

**THE EFFECTIVENESS OF THE  
CANADIAN INTERNATIONAL DEVELOPMENT AGENCY'S APPROACH  
TO ENVIRONMENTAL IMPACT ASSESSMENT: THE CASES OF THE THREE  
GORGES DAM AND THE MAE MOH MINE AND POWER PLANT**

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF  
THE REQUIREMENT FOR THE DEGREE OF  
MASTER OF SCIENCE(PLANNING)

in

THE FACULTY OF GRADUATE STUDIES  
School of Community and Regional Planning

We accept this thesis as conforming  
to the required standard



THE UNIVERSITY OF BRITISH COLUMBIA

April, 1994

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## ABSTRACT

This thesis reviews the Canadian International development Agency (CIDA)'s approach to Environmental Impact Assessment (EIA) for major development projects. Two cases are studied in the thesis as examples of CIDA's approach to EIA: The Three Gorges Dam in the People's Republic of China, and the Mae Moh Mine and Power Plant in Thailand.

The thesis uses fifteen criteria grouped into four sets to determine the effectiveness of the EIAs of the two cases studied.

The four sets are:

i. CIDA's own objectives for EIA.

These are that EIA should be an effective aid to decision-makers, result in a thorough analysis of the effects of projects or programmes on the quality of the environment, incorporate mitigation measures in the design of projects or programmes, result in the promotion of research which leads to technologies that economize energy, and result in environmental or related development training.

ii. The social legitimacy of EIA.

In order to be socially legitimate, an EIA approach should involve the participation of the people affected by the proposed project or programme, and have an impact report that reflects the interests and the preferences of the affected communities. Since the environment is perceived differently by different people, EIA approaches should serve the best interest of the community that will be affected by the project, judged in terms of immediate benefits for the local community.

iii. Technical legitimacy of EIA.

In order to be technically legitimate, an EIA should result in decisions that explicitly account for the impacts identified in the EIA process. An EIA process should take into account the adequacy of administrative, organizational and decision-making processes, legal instruments, and human and financial resources which are lacking in most countries receiving aid.

iv. Political legitimacy of EIA.

EIA procedures should be clearly understood by the countries receiving aid, or else those countries will perceive them as a western bias towards economic development in the developing countries as an exchange for environmental protection.

The EIAs of the two cases studied did not meet the fundamental criterion that, CIDA's approach to EIA should be an effective aid to decision-makers. The EIA recommendations in the cases studied were not used to guide the decision-makers in deciding the locations of the two projects, and whether to go ahead with the projects or not. The cases studied did not involve "grassroots" public participation.

These EIAs, however, were successful in identifying and analyzing the impacts of the studied projects on the quality of the environment. The two EIA reports recommended mitigations to guide project design. Since EIA is an evolving process, the whole exercise seemed to be mainly a learning experience for local experts and foreign consultants.

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## LIST OF ABBREVIATIONS

**CAD:** Computer Aided Design  
**CIDA:** Canadian International Development Agency  
**CIDA-INC:** CIDA Industrial Cooperation Program  
**CIPM:** Canadian International Project Management  
**CYJV:** CIPM Yangtze Valley Joint Venture  
**EARP:** Environmental Assessment Review Process  
**EGAT:** Electricity Generating Authority of Thailand  
**EIA:** Environmental Impact Assessment  
**ESA:** Environmentally Sensitive Areas  
**ESSA:** Environmental and Social System Analysts  
**FEARO:** Federal Environmental Assessment Review Office  
**GIS:** Geographic Information System  
**LET:** Lampang EIA Team  
**MW:** Megawatts  
**MWREP:** Ministry of Water Resources and Environmental Protection  
**NEPA:** National Environmental Policy Act  
**NEQA:** National Environmental Quality Act  
**NPL:** Normal Pool Level  
**PEA:** Participatory EIA Approach  
**PRC:** Provincial Research Council  
**SAS:** Solar Aquatic Systems  
**UBC:** University of British Columbia  
**UNEP:** United Nations Environmental Programme  
**U.S.A:** United States of America  
**USAID:** United States Agency for International Development  
**WCED:** World Commission on Environment and Development  
**WUSC:** World University Services of Canada  
**YVPO:** Yangtze Valley Planning Office

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### **Acknowledgment**

I am deeply indebted to busy people who assisted me in this research.

For their research abilities and technical input, the following individuals receive my special thanks:

- Professors Aprodicio A Laquian, Peter Boothroyd and William E. Rees who guided the research from an idea to the finished product and reviewed the drafts,
- Dr. Patrick Duffy Mr. William Harland and Mr. Robert Weir for direction in finding research material, and
- Ms Lori-Lee McArthur Mr. Terry Lyster, Mr. David Hoey and the 1994 members of UBC WUSC committee, who proofread the manuscript.

My gratitude goes to the World University Services of Canada (WUSC), with whose bursary I entered the Graduate School at UBC, and also to my wife Nthabiseng and son Alege who provided the moral support and lastly to parents Asneta Weweru Akonyu, and the late Zebdayo Dukii Akonyu, to both of whom this work is dedicated.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 The purpose of the Study

This thesis examines the Canadian International Development Agency's approach to Environmental Impact Assessment (EIA) processes and techniques for major development projects. It is based on two case studies: the planning for the Three Gorges Dam in China and the Mae Moh Mine and Power Plant in Thailand.

The search for the means that would allow the incorporation of environmental factors in decision-making continues to drive researchers and policy makers to formulate specific policies that would lead to administrative reorganization and institutional reform of EIA. This thesis attempts to document the effectiveness of CIDA's approach to EIA, assuming that EIA is necessary and socially useful for any development project regardless of where the project is to be built, what kind of people will be affected by the project, who will carry out the EIA study and who will make decisions based on the EIA studies.<sup>1</sup> It uses a list of criteria, derived mainly from what the thesis calls an ideal EIA, for judging the effectiveness of CIDA's approach to EIA.

Like the approach taken by most institutions that use EIA as a policy instrument to prevent environmental damage, CIDA's largely self-instituted approach to EIA is ostensibly intended to identify a potentially beneficial course of action for decision-makers who decide whether to fund a project or not. Generally an EIA report takes a position on what action project proponents should take to ensure that the "best" alternatives for development from an environmental point of view are selected.

CIDA's approach to EIA is to ensure that concerns about environmental matters are identified and considered in the political and bureaucratic decision-making systems of those countries where CIDA's aid goes.

#### 1.3 Objective and Scope of Study

The general question addressed in the thesis is: Is CIDA's EIA approach effective in affecting the fate of proposed projects in developing countries? Specifically the thesis asks whether CIDA's approach to EIA is an effective decision-making tool for CIDA and the countries of the Third World where CIDA's aid goes, and also

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1. *"the general thrust of the symposium is to stress the need for EIA. Failure to do EIA would result in serious environmental degradation and socio-economic impacts"* Wooldridge R. (1991), p. 303, Savory (1988), Berger (1988), CIDA (1992), Knight N. (1991), Costanza R. (1991), and WCED (1987) agreed with the above notion.

whether it serves to protect the biophysical and social integrity of the project environments. A brief historical background of EIA and its development by CIDA is provided. On the basis of various published theories and views on what constitutes a desirable EIA process, a model of an ideal EIA process is developed. From this model are derived criteria for assessing CIDA's EIA practices. These criteria are then applied to CIDA's process as exemplified by the two cases studied.

