Malawi Environmental Information System (EIS)

Developing an EIS Strategy from the Middle Shire

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A paper prepared by:
Mathilde Snel, J. Ronald Eastman, and James Toledano, Clark University

Introduction

For the past five years, the Government of Malawi (GOM), with the assistance of the Malawi Environmental Monitoring Programme (MEMP), has been exploring the use of information technologies for improving environmental management. This has culminated in the Middle Shire River Situation Analysis and Report.
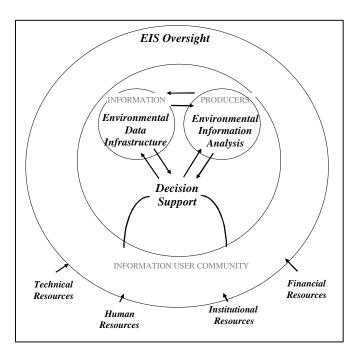
The Middle Shire Analysis was used to explore the issues related to developing an information system that can assist the GOM to make decisions on the environment. The document will highlight some of these issues in order to replicate this study, as well as, define some of the opportunities and gaps in implementing the Shire study in Malawi.

What is an Environmental Information System (EIS)

Given the significant pressures on natural resources in Malawi, the dynamic state of the environment demands information that is both timely and accurate. The proliferation of information technologies has allowed for greater access and dissemination of environmental information. A sustainable EIS is used to describe the institutional and technical infrastructure that routinely produces and uses environmental information to improve environmental and natural resource management. Geographic Information Systems (GIS) and Remote Sensing are information technologies that can be viewed as a driving forces behind this process.

As shown in the Middle Shire Report, such routine environmental monitoring and the use of information technologies can focus on obtaining information on environmental "hot spots" in which more intensive investigation may be carried out (Snel et. al., 1998 and Haan, 1998). As will be described in more detail below, a sustainable NEIS includes in-country capacity to address four components : 1) to develop an environmental data infrastructure, 2) conduct routine environmental analysis, 3) establish an environmental decision support network, and 4) provide for EIS oversight (Figure 1).

Effective decision making and the development of environmental management strategies must be demand-driven and participatory in nature in order to include the many

Figure 1: Components of an Environmental Information System (EIS).

local to national environmental decision makers and stakeholders. As a consequence, environmental information development must be distributed ensuring that capacities are developed at many different levels. In the end, success of an environmental information system will be judged according to the type and quality of environmental decisions that result.

Key Issues for Developing a NEIS

In order to replicate the analyses found in the Middle Shire Report and to develop a sustainable National Environmental Information System (NEIS) strategy, four areas need to be developed by the Government of Malawi: 1) environmental data infrastructure, 2) environmental data analysis, 3) environmental decision support network, and 4) EIS oversight. To develop each of these areas and the questions they pose, institutional, human, technical, and financial resource issues must be addressed and resolved. Unfortunately, the success of the Middle Shire analysis has been limited to addressing only the first two issues. As yet, adequate attention has not been given to the last two issues. In this document we will concentrate on the activities accomplished on the first two issues.

Developing a National Environmental Data Infrastructure

The development of an in-country environmental data infrastructure entails the routine collection of core environmental data sets. It is important that such environmental data sets are managed adequately to ensure that they are easily retrievable and interoperable as environmental concerns arise. The ability to supply environmental data from a variety of sources is facilitated through the development of data standards and an environmental data infrastructure that allows for proper archiving and regulated accessibility. This ensures that environmental data used for environmental decision making is of the highest accuracy and integrity.

The important question to be asked is what environmental data need to be routinely available and how should it be compiled to ensure good quality and routine collection? We have addressed this question by resolving most of the following issues through the Middle Shire analysis.

Key *Institutional* Issues to Resolve
- Which institution(s) should be involved in routine collection of environmental data?
- How should routine environmental data collection be encouraged in these institution(s)?
- Which institution coordinates the collection of environmental data catalogues?
- How is collection of good quality data ensured? Are national environmental data standards needed? If so, which institution(s) provides guidance on such standards? How is compliance to such environmental data standards encouraged?

Key Human Resource *Issues to Resolve*
- How are skilled staff acquired to routinely collect good quality environmental data?
- How are skilled staff retained?

Key Technical *Issues to Resolve*
- What type of technical resources are required to routinely collect good quality environmental data?
- What type of maintenance is required in support of the continual usage of such technical resources?

Key Financial *Issues to Resolve*
- What types of financial resources are required to support routine collection of national environmental data?

It was recognized earlier on that the provision of accurate information is reliant upon well established procedures and protocols. The development of an environmental data infrastructure in Malawi has to date focused specifically on building technical capacity in the following institutions (where technical assistance has been provided by Clark University and the University of Arizona[1]): the Department of Forestry to routinely monitor land cover change; the Ministry of Agriculture to routinely monitor agricultural yields and soil loss; the Meteorology Department to routinely monitor rainfall and rainfall energy, and the Department of Surveys to provide core spatial environmental data sets. Furthermore, to ensure future management and interoperability of in-country environmental data, technical assistance was provided to the Department of Surveys in developing environmental data standards (Figure 2).

Conducting National Level Environmental Data Analysis

Multidisciplinary environmental analysis is required to routinely address environmental concerns as they arise. Such environmental analysis may be conducted to help identify environmental "hot spots" (e.g., as done in the Middle Shire assessment) or to carry out elaborate analyses within specific areas of environmental concern. Highly trained technical staff are required to conduct routine multidisciplinary environmental analysis. Such multidisciplinary analysis may span biophysical and social explanations of environmental change and result in recommendations on mitigation strategies as needed by environmental decision makers.

