

**Quarterly Report**  
**Malawi Environmental Monitoring Programme**  
**Clark University Activities**  
**March 1997-June 1997**

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**Introduction:**

Clark's involvement in the Malawi Environmental Monitoring Programme continues to emphasize the development of environmental monitoring capacities within the Government of Malawi (GOM) and during its second phase MEMP II has extended its focus to include the University of Malawi (UNIMA). This report will review Clark's involvement in the MEMP over the part quarter from March 1997 to April 1997 with specific reference to the two programs as outlined in the *Second Annual Workplan for the Components of the Malawi Environmental Monitoring Programme* (April 1997): 1) expanding environmental monitoring technologies and 2) strengthening environmental training and research.

**Program I: Expanding Environmental Monitoring Technologies**

***Program I: Component 2: Develop Prototype Environmental Information System***

Clark University's involvement in expanding environmental monitoring technologies in its present phase primarily focuses towards providing assistance in the development of a prototype Environmental Information System (EIS) on the Shire River valley (Component 2 under Expanding Environmental Technologies). Since the development of the prototype EIS will require the extensive collection and use of geographic data, Dr. Ron Eastman and Mathilde Snel met with members of the Department of Surveys in Blantyre from June 5-9, 1997 to discuss the development of digital mapping standards (task ID 2.4). Recommendations for digital mapping standards were made and include geo-reference (e.g. geodetic, projection, entity, representation, attribute, relationship, geometrical, and topological), map accuracy, and meta-data/documentation standards (task ID 2.5). Discussions were held on creating a digital map data storage and distribution format (task ID 2.5) and medium (task ID 2.6). The digital mapping standards as recommended in the draft report (June 1997) will be used as provisional standards throughout the compilation of digital geographic data in the prototype EIS. It was agreed that the provisional digital mapping standards will be reviewed by the Department of Surveys and refined in October when members of Clark University meet with the Department of Surveys again to finalize the digital mapping standards.

To avoid any ambiguities in the development of the prototype EIS, the Clark University team was involved with MoREA to review and refine the purpose and methodology of the prototype EIS. As stated in the *Second Annual Workplan* (April 1997) it was emphasized that the main goal of the prototype EIS is to build capacity in Malawi on environmental analysis, monitoring, and reporting. It was discussed that the investigation of the prototype EIS will analyze sedimentation in the Shire with respect to land cover change and soil erosion potential and answer the following questions: 1) where are significant land cover changes occurring in the Shire river valley?; 2) what is the geographic distribution of soil erosion hazard in the Shire?; 3) does landcover/use contribute to soil erosion?; 4) what are the underlying causes of landuse/cover change and soil erosion?; and 5) what are possible intervention strategies and their anticipated impacts?. It was clarified that the issue of sedimentation will be analyzed not only due to concerns of an instable energy supply, but additionally due to concerns of livelihoods of farmers and irregular water flow at SUCOMA. Furthermore it was emphasized that as indicated in the *Second Annual Workplan* (April 1997) the study area will cover the entire Shire watershed although will place a

particular emphasis on the mid-Shire covering the Blantyre and Machinga ADDs - areas considered of political importance.

In refining the purpose and methodology of the investigation of the Shire, acknowledgment was made that there is a need for social analysis to help identify the underlying causes of land cover change and soil erosion and to provide policy recommendations that may help mitigate environmental degradation. Nicholas Haan proposed to provide guidance to a group of Malawian social scientists in situating such a social analysis for the Shire river valley (Appendix 1). It was proposed to include a third task (after task ID 2.2, under the section Assessment of Causes of Sedimentation) on “Situating a social analysis into the Shire river valley investigation” designated to incorporate a social, economic, and political analysis of environmental degradation in the Shire. By adding this component, the methodology of the prototype EIS will focus more extensively on integrating the use of both geographic technologies and community based analysis to provide a more holistic investigation on the biophysical and socioeconomic causes of land cover change and soil erosion in the Shire river valley. Furthermore, the methodology will emphasize that the investigation of environmental degradation requires analysis between and among varying geographic and temporal scales from the small scale (e.g. analyzing environmental changes in the entire watershed) to the large scale (e.g. analyzing the underlying socioeconomic causes of environmental degradation at the community level).

Since funding for the Task Force Analysis Team has not been secured yet, Clark University is working jointly with MoREA to help facilitate the process. A time line has been proposed for tasks to be completed within the GOM line agencies themselves (Department of Forestry, Department of Surveys, MET/MEMP, and Land Conservation Research Branch/Land Husbandry Training Center) (Appendix 2) and discussions will be pursued with GOM agencies to get a better understanding of the level of commitment of government staff to the Shire investigation. There is concern that with the present delay in forming the Task Force, the Shire valley products may not be provided as scheduled in the *Second Annual Workplan*. For now, Mathilde Snel will be working with a number of GOM agencies to start the analysis of landcover/use change and soil erosion potential in the Blantyre ADD.