The limitation of the study is lack of representation in the form of EIA case studies of CIDA's approach. Only two cases were examined to represent CIDA's approach. This number may not be statistically representative, given that CIDA was involved in many more studies. At the time of the study, most EIA reports in CIDA's possession were parts of feasibility studies of development projects. These were classified documents, and therefore not available for research purposes.

However, for the purpose of this thesis, the two cases studied will achieve the purpose and objectives of the thesis, given the magnitude of the cases and the international attention they received. (The Three Gorges Dam when built, will be the world's largest, and the Mae Moh Mine and Power Plant Project reviews led to the first ever research on acid rain in Thailand). The method was, therefore, limited to library research and interviews with people with direct experience in CIDA's activities.

#### **1.4 Background**

Planners and other decision-makers are faced with the problem of determining the proper balance between human activities and environmental integrity because maintaining human life on earth imposes costs on the environment (Cleveland 1991, Hannon 1991, El Serafy 1991, Sammy 1982). The present economic planning process has ignored or only partially captured these costs (Huetting 1991, Faber and Proops 1991, Rees 1989).

In order to "predict" the future effects of proposed projects and programmes on society in general and on the environment in particular, governments have developed the EIA process. It is a systematic procedure meant to assist decision-makers in making choices on the face of uncertainty, risk and conflicting objectives.

CIDA, like other institutions that administer aid in developing countries, has included the EIA process as a requirement for input to decisions on funding operations that have diverse and significant environmental impacts (CIDA 1986). Until the passage of the Canadian Environmental Assessment Act in March 1992, no Canadian legislation required that CIDA conduct EIA for the projects that it funds abroad. EIA was an environmental strategy

voluntarily developed by CIDA to try to meet the performance of its international counterparts, who were already responding to the worldwide outcry for decision-making that puts into consideration environmental impacts. CIDA's initial environmental framework was designed in accord with Canada's Environmental Assessment and Review Process (EARP). Over the years, the framework has incorporated ideas from other agencies such as the World Bank.

In accordance with Canadian government policy, CIDA develops and applies phased approaches for assessing the environmental implications of its policy and programme proposals. According to FEARO's September 1990 press release, "Canadian international development assistance is subject to the Canadian Environmental Assessment Act, and environmental assessment will be an important element of Canadian international development assistance." Accordingly, CIDA's EIA should comply with that spirit and with Canadian environmental assessment law.

Section 5(1)(b) of the Canadian Environmental Assessment Act states that, "An environmental assessment of a project is required before a federal authority performs functions in respect of a project where a federal authority makes or authorizes payments or provides guarantee for a loan or any other form of financial assistance to the proponent for the purpose of enabling the project to be carried out in whole or in part, except where the financial assistance is in the form of any reduction, avoidance, deferral, removal, refund, remission or other form of relief from payment of any tax, duty or impost imposed under any Act of Parliament."

As well, CIDA's EIA is guided by:

1. Respect for the sovereignty of partner countries;
2. Adaptation of approaches for public review of environmental assessment and consultations with affected communities in a manner that respects the foreign nature of projects;
3. Application of environmental assessment requirements of partner countries, or international development institutions, when they meet the basic objectives of Canadian Law;
4. Assisting partner countries to develop and apply environmental planning and assessment capacity; and
5. Making available to the Canadian Public the environmental assessment reports of CIDA projects (CIDA 1992a).

CIDA's funding operations are executed via three channels: the Bilateral Project Cycle, a government to government assistance programme, the Multi-lateral and the Industrial Cooperation Program (CIDA-INC), a programme to assist Canadian industries in marketing products abroad.



In its bilateral project approval process, when CIDA receives an application from a developing country to fund a project, it selects a project team leader to assemble existing information on the project or programme proposed and determine the gaps in the documentation, a resource officer to write the terms of reference for feasibility studies of the project, and an environmental advisor to design and commission the necessary environmental studies. The actual EIA study of the project is contracted to consultants who are drawn mainly from Canada.

CIDA advertises the job in Canadian and international newspapers, and then chooses consultants by assessing the quality of their work on similar projects, as well as the amount of money the consultants ask to complete the job. CIDA's project team leader uses the results of the feasibility studies provided by the selected consultants to prepare a project appraisal report.

In the Industrial Cooperation Program (CIDA-INC), which is designed to promote Canadian industry abroad, Canadian industry and resource companies are sponsored by CIDA to seek markets for their products abroad. Where the activity abroad involves a project that requires the preparation of an environmental impact assessment report, the firm consults with the subject country and prepares an estimated cost of the EIA. The estimate goes to CIDA-INC together with the rest of the project proposal for approval. If CIDA agrees to fund the EIA, the proponent hires a consultant or does the EIA study.

### **1.5 Structure of the thesis**

This thesis has five chapters:

Chapter One outlines the objectives of the thesis. It briefly states why CIDA includes EIA as a requirement for input to decisions on funding operations that have diverse and significant environmental impacts.

Chapter Two gives a definition of EIA, traces its origin and its spread through out the world. It provides a general overview of an ideal EIA process and the techniques used to conduct it. It lists resources that may be needed to conduct an EIA study. This chapter also reviews the EIA approach of CIDA beginning with EIA in Canada, followed by CIDA's environmental policy, and later the use of EIA in its bilateral activities and through CIDA-INC. Lastly Chapter Two establishes criteria to judge the effectiveness of CIDA's approach to EIA.

Chapter Three reviews two case studies of planning with EIA: the Three Gorges Dam Project and the Mae Moh Mine and Power Plant Project.

Chapter Four is devoted to contrasting the results of CIDA's EIA approach in the cases studied with the established evaluation criteria for determining the effectiveness of CIDA's EIA. It also provides the outcome of contrasting the EIA results with the evaluation criteria.

Chapter Five draws conclusions about CIDA's approach to EIA and with reference to the procedures discussed in Chapter Two, identifies implications for improving the process. Lastly, Chapter Five suggested ways of how to improve CIDA's EIA.

## CHAPTER TWO

### THE EIA PROCESS AND TECHNIQUES

This chapter provides a definition of EIA, states its origin, and its spread throughout the world. It traces the origin of EIA and how CIDA eventually included it into its process for approving project funding in the less industrialized countries. To develop criteria for assessing CIDA's approach to EIA exemplified in the two cases studied, this chapter develops a model of an ideal EIA process by describing a summary of EIA process outlined by Canter (1977), Tywoniuk (1987), Ahmad and Sammy (1985), Whitney and Maclaren (1985), and the United Nations Environmental Programme (1988). In addition to the ideal EIA process, this chapter also identifies the required techniques to conduct an EIA and resources needed. It then illustrates CIDA's requirements for EIA and gives an overview of the EIA approach of CIDA.

