM, and the donor community.

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1 <sup>1</sup>*The Malawi National Environmental Information System (Draft Proposal)*. J.R.. Eastman and J. Toledano. April 18, 1994.

# Appendix I

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## **List of GIS Advanced Course Trainees - June 1995:**

Land Resources and Conservation Branch

Zwide D. Jere

Meteorological Department

M. Gwazantini

J. Nkhokwe

Forestry Department

Binie Chongwe

Water Department

D.V.L. Naketo

P.W.R. Kaluwa

Surveys Department

G.C. Mzembe

E.M. Likombola

## Appendix II

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### List of Government of Malawi Officers Receiving GIS Training Certificates:

Ministry of Research and Environmental Affairs  
Tawonga Mbale

Land Resources and Conservation Branch, Ministry of Agriculture  
Vincent Albert Lameck Mkandawire  
Zwide D. Jere

Meteorological Department  
M. Gwazantini  
J. Nkhokwe

Forestry Department  
S. Kainja  
J. Luhanga  
Patrick S. Jambo  
Binie Chongwe

Water Department  
Alex Miston Banda  
D.V.L. Naketo  
P.W.R. Kaluwa

Surveys Department  
G.C. Mzembe  
E.M. Likombola  
Richie B. Muheya  
Susan N. Machila

Fisheries Department  
Orton M. Kachinjika  
Dr. N.C. Mwanyama

## Appendix III

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### List of Participants : Workshop on GIS for Environmental Monitoring

<b>Name</b>	<b>Title</b>	<b>Agency</b>
R.P. Chingoli	Senior Planning Officer	Ministry of Physical Planning and Surveys
A.F. Tambala	Surveyor General	Ministry of Physical Planning and Surveys
Z.D. Jere	Land Husbandry Officer	LRCB Mzuzu ADD
R.B. Muheya	Chief Cartographer	Survey Department
D.V.L. Naketo	Hydrologist	Water Department
P.W.R. Kaluwa	Senior Hydrologist	Ministry of Irrigation and Water
Dr. Chrissie Mwiyeriwa	PM Liwonde ADD	Liwonde ADD
Tressa Mandeule	Parks and Wildlife Officer	National Parks and Wildlife
Alex M. Banda	Chemist	Water Department
Susan Machila	Photogrammetrist	Survey Department
V.A.L. Mkandawire	Senior Land Husbandry Officer	Ministry of Agriculture and L/S Dev.
T.G. Mbale	Environmental Officer	Ministry of Research and Environmental Affairs
S. Kainja	Principal Forestry Officer	Forestry Department
W.K. Burger	MEMP Technical Advisor	Ministry of Research and Environmental Affairs
Dr. Danny Chinombo	Asst. Chief Veterinary Officer	Department of Veterinary Services
R.J.M. Mwakalagho	Ag. Asst. C.L.R.C.O.	LRCB
S.A. Mapila	Deputy Director, Fisheries	Fisheries Department
Steve Alimoso	Senior Fisheries Res. Officer	Fisheries Department
Maxwell Gwazantini	Hydrometeorologist	Meteorology Department
Orton M. Kachinjika	Senior Fisheries Res. Officer	Fisheries Department
C.M. Munthali	Agrometeorologist	Meteorology Department
E.R. M'mangsa	Principal Environmental Officer	Ministry of Research and Environmental Affairs
R.H. Manondo	Deputy Secretary	Ministry of Research and Environmental Affairs
A. Kamperewera	Principal Environmental Officer	Ministry of Research and Environmental Affairs
Dr. J.R. Eastman	Director, Clark Labs	Clark University
J. Toledano	Senior Res. Assoc., Clark Labs	Clark University
W.M. Phiri	Senior Environmental Officer	Ministry of Research and Environmental Affairs
S.P. Kamwendo	Chief Veterinary Officer	Department of Veterinary Services

# Workshop on GIS and Environmental Monitoring

Mangoche, Malawi : June 20-21, 1995

Tuesday, June 20

09:00-09:30 Official Opening

*Mr. Ralph Kabwadza : Ministry of Research and Environmental Affairs*

09:30-10:30 Introduction to GIS and Image Processing as Tools for Environmental Management

*Dr. Ron Eastman : Clark University*

10:30-11:00 Overview of GIS Activities within the Malawi Environmental Monitoring Program

*Mr. James Toledano : Clark University*

11:00-11:20 Coffee / Tea

11:20-12:30 Project Presentations : Database Development

1. Introduction to Digital Data and Georeferencing
2. Global Positions Systems for Field Mapping
3. Landuse / Landcover Mapping using Remotely Sensed Imagery
4. Rainfall Mapping using Cold Cloud Duration Data

12:30-13:45 Lunch

13:45-14:45 Project Presentations : Environmental Analysis

1. Forest Plantation Management
2. Agricultural Yield Analysis using Database Management Mapping Systems
3. Microcatchment Analysis using GIS
4. El Nino / Southern Oscillation Drought Monitoring

14:45-16:00 An Illustrated Case Study : Forest Monitoring and Land Allocation in the Kamunde Catchment

16:00-16:20 Coffee / Tea

16:20-16:50 The Process of GIS Implementation

*Dr. Ron Eastman : Clark University*

16:50-17:30 Question and Discussion Period

*Moderator : Mr. Ralph Kabwadza, MOREA*

Wednesday, June 21

8:30-9:00                    Agenda and Overview of the Needs Assessment Process  
*Mr. James Toledano : Clark University*

9:00-10:30    Intra-Agency Group Discussions

10:30-10:50    Coffee

10:50-12:30    Agency Assessments of the Potential of GIS and Implementation Issues

12:30-13:30    Discussion on the Potential of GIS and Image Processing for Environmental Monitoring, its role in the  
Malawi                    Environmental Monitoring Program, and the Potential for the Development of an Environmental  
Information                    System (EIS).

*Discussion Leaders : Mr. Ralph Kabwadza, MOREA*

*Mr. Sam Kainja, DOF*

Mr. Kent Burger, MEMP    Technical    Advisor