***Program I: Component 4: NDVI time series analysis and interpretation***

To facilitate future environmental monitoring in Malawi, the Clark team has been involved in analyzing the value of easily accessible coarse AVHRR data (at a resolution of 11km, 7.6km, 3km and 1km). The Meteorological department and Department of Forestry are presently obtaining data from Harare at a 11km resolution. The Forestry department has already conducted long time series analysis on a number of forest reserves and districts. For larger forest reserves the time series analysis has proven to be useful, however, due to the coarse 11 km resolution of the data the data has not been useful for analyzing vegetation changes in smaller forest reserves. During the advanced GIS training held at Bunda college, the value of using 7.6 km NDVI imagery was assessed. A time series was conducted over 14 years (1982 - 1996) on the watershed that contributes to sedimentation of the Nkulu and Tedzani falls hydroelectric dam. Results pointed to two particularly interesting trends: a 8-10 year climatic cycle and landcover change. Land cover changes were indicated in especially the Mwanza and Neno areas. A similar long time series analysis with the 7.6 NDVI data will be conducted with the Department of Forestry over the entire Shire watershed (task 4.2) to contribute towards the investigation of landcover changes in the entire Shire river valley.

The Clark team have also been analyzing the use of different resolution data for environmental monitoring (task ID 4.3). Dr. Ron Eastman and Mathilde Snel looked into the feasibility of using 1km NDVI data - being downloaded at the Department of Fisheries station in Salima - to map landcover/use and to detect fire. Subsequently, Nicholas Haan conducted a special session with the Department of Forestry to analyze the use of different resolution NDVI data - the 1km resolution AVHRR data, the 7.6 km resolution NDVI data, and a 20 meter resolution SPOT image - for monitoring vegetation changes. Official provisions will need to be made to give GOM line agencies access to the 1km data being collected in Salima. The Clark team and MoREA are looking into this matter. Due to recent political changes that have proposed to change MoREA into a department under a larger Ministry of Forestry, Fisheries, and

Environmental Affairs, access to the 1 km data presently being collected by Fisheries may be more easily facilitated.

The possibility of obtaining 3km NDVI data from the Meteorological Department is also being pursued. The Meteorological department in Chileka sent a letter requesting the data from the Meteorological department in Harare (task ID 4.1). As yet they have neither heard work or received the data. Mathilde Snel has contacted Graham Farmer in Harare to check on the status of the data.

## **Programme II: Strengthening Environmental Training and Research**

Clark's involvement continues to emphasize building capacity of GOM and UNIMA in geographic technologies and environmental monitoring. The subsequent section will outline Clark's involved in strengthening GIS technical capacity and environmental research and training.

### ***Programme II: Strengthen GIS technical capacity***

A critical part of strengthening GIS technical capacity has been Clark's continual involvement in conducting a series of geographic technologies trainings. The third sequence in geographic technologies courses (1996 - 1997) was completed this past June, 1997. An advanced course in GIS was conducted at Bunda college from June 17 to June 21, 1997 (task 6.1). Seventeen participants attended from the GOM and UNIMA (Department of Surveys, Department of Forestry, LRCB Shire valley ADD, Land Husbandry Training Center, UNIMA Bunda, UNIMA Polytechnic, and UNIMA Chancellor). The advanced course covered sessions on time series analysis for the detection of land cover change, decision making techniques for environmental analysis, and modeling of soil erosion potential using additive and multiplicative models (e.g. SLEMSA) (task 6.4). As with the intermediate training held in January 1997, sessions in the advanced training focused on the analyzing landcover/use change and soil erosion in parts of the Shire river valley.

In addition to the advanced course, a three day digitizing course in ArcEdit facilitated by James Toledano, Mathilde Snel, and Nicholas Haan was held at the Polytechnic University from July 8 to July 10th, 1997. This training was held to especially facilitate the digitizing of Shire valley products (e.g. soils data). Other specialized trainings in respective GOM line agencies will be conducted by Mathilde Snel for research and delivering products for the Shire river valley investigation at the Department of Forestry, Meteorological Department, Department of Surveys, and Land Resources Conservation Branch (task 6.3).

Discussions were facilitated with UNIMA staff on the training of additional UNIMA staff in the next sequence of geographic technology training to start in October 1997 and in establishing a GIS curriculum (task ID 6.2). Furthermore, discussions were held and tasks allocated to UNIMA trainees of the 1996-1997 geographic technologies course to train in the next sequence of geographic technologies courses to start in October 1997.

### ***Programme II: Strengthen national environmental research and teaching capacity***

Discussions with MEMP were initiated on establishing a teaching curriculum in environmental sciences at Bunda, the Polytechnic, and Chancellor (task 6.5). This activity is ongoing.