#### 2.1 Environmental Impact Assessment

EIA is a process concerned with identifying and assessing the environmental consequences of planned development projects, programmes and policies in an attempt to ensure that the *best* alternatives for development are selected. It is a formal study process used to *predict* the environmental consequences of proposed major developments. Such developments may include, for example, building a hydroelectric dam and factory, irrigating a large valley or developing a harbour or a major mine.

EIA is meant to integrate ecological and social considerations into the planning of major developments. This process ensures that environmental factors, public concerns and community values are integrated early in the planning process so that business or governments can make timely decisions on projects.<sup>2</sup>

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2. *Organizations and individuals define EIA differently. For example:*

*a) EIA may include studies of the weather, flora and fauna, soil erosion, human health, urban migration, or employment, that is to say of the physical, biological, socioeconomic and cultural impacts. The number of studies vary depending on the terms of reference of specific actions (United Nation Environmental Programme 1988);*

*b) EIA seeks to compare the various alternatives which are available for any project or programme. Each alternative will have economic costs and benefits as well as environmental costs and benefits. Naturally there must be a trade-off between the environmental benefits and economic costs. Adverse environmental impacts may be reduced at higher economic costs. Conversely, economic benefits may be enhanced at higher environmental cost. EIA seeks to compare all feasible alternatives, and determine which represents an optimum mix of environmental and economic costs and benefits (Ahmad J. Yusuf, and George K. Sammy, 1985);*

## **2.2 The origin and antecedents of the EIA Process**

The EIA process has a legal birthday. It entered the world as a section of the US National Environmental Policy Act on January 1, 1970. Its origin can be traced to the 1960's in the US, although previously in 1959 a Bill was passed in the United States' Senate, which sought "to declare a national policy on conservation, development and utilization of natural resources." (U.S.A Senate Bill No. 2549).

Lang (1977) says that environmental degradation as a result of increased industrialization following the Second World War, was seen by many as a threat to their basic interests and continued well being. This perception, which many people share today, led to calls for action.

Additional factors contributing to the introduction of the EIA are outlined in O'Riordan and Sewell (1981):

- i) the growing scale and associated effects of resource development projects;
- ii) inadequate coordination between regulatory agencies; and
- iii) failure to adequately recognize and integrate environmental and social factors into project appraisal.

The United States federal government's response was the passing of the National Environmental Policy Act (NEPA in short) in 1969, which mandated the EIA process and thereby led to a new era of environmental management in the United States. Prior to that, development projects were largely carried out within a limited framework of objectives. Assessment of project viability was dominated primarily by technical and economic feasibility with cost-benefit analysis the prominent method used to evaluate project alternatives (Lahlou and Canter 1993).

NEPA specifies that EIA must be performed on all major US federal actions significantly affecting the quality of human environment. Thus the nation may attain the widest range of beneficial uses of the environment without degrading it, or risking health or safety, or creating other undesirable and unintended consequences (Public

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*c) EIA is based on predictions. The technical work involves estimating the changes in the environmental quality which may be expected as a result of the proposed action. For example, how will a coal-burning electricity generator affect air quality in the adjacent village? Predictions can be based on existing mathematical formulae, or computer models generated for specific projects or programmes. Where numerical analysis cannot be employed (for example in social impacts), expert judgement and the knowledge by experience is heavily relied upon (Whitney and MaClaren 1985); and*

*d) EIA attempts to guide the decision of policy and decision makers, by weighing environmental effects and economic costs and benefits in the overall project evaluation. If it is done the decision maker is less likely to overlook an environmental consequence in arriving at a decision (Bisset R. 1987).*

Law, 91-190, 1970). The focus originally was on the bio-physical environment. By about 1975 the practice was expanded to include the social and cultural sectors of the human environment.

Within a decade, a host of countries followed the initiative of the U.S.A. Among the industrialized nations, Canada, Great Britain, France, the former West Germany, the Netherlands, Australia and New Zealand, all initiated the use of EIA for appraisal of major projects (Wandesford-Smith, 1980). Japan instituted it in later years.

EIA process did not stop within the western industrialized countries. Less industrialized countries such as Bangladesh, Hong Kong, India, Iran, the Republic of Korea, Malaysia, Papua New Guinea, the Philippines, Thailand, the Trust Territory of Pacific Islands, and the former Soviet Union, all adopted the process (Jalal and Thampi, 1979).

Multilateral development aid organizations for example the World Bank and government development agencies like the United States Agency for International Development and CIDA, also developed environmental impact assessment review processes which have direct links to the original EIA.

### **2.3 An Ideal EIA Process and Associated Techniques**

To develop criteria for assessing CIDA's approach to EIA, this study outlines a structure of a model EIA.

Based on EIA requirements, several authors have developed structured environmental impact assessment frameworks and guidelines (Canter 1977), and a substantial number of specific and global EIA methodologies, concerned partially or totally with various environmental components have emerged during the past two decades. The process described below is a synthesis of a number of approaches by different authors, which forms the basis of an ideal EIA process and associated techniques and needed resources.

An ideal EIA of projects and programmes involves some or all of the following activities:

- 1 - screening;
- 2 - preliminary assessment;
- 3 - organization; and
- 4 - full scale EIA (including scoping, study and reports).

This list is derived from the EIA processes outlined by: Tywoniuk N (1987), outlining CIDA's perspective; Ahmad and Sammy (1985), outlining the perspective of researchers from developing countries; Whitney and

Maclaren (1985), outlining the Canadian perspective; and the United Nations Environmental Programme (1988), outlining the perspective of an international organization.

The preliminary activities comprising screening, preliminary assessment and organization are meant to answer the questions: Who will make decisions about the project? Who will be the facilitator of the EIA process? Where is the location of the project site? What is the proposed action? and What is the relevant existing legislation? A full scale EIA evaluates the impacts of a project on the physical and human environment of the project area in order to aid decision-makers in deciding whether to go ahead with a project or not.

### **2.3.1 Screening**

Screening is the first and simplest tier of project evaluation. The principle purpose of screening is to evaluate whether the possible implications of a proposed project will require further analysis or whether special consideration of effects is needed. It clears the way for those projects which in past experience are not likely to cause serious environmental and social problems.

The exercise may include one or more of the following:

- measuring the project against simple criteria such as size or location near sensitive areas;
- comparing the proposal with lists of project types rarely needing an EIA, (for example schools), or definitely needing one (for example coal mine);
- estimating general effects, (for example increased need for infrastructure), and comparing these impacts against set thresholds; and
- doing complex analysis using available data.

These activities may or may not involve the local people.

### **2.3.2 Preliminary Assessment**

In general, if screening does not automatically clear a project, the proponent may be asked to undertake a preliminary assessment, sometimes referred to as "Initial Impact Assessment." This involves research and solicitation of expert advice to: identify the project's key effects on the local environment; generally describe, and predict the extent of the impacts; and briefly evaluate their importance to decision-makers (UNEP 1988).

The preliminary assessment narrows the discussion on possible project sites and serves as an early warning for potential serious environmental difficulties.

