

PROFESSIONAL
PRACTICE

EIA SOFTWARE IN DEVELOPING COUNTRIES: A HEALTH WARNING

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INTRODUCTION

In November 1996, a workshop was held at University College London. Its purpose was to explore the utility of computer software packages designed to guide environmental impact assessment (EIA). The workshop responded to a growing interest in and concern over the practical use of EIA software in developing countries.

Participants included professionals currently engaged in developing EIA software for the United Nations' Food and Agricultural Organization and the Canadian International Development Agency, as well as practitioners

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specializing in EIA and/or software design. Many software packages were demonstrated. Some are designed to facilitate specific components of the EIA process (for example, screening, impact identification); others are promoted as comprehensive EIA systems. Participants also were able to review two packages in their preparatory stages.

The workshop highlighted several concerns. Thus, the purpose of this report is to extend a gentle warning about the problems that might arise if EIA products are not tailored to the particular circumstances of developing countries. Some practical ideas to overcome these concerns are proposed to assist future product development.

EIA SOFTWARE — THE DANGERS

Substitution of Thought

Any computer software that explicitly seeks to replace or reduce the need for mental activity runs the risk of eliminating the capability of individuals to undertake such activity for themselves. In addition, as a user's experience with a particular software package grows, any weakness in logic or process that is written into the software is likely to be carried forward as convention. Software developed for EIA is no exception to either of these problems.

EIA is far from an exact science. Although the process draws on quantitative techniques in order to predict impacts and develop mitigation, it is also qualitative in its solicitation and interpretation of the objectives and values of a wide range of interested parties. In many developing countries, the range of interested parties is particularly wide, encompassing government agencies, developers (public and private), politicians, integrated, and disenfranchised local people, international and domestic nongovernmental organizations, and development assistance agencies. No system of software can have at its disposal all the information necessary to represent all these interests.

Proper solicitation and interpretation of information drawn from these parties require human interaction skills and flexibility that are impossible to replace with software alone. For example, software is unlikely to resolve such issues **as**: how to accommodate risk adversity and seasonality within impact identification and evaluation; how to identify and balance the different values attributed by different interested parties to particular impacts; whether

proposed mitigation measures are likely to be technically and institutionally feasible; and whether the manner in which the results of an assessment are presented is truly relevant to the particular decisions that they are intended to support.

Checklists

An example of where **EIA** software can constrain the needed flexibility of the **EIA** process is the use of *checklists*. Much of the software reviewed employs checklists to steer the user to the appropriate scope of issues for assessment. Commonly these checklists include menus of project components, characteristics of the existing environment, and types of environmental impacts. The more sophisticated software goes further, introducing an element of “intelligence” whereby, through the application of pre-defined “rules,” a range of potential indirect impacts of a proposed development can be identified.

Scoping checklists are valued by **EIA** practitioners who work within the complex physical and human environments of developing countries. Checklists provide both a starting point for scoping and a means to cross-check results to avoid the omission of key issues. Practice demonstrates, however, that checklists are no substitute for a systematic program of stakeholder consultation, supported by technical specialists and site visits. Therefore, computerized checklists cannot be the sole basis for the scope of an **EIA**. Checklists should only inform and/or corroborate.

impact Prediction

The dangers of overdependence on checklists are compounded where a checklist-derived inventory of potential impacts becomes the focus for qualitative impact predictions. There are very real difficulties in accurately quantifying impact predictions in many developing countries (because of data shortages or seasonal, economic, or demographic uncertainty, for example). Thus, it is quite commonplace for many types of impact predictions to be qualitative, based on informed expert judgment and consultation, rather than empirical assessment. Not unexpectedly then, the users of software that makes use of techniques to score and weight different impacts can be tempted to complete an impact assessment without ever leaving the terminal. Personal judgment is, however, inadequate for predicting impacts, determining whether mitigation is required, or concluding whether a project can be authorized on environmental grounds.

The possibility also exists that model users will amalgamate the scored impacts. The hazards for rational decision making of combining integers assigned to impacts is well documented and need not be discussed here.

Geographic Information Systems

A wealth of spatial demographic and physical data is commonly available to government departments and development assistance agencies. The temptation to update and employ this information to assist EIA is understandable. The application of geographic data to decision making can be problematic, however. The utility of a GIS package is only as good as the quality of the data it carries. Compiling accurate and comprehensive baseline environmental information over wide geographic areas is often limited by—

- * High costs;
- Absence of ground-truthing;
- Spatial variability (for example, good ecological data is often concentrated in protected areas);
- Reluctance on the part of government authorities to release up-to-date information; and
- Difficulties in handling dynamic parameters, for example, movement of people, seasonality, etc.