The important question to be asked is what routine environmental analyses need to be conducted and what infrastructure needs to be in place to ensure this is accomplished routinely. We have addressed this question by resolving most of the following issues through the Middle Shire analysis:

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Figure 2: Partial listing of the proposed environmental data standards

Key *Institutional* Issues to Resolve
- Which institution(s) and/or individuals should be involved in routine environmental analysis?
- If cross-disciplinary environmental analysis requires the participation of various institutions, which institution should coordinate such routine analysis?
- How often should national environmental analysis be conducted?

Key Human *Resource Issues to Resolve*
- How are skilled staff acquired to adequately analyze environmental data?
- How are skilled environmental analysts retained?

Key Technical *Issues to Resolve*
- What type of technical resources are required to analyze environmental data?
- What type of maintenance is required for the continued use of such technical resources?

Key Financial *Issues to Resolve*
- What types of financial resources are required to support routine national environmental analysis?

To date capacity has been developed to begin addressing adequate environmental analysis. This capacity has included: 1) four annual training cycles (including an introductory, intermediate, and advanced course) in environmental monitoring using Geographic Information Systems, Remote Sensing, and Global Positioning System (GPS) - to date approximately seventy individuals have been trained; 2) specialized courses in environmental monitoring including ground truthing and participatory rural assessment within various Government agencies; 3) development of a University curriculum in the Environmental Studies program; and 4) completion of select environmental analysis case studies such as the Mid-Shire and Public Land Utilization Study (PLUS).

Unresolved Issues

Although we have addressed many of the issues for supporting the development of an EIS, they have been devoted to those above. Ideally, the establishment of a decision support network and an overall EIS oversight will be crucial in developing a model that extends the Mid-Shire analysis. With adequate time, these issues can be resolved. This next section offers some insight on what these issues are that must be addressed.

Establishing a National Level Environmental Decision Support Network

An EIS is intended solely for the support of environmental decision making and to improve environmental conditions and management. It is critical that national to local environmental information users and providers are adequately linked such that: 1) environmental information is collected with respect to user

demands; 2) environmental information is adequately disseminated to all relevant environmental decision makers and stakeholders; and 3) adequate support is given for environmental information usage. An EIS needs to accomplish these tasks on a routine basis.

The questions to be asked is what types of decision support activities are required to further support the Middle Shire analysis and what type of infrastructure needs to be in place to ensure that a study like the Middle Shire can continue to articulate and deliver the proper environmental information to decision makers for other areas of environmental interest. The following are some of the questions that need to be addressed.

Key *Institutional* Issues to Resolve
- Who should coordinate routine environmental information forums to routinely assess environmental information needs and disseminate environmental information?
- How often should such environmental information forums be conducted?

Key Human Resource *Issues to Resolve*
- What type of capacity needs to be built to ensure effective environmental information forums?
- What type of capacity needs to be built so that environmental policy may be more adequately enforced?

Key Technical *Issues to Resolve*
- What technical resources are required to link environmental information producers and stakeholders?

Key Financial *Issues to Resolve*
- What financial resources are needed to conduct effective environmental information forums?
- What financial resources are required to support environmental information usage to improve natural resource management

To date, because of time constraints, these issues have not been adequately addressed. Provisionally, however, the Mid-Shire analysis and the information it provides can be of extreme importance to decision makers in Malawi. As a result, the Mid-Shire was identified by the MEMP because of its intended purpose of supplying environmental decision makers with key information on erosion and landuse change in this rapidly changing environment. A key lesson learned is that a more permanent infrastructure needs to be set in place that can routinely coordinate and replicate a study like the Middle Shire in order to supply decision makers with routine environmental information.

Developing EIS Oversight

Finally, this is the most important component of an EIS. An effective EIS implies that all activities are coordinated and integrated. EIS oversight requires that a committee, forum, or institution is mandated to oversee and coordinate that: 1) environmental data are routinely collected according to standards and user demand within respective institutions; 2) environmental analysis draws from multidisciplinary expertise and is routinely conducted to satisfy user demands; 3) environmental information needs are routinely assessed and information routinely disseminated, and 4) environmental support are routinely reviewed to encourage environmental information usage (e.g., review of extension, environmental support funds, and policy).

An important question to be asked is what type of infrastructure needs to be in place to adequately oversee the development of the national EIS? We can resolve this issue by asking a set of more detailed questions.

Key *Institutional* Issues to Resolve
- What types of activities would be required to adequately oversee and coordinate the development of the EIS?
- Who should oversee and coordinate national EIS activities?

Key Human Resource *Issues to Resolve*
- What type of capacity needs to be built to ensure effective EIS oversight?

<u>*Key* Technical *Issues to Resolve*</u>
- What technical resources are needed to ensure EIS oversight?
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<u>*Key* Financial *Issues to Resolve*</u>
- What types of financial resources are required to support the oversight of the national EIS?

To date, the activities related to the Mid-Shire have been coordinated by the Environmental Affairs Department with assistance from the MEMP, and more recently, through the establishment of the EIS task force, whose sole task is the coordination of the activities related to the Mid-Shire. But this highlights the fact that such a group must have a clear mandate by the Government to conduct and coordinate routine activities.

The Way Forward

The development of an EIS in Malawi has to date focused on primarily capacity building related to data infrastructure and analysis. A number of sessions with senior staff and the technical level EIS task force have been conducted. The User Needs Assessment Training Workshop will culminate in a draft on: 1) the state of EIS in Malawi (including accomplishments and constraints) and 2) recommendations towards its further development. It is envisioned that this session will result in a draft report on recommendations to further develop a National EIS that will help pave the way forward to develop a sustainable Malawian EIS that routinely and collaboratively produces and uses environmental information to improve the management of Malawi's natural resources and environment.

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