### **2.3.3 Organization**

If after a preliminary assessment and the competent authority deems that a full EIA is needed, the next step for the project proponent is usually to organize a detailed EIA study.

This entails commissioning a team of experts' workshops in order to identify the team of decision-makers who will do all or some of the following: plan, finance, permit and control the proposed project or programme. These decisions are affected by laws and regulations governing the project or programme. The team commissioned will determine how and when the findings of the EIA will be communicated (UNEP 1988, Tywoniuk 1987, Sammy 1982, World Bank 1991).

### **2.3.4 Scoping**

Before a full scale EIA is conducted the team of experts commissioned engage in a scoping exercise (Beanlands and Duinker 1983).

Scoping is a process whereby the spatial and temporal boundaries of the EIA study are determined. Scoping also involves the selection of the "important" environmental components of the project to be studied, listing hypothesis of the EIA study and selection of those groups of people upon whose opinions the criteria for significance of effects are based.

Its aim is to ensure that the study addresses all the issues of importance to the decision-makers. In general the major steps in scoping are:

1. issue identification;
2. development of scenarios;
3. identification of indicators;
4. identification of time and space boundaries; and
5. analysis of impacts both single effects and cross effects.

A scoping exercise may be accomplished through two or three workshops (Beanlands and Duinker 1983, Whitney and Maclaren 1985, UNEP 1988), depending on the complexity of the project or the scale of anticipated environmental impacts. The presence of qualified multi-disciplinary staff drawn from a pool of specialists in fields such as environmental science, rural and urban planning, economics and engineering for example and participation of some members of the public (interest groups) is therefore important.

While interest groups could identify themselves by participation in meetings, petitions, letters to the newspapers, or chosen by those commissioned to carry out the EIA study, a survey is needed to ensure that not only activist minority views be taken into account, but rather that the silent majority's opinions can be considered as well (Maclaren and Whitney 1984). Majority's opinions in many circumstances are the views of the inhabitants of the area where a project is located. Their knowledge of the area can not be compared to that of people who do not reside in the area.

The analysis accomplished after each workshop are submitted in a report to the project proponents. Each of the five steps of the scoping process is covered in the report. The report later becomes part of the final environmental assessment report.

The first workshop is usually meant for issue identification, development of scenarios and identification of indicators. It usually takes two to three days, and is led by experienced facilitators. The number of participants is kept small. Attendees may include the project team, selected resource experts and consultants to cover scientific or technical areas, and experts from other government or academic institutions (Tywoniuk 1987). The academic background and beliefs of participants is of crucial importance because, the quality and bias of the EIA is dependent on this group. The workshop mainly begins with the study team meeting with the selected group to discuss the inclusion of all the possible issues and concerns raised by all these groups. The group will discuss major issues of concern to the local or regional population, the national government or the development organization.

After identifying the issues the workshop participants prepare a detailed description of the development scenario; including timing and location of the major activities associated with the development and a description of the environmental and social context in which the development will be implemented.

The second workshop may take two to three days and is held at the project site. Public interest groups if not introduced in the first workshop are usually introduced at this stage. All the items discussed in the first workshop are revised and the results are put to the scrutiny of the public interest groups.

The list of project activities and environmental conditions or characteristics discussed in the workshops are displayed in checklists and matrices. After the workshop, the participants then write a report which summarizes the discussions and the final results of the scoping exercise. The report, which contains a simple checklist of environmental parameters for investigation and simple matrices displaying the relationships of environmental



conditions that might be affected, recommends whether there is the need to assess the impacts of the project in a broader context and in more depth or not (Tywoniuk 1987).

An example of a simple checklist is that used by the National Environmental Board in Thailand for assessing the environmental impacts of the Huasai-Thale Noi Road project (see Table 1 next page).

Also on the next page (Table 2) is an example of a simple matrix generated as class exercise to scope the EIA of a refugee settlement in Mozambique by the School of Community and Regional Planning Students at the University of British Columbia. It consists of horizontal list of project activities arranged against a vertical list of environmental conditions or characteristics that might be affected. This combination facilitates the systematic identification of cause-effect relationships between the specific activities and effects.

Table 1

Checklist for the Huasai-Thale Noi Road Project.  
Source: Biswas and Geping (1987).

Items	Nature of Likely Impacts									
	Adverse						Beneficial			
	ST	LT	R	IR	L	W	ST	LT	SI	N
Aquatic ecosystems		X		X	X					
Fisheries		X		X	X					
Forests		X		X	X					
Terrestrial wildlife		X		X		XX				
Rare & endangered species		X		X		X				
Surface water hydrology		X		X						
Surface water quality		X				*				
Groundwater	*	*	*	*	*		*	*	*	*
Soils										
Air quality	X				X					
Navigation		X			X					
Land transportation								X	X	
Agriculture							X			X
Socio-economic								X		X
Aesthetic		X			X					

ST = Short-term

LT = Long-term

R = Reversible

IR = Irreversible

L = Local

W = Wide

SI = Significant

\* = Negligible

N = Normal

Table 2.

The matrix compiled for scoping the EIA of the construction of a refugee settlement in Mozambique.  
Source: From a workshop by Planning Students at The University of British Columbia (March, 1992)

## SCREENING MATRIX

Activities:	CAMP CONSTRUCTION				CAMP OPERATION		
	Channel Dock	Road	Site Preparation	Well	Waste Disposal	Ground Water	Energy
<b>Resources:</b>							
<i>Environment</i>							
1. Vegetation	L				M	M-H	H
2. GroundWater	L				H	H	H
3. Nature Reserve	L				M-H	M-H	H
<i>Socio-economic</i>							
1. Local Inhabitation	L				M-H	H	H
2. Camp Condition	M+	M+					
3. Ethnic Crowding							
4. Health							
5. Crime							
6. Security	H	M+	Unknown	Unknown			

L = Low

M—H = Medium High

M = Medium

M+ = Medium Positive

H = High

### **2.3.5 Full scale EIA Study Process**

Most times a typical detailed EIA study of a project starts after "scoping." According to UNEP (1988), it should always attempt to answer the following five questions:

1. What is likely to happen as a result of the project?
2. What will be the extent of the changes?
3. Do the changes matter?
4. What can be done about them?
5. How can decision-makers be informed of what needs to be done?

#### **2.3.5.1 Prediction**

The questions "what is likely to happen as a result of the project?" and "what will be the extent of the changes?" are answered by "prediction". Prediction scientifically characterizes the effects of a project on the environment and the local community. For example toxic liquid effluent in a water source reduces the water quality. This results in reduction of fisheries, which eventually affects economy of fishing villages, and may result in cultural changes.

Prediction draws on all modeling techniques, scaling, networks, overlays, models, simulations and measures plus photomontages, experiments or expert judgment.

Overlays, for example, are transparent sheets showing specific spatial data which can be placed on base maps (topographic sheets of the project area) to identify potential conflict. They show the area of special environmental interest (usually environmentally sensitive areas such as archaeological sites, fragile habitats like wet-lands and bogs, scenic vistas, areas with endangered species etc.). One transparency is eventually made to show the distribution of each chosen variable. Overlaying these sheets, reveals areas of conflict. The regions with the greatest overlap are regarded as the most affected. The preparation of the base map and overlays often dictates the extent of the base line study. The most recent overlays are produced faster and more reliably on computer aided design (CAD) systems and Geographic information systems (GIS) (Klinkenberg 1990).