Thus, GIS data are frequently outdated and/or inaccurate. Excellent software may be available, but if the predictions of impacts on resources and people are based on partial or out-dated data, then the assessment will be inaccurate. Add the high costs involved in procuring GIS hardware, training staff, and maintaining data, and the utility of GIS as a generic tool for EIA in developing countries becomes questionable.

Training

The above concerns have concentrated on EIA software as a decision-support tool. EIA software has another and possibly far more useful function, that of facilitating training. The use of checklists to demonstrate the various tasks associated with impact identification, prediction, and evaluation, and the opportunities for comparing alternative locations and routes offered by GIS, all have potential utility as EIA training tools.

Overseas training in EIA is verging on the ubiquitous. There are literally hundreds of EIA training courses currently being conducted for EIA practitioners, government officials, and nongovernment organizations around the world (see, for example, IAIA's training database). With few exceptions,

these courses are based on EIA procedures and methodology originally adapted from the United States' National Environmental Policy Act (NEPA). The appropriateness of NEPA to developing countries is not the concern of this report. This report is concerned with appropriateness of EIA software designed to support NEPA-type procedures and methodology in the context of training in developing countries.

With software houses beginning to market their products to donor agencies, the potential exists for "off-the-shelf" software to become integral to overseas training when it is not tailored to local circumstances. There are certain important characteristics of **EIA** in developing countries that differentiate it from EIA in developed countries, differences that standard software is unlikely to accommodate. For example:

- The dominance of socioeconomic and natural resource degradation
- Issues beyond those associated with noise, traffic, and local air pollution
- Greater uncertainty in baseline information and thus impact predictions
- The need to undertake technical and institutional feasibility studies of proposed mitigation

EIA SOFTWARE – THE POSSIBILITIES

The current drive toward automation of design and management processes through computer assistance is a powerful force. Whether desirable or not, the widespread adoption of management software is a predictable future scenario. In light of this and the problems and issues just described, outlined below are some of the ways those responsible for commissioning, designing, or marketing EIA software might improve the utility of their product for developing countries:

- Prior to commissioning new EIA software, a **needs assessment** could be conducted with the target country or institution, to determine whether

computer software is the most effective end use of resources dedicated to strengthening the quality and relevance of **EIA**.

- Once commissioned, but before embarking on the design of **EIA** software, both the designers and end-users could make clear the points in the **EIA** process the software is aimed, and whether it is intended as a decision-support or training tool, or both.
- Within the software and associated user manuals, *prompts* could be introduced to prevent the package from becoming over-simplistic and erroneous. These prompts could impress on the user the investigative nature of the **EIA** process, ensuring that—
 - a systematic program of consultation is integral to identifying impacts and proposing mitigation;
 - verification of impact inventories is made through site visits;
 - the user is exposed to the limitations of checklists and the dangers of scoring impacts;
 - impact importance and resulting mitigation is identified on the basis of a combination of reasoning, values, policies, and experience, and not personal judgment alone; and
 - technical and institutional feasibility studies are undertaken for all major mitigation proposed.
- In addition, for systems incorporating **GIS**, prompts could expose the limitations of using geographic data in **EIA** predictions. The software could identify, for the user and the decision maker, which impact types can be assessed using **GIS** data and which cannot be assessed using **GIS** data. The importance of accurate and current data also could be emphasized.
- Regarding overseas training in **EIA**, an international evaluation study could investigate the utility and appropriateness of existing off-the-shelf **EIA** software to developing countries.

FINAL NOTE: AVAILABLE EIA SOFTWARE

Some interesting **EIA** software can be downloaded from the Internet, including:

- International Institute for Advanced Systems Applications:
<http://www.essaca.co.at>
- Forest Technology Systems Inc. (FTS):
<http://www.ftsinc.com/fts>
- Water quality assessment:
<http://www.ncl.ac.uk/-nxc/EIA.html>
- Major U.S. government environmental information sources:
<http://glnpogis1.r05.epa.gov/glmpo/edu/sea/seahome.html>
- ESSA Software Limited:
<http://www.essa.com>
- British Columbia EA office:
<http://www.eao.gov.bc.ca>
- US-EPA and Purdue University software for environmental awareness:
<http://glnpogis2.r05.epa.gov/glmpo/edu/sea/seahome.html>