The prediction methods are designed to identify least-cost and least impact locations or routes through a landscape for project or development corridors. The sophistication of these methods is limited by finances, the scope of the EIA or need to apply them, and the availability of experts and time.

Lately, social and cultural impacts are becoming important issues that warrant the prominence in describing the extent of changes expected as a result of a major project. Younger disciplines such as some branches of sociology and cultural anthropology are trying to cope with the pressures of public demand to integrate sociocultural effects wherever possible into every discussion involving physical/biological change (Montz and Dixon 1993).

All prediction techniques, by nature, involve some degree of uncertainty. Attempts to quantify the uncertainty of each prediction in terms of probability or margin of error is encouraged. Further details of these techniques are beyond the scope of this thesis.

Prediction is summarized as: identification of environmental modification that may be significant; forecasting of the quantity and/or spatial dimension of change in the environment identified; and estimating the probability that the impact will occur (Keeny 1992).

#### **2.3.5.2 Evaluation, Detailed Study of Impacts and display on Matrices**

The answers to the questions "what will happen as a result of the project?" and "does the change matter?" are answered by evaluation, i.e. by reviewing the predicted adverse impacts of a project or programme to determine whether the effects are significant enough to warrant mitigation or canceling the project, and detailed study of the effects.

The judgment of significance is based on one or more of the following:

- i. comparison with laws, regulations or acceptable standards;
- ii. consultation with the relevant decision-makers;
- iii. reference to pre-set criteria such as protected sites, features or species;
- iv. consistency with government policy objectives;
- v. acceptability to the local communities or the general public.

Evaluation involves decisions about the importance of significant impacts within each component of the environment. Some impacts on component of the environment affect other components, because of the interactive nature of environmental components.

Once the candidate list of key impacts derived from the scoping process (for example the atmospheric air and changes to air quality, noise levels, wild life habitats, species diversity, landscape views, social and cultural systems, settlement patterns and employment levels) are evaluated for significance, the EIA team compiles a matrix that shows the project components or activities on the horizontal axis and the environmental sector on the vertical axis. The matrix can show the relationship between various components of the project and elements of the environment. The construction of a matrix with description of relationships assists EIA study team in identifying possible range of outcomes of any action as well as provides a clearer understanding of the environment even if no action is taken. The relationship appears in qualitative form, similar to those in Table 2.

All the project components may be named (inception, construction and operation), and all the sources of impacts may be named (for example smoke emission, water consumption, and jobs created) and then possibly the receptors in the environment are listed, (for example crops, communities using the water for drinking, migrant labourers) by surveying the existing environment and consulting with stakeholders.

#### **2.3.5.3 Mitigation (controls, treatment, engineering design)**

If the predicted changes are evaluated as significant, then the answer to the question, "what can be done about them?" is in most cases mitigation measures. A wide range of measures can be proposed to prevent, reduce, remedy, or compensate for each of the adverse impacts evaluated as significant.

Possible mitigation measures include:

- Changing the project sites, routes, processes, raw materials, operating methods, disposal routes or locations, timing or engineering design;
- Introducing pollution controls, waste treatment monitoring, phased implementation, landscaping, personnel training, social services or public education; and
- Offering, as compensation, restoration or damaged resources, money to affected persons, concession on other issues or off-site programmes to enhance some other aspects of the environment or quality of life for the community.

#### **2.3.5.4 Documentation**

Documentation, conclusion and the presentation of the report are the last steps in the EIA process. These may respond to the question, "how can decision-makers be informed of what needs to be done?" They communicate the findings of the EIA to the decision-makers in a manner that will be understood by the audiences. This means, identifying the key decision-makers, perceiving the questions they will ask, and providing the answers in a format they can understand.

An EIA report sometimes called an environmental impact statement (EIS) contains:

1. An executive summary of the EIA findings, which provides an overview of the study and lists the major conclusions reached in the study.
2. A description of:
  - a) the development project;
  - b) major environmental and natural resource issues that needed clarification and elaboration;
  - c) the project impacts on the environment (in comparison with a baseline environment as it would be without the project), and how those impacts were identified and predicted;
3. A discussion of options for mitigating adverse impacts and for shaping the project to suit its environment, and an analysis of the tradeoffs involved in choosing between alternative actions;
4. An overview of gaps or uncertainties in the information; and
5. A summary of the EIA for the general public.

All this may be contained in a concise easy-to-read document, with cross references to background documentation, which is provided in an appendix.

#### **2.3.6 Resources that may be needed to complete an EIA study**

In general, in order to complete an ideal EIA study, the following resources may be required:

1. Qualified multi-disciplinary staff including: a skilled manager, to co-ordinate the EIA activities, communicate with the decision-makers, and motivate the study team; trained specialists in

fields such as environmental science, rural and urban planning, economics, waste and pollution control, process engineering, landscape design, sociology, cultural anthropology; and a communication expert.

2. Reference material in form of technical guidelines and secondary data on the projects, agreed on by the competent authority. The materials are used to lead the various phases of the EIA process, especially screening, scoping, prediction, evaluation and mitigation.
3. Analytical capabilities including those related to: field work, laboratory testing, library research and data processing, remote sensing, photographic interpretation, photomontage, surveys and predictive modeling.
4. Administrative resources for the day to day running of the EIA process including: office staff, meeting rooms and support, communications facilities and records management.
5. Institutional arrangements including: a formal procedure for consultation with decision-makers and other interest groups, the authority to obtain the necessary information for the proposed project, and a formal process for integrating the EIA into decision- making about projects.
6. Review, monitoring and enforcement powers, to ensure that accepted mitigation measures are included in the development.
7. Money and time needed to perform the EIA. UNEP (1988), estimates the length of time to finish a preliminary assessment to be from 2 to 10 weeks; a full EIA takes from 3 months to 2 years. The estimated cost is between 0.1% to 1% of the total cost of the project. (UNEP (1988) also says that, EIA for most major development projects require extensive resources, but programmes and policy assessment would need just a few).

#### **2.4 The EIA Approach of CIDA**

This section reviews CIDA's EIA process in order to determine how it fits in the ideal EIA structure discussed in the previous section.

The EIA approach of CIDA is derived from that of the Canadian federal government. In Canada the EIA process was adopted in 1973. The Environmental Assessment Review Process (EARP) was established by a cabinet

decision on December 20, 1973 and the Federal Environmental Assessment Review Office (FEARO) was established by a cabinet memorandum in 1974 to administer the EARP (FEARO, 1985).

The Canadian government was under the same pressure as that of the U.S.A to respond to the perceived environmental crisis. This was especially so because large-scale hydrocarbon exploration was underway throughout the North and Eastern offshore areas (Rees 1988).

The Cabinet decisions on the state of the environment were replaced by EARP Guidelines issued by an Order-in-Council on June 22, 1984 (SOR/84-467).

The purpose of EARP is to ensure that the adverse environmental consequences of all federal proposals are assessed early in the planning process before any irrevocable decisions are made.

The scope and process of EARP are concerned with changes that a proposal may cause to the natural environment, as well as directly related social and economic implications.

Like the EIA legislated by NEPA in the U.S.A., EARP applies to all Canadian federal proposals, i.e., those proposals that are undertaken directly by a federal initiating government department, have an environmental effect on the area of federal responsibility, or to which the federal government makes a financial commitment, or are located on lands, including the offshore, that are administered by the federal government, or have effects external to Canadian territory (FEARO, 1985).

FEARO provided initiating departments with procedural guidelines for screening proposals and general assistance in developing and implementing specific departmental procedures. FEARO also provided public information and logistical support for public review for EIA proposals. FEARO guidelines of the proposal allowed the particular Minister responsible for a proposed project, to decide the need for public review by a panel. However, the guidelines did not provide procedures for environmental assessments. At that time it was the responsibility of the federal department or agency, such as Crown Corporations, to develop the procedures. The guidelines did not establish mechanisms for any public participation in the initial part of the environmental assessment process (FEARO 1990c).

Within the time period of this research, the environmental assessment establishment in Canada went through administrative and legal changes. The Canadian House of Commons has passed the Canadian Environmental Assessment Act on March 19, 1992, which gives environmental assessment legal powers. The Act



was later endorsed by the Canadian Senate and became law in 1993, after the most important sections of the regulations were written (Statute of Canada 1992, FEARO 1992 Press release). With the passage of a new environmental assessment law in Canada, a new agency known as the Canadian Environmental Assessment Agency has taken over the responsibility of EARP.

Canadian federal government departments like their U.S.A counter parts use EIA as a tool to estimate the likely environmental effects of proposed developments in the hope that they can be mitigated by marginal changes in design (FEARO 1985).

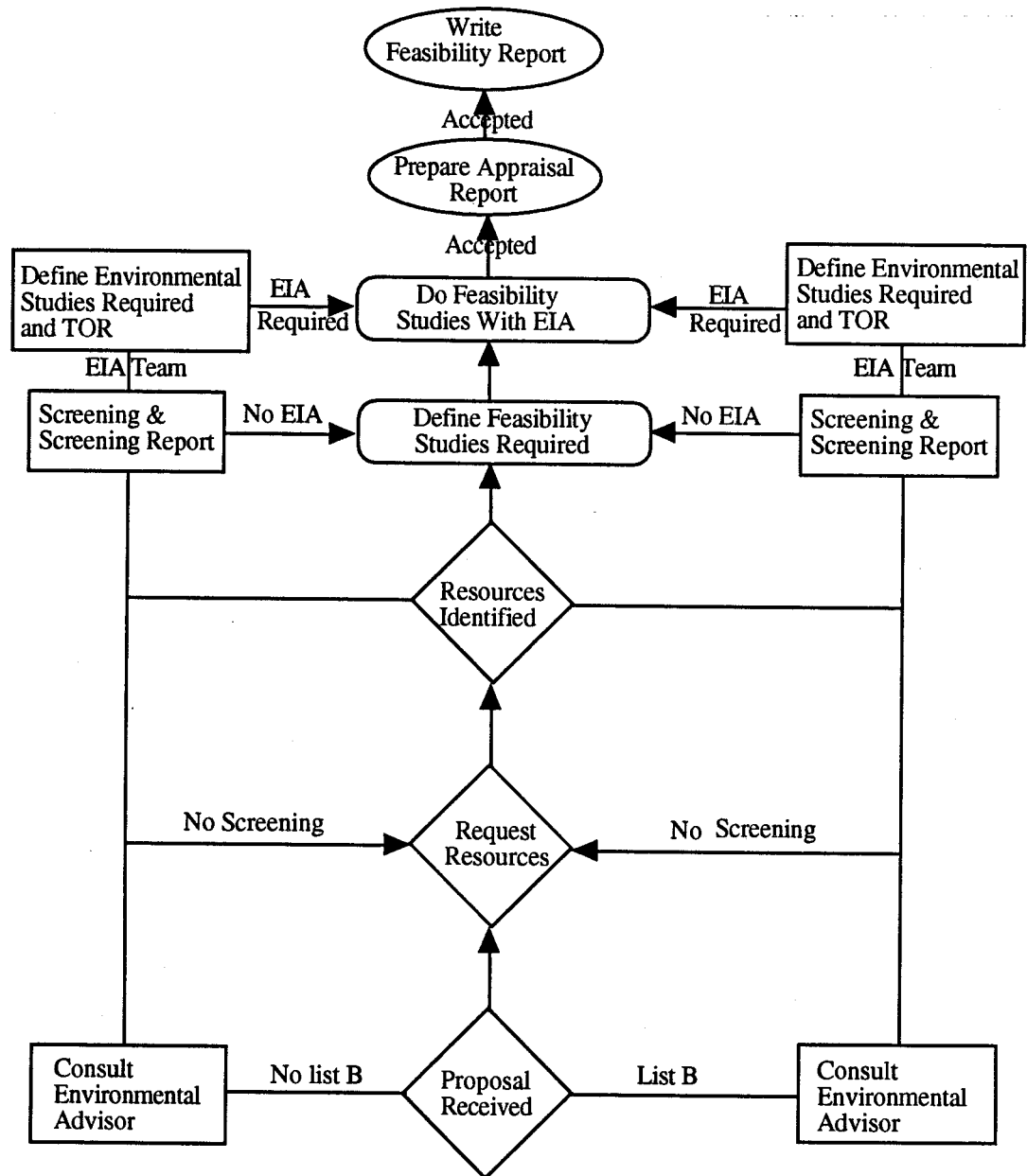
Over the years, increased international awareness of environmental problems has resulted in several efforts by CIDA to include EIA as a requirement for its approval process for project funding (CIDA 1992a). The Canadian Environmental Assessment Act does not however, mandate CIDA to adopt EIA as a decision tool to aid decisions about funding projects abroad.

In 1986, CIDA adopted its "Environment and Development" policy, and EIA became an important part of the bilateral project cycle and the industrial cooperation programme. The EIA framework of CIDA was an agreement with the government-wide EARP in response to the order-in council of June 1984.

On May 1st 1986, CIDA released a document that revealed it would include EIA in the approval process for project funding. A systematic environmental screening process for all bilateral projects was outlined in that document (CIDA 1986b). See figure 1 in the next page.

Figure 1

### Flow Chart of the EIA Component of CIDA's Project Approval Process



Also in 1986, CIDA developed a form of environmental assessment framework that followed the EARP guidelines of 1984. Mr. Robert Weir, the officer in charge of environmental impact assessment in CIDA's Environment Division in Ottawa, says that CIDA started screening its projects in 1984, using the EARP guidelines as a model (Weir 1991, Pers. Comm.).

In January 1992, CIDA released a new policy document which contained the following statement:

CIDA's policy is to integrate environmental considerations into decision-making and activities, and to work with its partners and developing countries at improving their capacity to promote environmentally sustainable development. (CIDA, 1992a. p.1).

The objectives for environmental sustainability, both general and operational apply to all CIDA branches and delivery channels (CIDA, 1986a; CIDA, 1992a).

CIDA acknowledges that before this policy, it worked in an *ad hoc* manner (CIDA, 1986a), and that its EIA has had a poor reception both in Canada and receiver countries compared with the EIAs of other government departments. Recognizing that by 1986 many bilateral and multilateral donors were already using the EIA process, CIDA (1986a) says that:

- "(a) The possible impacts on the environment will be considered up front when reviewing CIDA financing for any bilateral programme or project.
- (b) The production of full detailed environmental impact statements would be rare (only 32 for other federal government departments over a 10 year period) and the number requiring any assessment would be limited by screening of projects in accordance with procedures available from FEARO.
- (c) The project delays should not occur because of the environmental assessment, as other donors and other government departments' experience has been that environmental assessment is performed at an early planning stage and assessments developed concurrently. The framework developed by the CIDA working group, and approved by FEARO, incorporates the principles of parallel assessment and approval tracks.
- (d) Costs should not ordinarily be increased because of environmental assessments.
- (e) The likelihood of abandonment of projects due to environmental assessment is remote. Only three projects in Canada have failed to proceed, following a Cabinet decision, where the EIA process have resulted in major design changes." (CIDA, 1986).

These CIDA suggestions were to be implemented as follows:

- The EIA will be arranged by the branch involved with the project, with the help of the former professional division of CIDA and the consultants hired by CIDA;

- Reporting requirements of FEARO<sup>3</sup> are limited to projects with significant environmental problems;
- Where CIDA is funding a project with other donors, federal EARP is obligatory; and
- Equipment to be used in CIDA sponsored projects will meet Canadian environmental regulations (CIDA 1986b).

For multilateral funding, CIDA advocates and supports policies and procedures that ensure the use of EIA (CIDA 1992a).

Under the present Canadian Environmental Assessment Act:

- (i) Canadian international assistance will be subject to Canadian EIA law;
- (ii) The EIA will respect the sovereignty of the states getting Canadian assistance and be conducted in accordance with the principles and practices of international law;
- (iii) The EIA reports will be made available to the Canadian public;
- (iv) Canada will adopt the environmental assessment requirements of recipient countries and of other appropriate international and multilateral development institutions when they meet the basic goals and objectives of Canadian environmental policy;
- (v) Canada will encourage and assist developing countries to develop and implement an indigenous capacity for environmental assessment; and
- (vi) The model for public review of Canadian projects will be adapted to respect the foreign nature of projects (CIDA 1992a).

Despite CIDA's efforts to improve the ability of developing countries to manage their environments, criticisms of the current process have been frequent and strong. Scientific, political, and ethical concerns relating to the types of information included in an environmental impact statement and access of information by concerned parties have been cited (Fuggle 1988; Runnalls 1986; Rees 1988a ). Runnalls (1986) says CIDA has been one of the slowest of the bilateral agencies to act.

Rees (1988a), points out that, " While the role of people and communities affected by development in the EIA process is undefined, it could make a significant contribution not only to the quality of the EIA, but also to local environmental education and institution building."

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3. *FEARO guidelines are applicable in CIDA project cycle only by the recommendation of an environmental advisor, who will allocate the FEARO code.*

It seems that, regardless of the new environmental legislation in Canada, *ad hoc* CIDA's EIA approach will continue, since the act has not explicitly mandated EIA for CIDA's activities.

#### **2.4.1 CIDA's EIA Activities**

CIDA's project funding falls under three categories: bilateral, multilateral and the industrial cooperation programme. To guide its EIA activities for projects, CIDA relies on the work of a group of multi-disciplinary staff within its Environment Division and the existing environmental expertise within the recently abandoned Professional Services Branch. This group of experts is supported by additional environmental expertise from within the agency and others drawn from outside the agency in Canada and abroad. The Environment Division audits all environmental assessments carried out in CIDA's name (CIDA 1992c).

For technical guidance through various steps of EIA, CIDA relies on the work of consultants drawn mainly from Canada and the recipient country. The consultants follow the FEARO guidelines and guidelines adopted from the World Bank in their evaluation process. CIDA may invite observers to comment on the EIA results (CIDA 1992c and CIDA 1986c).

##### **2.4.1.1 CIDA's Bilateral Project Cycle EIA process**

CIDA's president after receiving a request for assistance to fund the construction or the feasibility study of a bilateral project, appoints a Project Team Leader (PTL). The PTL organizes a team consisting of a resource officer, to provide specialist knowledge to the team, write the terms of reference of the EIA study and hire consultants, and an environmental advisor. This team, with the help of the consultants, screens the project.

###### **2.4.1.1.1 Screening**

In CIDA's bilateral project cycle screening involves checking the project against an environmental checklist. The project team leader chosen by CIDA determines whether the project falls in any of the two lists.

List "A" includes: projects that are automatically excluded from further screening because they are perceived to have NO significant environmental impacts.<sup>4</sup>

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#### ***4. List "A" includes:***

- 1. Human resources development e.g. education, training, institution building;*
- 2. Human health e.g. - medical assistance;*
- 3. Food Aid; and*
- 4. Environmental Improvement/Protection,*

List "B" includes: projects that may have significant environmental effects and require further screening.<sup>5</sup>

In events where the project does not clearly fall under list A or B, the project team leader refers to a FEARO code<sup>6</sup> with the advice of an environmental expert.

- 
- *environmental education e.g. technical training in schools and universities, non governmental organizations, and in governments*
  - *institutional building e.g. environmental legislation and environmental agencies (CIDA 1986b).*

5. List "B" includes:

1. *Transportation projects; e.g. the construction of roads, railroads, bridges, pipelines, ports, canals, airports, and power lines.*
2. *Energy production projects; e.g. construction of hydroelectricity dams, biomass, peat, coal, oil and gas extraction, and nuclear development.*
3. *Waste management and domestic infrastructure; Waste resources infrastructure e.g. dams, transmission canals and pipelines, storage structures, tunnels, dykes and control structures, reservoirs. Water supply and sewerage e.g. water treatment plants, water transmission pipelines, reservoirs and storage facilities, distribution systems, sewerage lift stations and force mains, sewage treatment works, sewage and effluent disposal; Solid wastes disposal and pollution control works e.g. sanitary land fills, incinerators, composting facilities, transfer stations, hazardous waste storage and/or treatment.*
4. *Industrial services*
5. *Telecommunications*
6. *Non- renewable resource extraction e.g. mining, oil and gas, prospecting for resources.*
7. *Renewable resource development forestry e.g. harvesting and Transportation, processing, pest and weed control. Agriculture e.g. land clearing, drainage, irrigation, fertilization, mechanization, introduction of new species, plantations, pest control, processing of produce. Fisheries e.g. resource management, aquaculture/mariculture, processing/infrastructure.*
8. *Integrated regional development schemes*

6. FEARO code:

- 0 - *initial assessment or preliminary assessment starting; no decision made yet.*
- 1 *Automatically exclude proposal from study as a type that would not produce any adverse environmental effects.*
- 2 *Proceed with proposal because there are no significant adverse effects.*
- 3 *Proceed with the proposal because the potentially adverse impacts may be mitigated with known technology.*
- 4 *Assess the proposal in greater detail because adverse effects that might be caused by the proposal are unknown.*
- 5 *Give the proposal further study because the ability to mitigate adverse effects is unknown.*
- 6 *Refer the proposal to the Minister of the Environment for public review by a panel because the potential adverse impacts are significant.*
- 7 *Refer the proposal to the Minister of the Environment for public review by a panel because public concern about it is such that a review is desirable.*
- 8 *Automatically refer the proposal to the Minister of the Environment for public review as a type that potentially could produce significant effects.*
- 9 *Either modify the proposal and re-screen it or abandon the proposal because the impacts are unacceptable.*
- 10 *Production of an Environmental Impact Statement at request of the Canadian International Development Agency, because potential adverse impacts are significant.*

#### **2.4.1.1.2 Preliminary Assessment**

In CIDA's bilateral project cycle, if there are any environmental effects associated with the project documented in the screening report, or if the project has a FEARO code No. 3 or above, further definition of mitigation measures for known impacts are investigated in an initial impact assessment. CIDA then hires consultants to conduct detailed screening and initial impact assessment. The consultants choose the EIA study methods and techniques in consultation with CIDA's environmental advisor (Harland 1993, pers. comm.).

#### **2.4.1.1.3 Organization**

After a preliminary assessment, and the project team deems that a full EIA is needed, terms of reference for the full scale EIA, acceptable to both CIDA and the recipient country are prepared. The decision to conduct an EIA is reached by CIDA and the receiver country. Consultants are invited from the receiver country and from Canada to engage in a full scale EIA. Again the consultants choose their own techniques and processes of evaluation in consultation with CIDA's environmental advisor.

#### **2.4.1.1.4 Scoping**

After a decision has been made to submit a proposal (a project and its alternatives) to conduct a full scale EIA, the project team together with the consultants engage in a series of scoping workshops in Canada or in the receiver country or both, depending on the availability of data on the project.

#### **2.4.1.1.5 Full scale EIA Study Process**

As mentioned in chapter one, CIDA contracts all full scale EIA studies to consultants. The consultants may choose their own methodology of EIA, which follow guidelines provided by CIDA's Environment Division or those of the consultant's choice and are acceptable to CIDA and its partner

#### **2.4.1.2 EIA in CIDA-INC**

In CIDA's Industrial Cooperation Program, the proponent prepares a project proposal which outlines the work to be done using the terms of reference developed by CIDA in collaboration with the aid recipient. Applicants seeking financial support to promote Canadian industry abroad can get assistance from CIDA to prepare EIAs of major projects. The Canadian firm is either invited by a government abroad or goes abroad and seeks projects in which it can be involved. The firm can ask for funding for the EIA from CIDA.

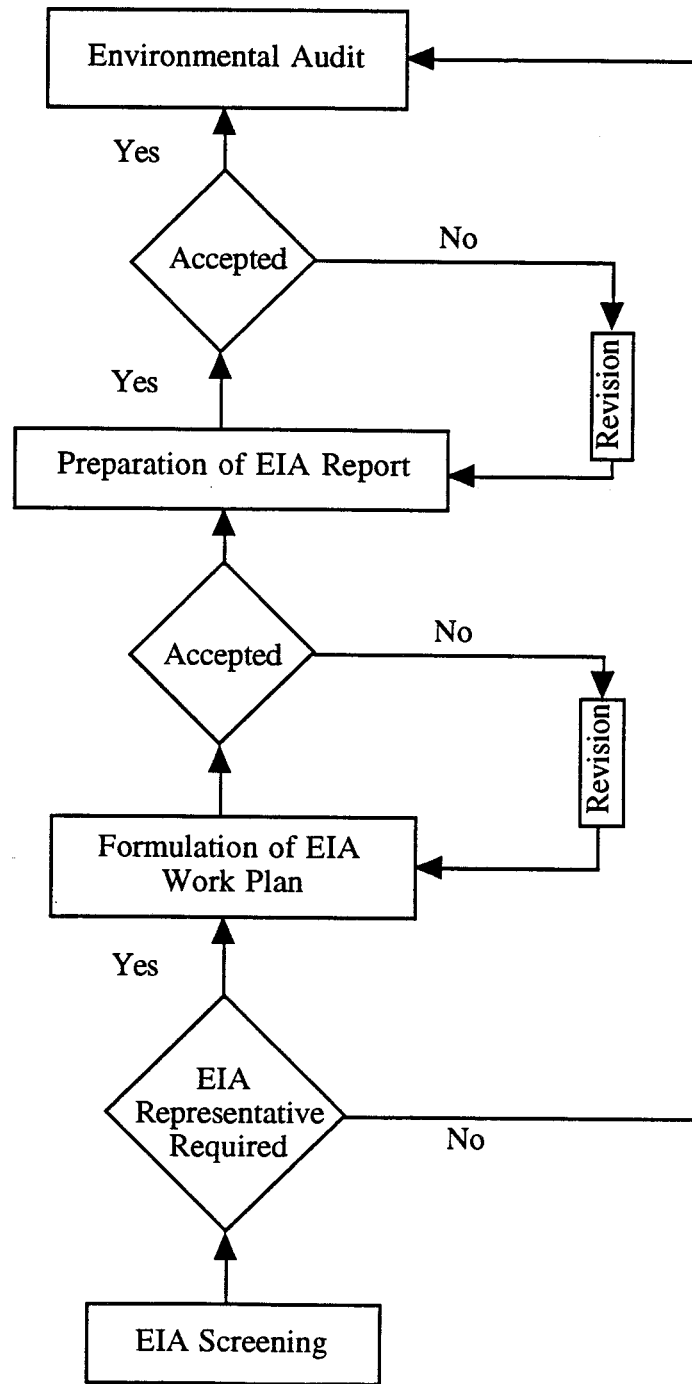
The responsibility for complying with Canadian environmental assessment legislation and regulation governing CIDA's environmental policy rests with the applicant (Harland 1993, Pers. Comm., CIDA 1992b). CIDA provides guiding principles for the EIA. These specify activities in relation to the overall Project Cycle. A flowchart of the EIA activities is given in the next page.

The proposal submitted when applying for funding should include the description of the environmental condition of the area in which the project is to located. The proposal is reviewed by the environment department which then advises the programme about the environmental implications of the proposal. The two cases of CIDA's approach to EIA found in Chapter Three are both sponsored via the Industrial Cooperation Program.



Figure 2.

Flow Chart of Environmental Assessment Activities in relation to the overall (CIDA-INC) Project Cycle  
Source: CIDA 1992



## **2.5 Set of criteria by which to judge the effectiveness of CIDA's EIA**

Section 2.3 of this chapter has given the structure of an ideal EIA process. On the basis of the discussion of an ideal EIA and CIDA's EIA process outlined in section 2.4, this section establishes fifteen criteria to judge the effectiveness of CIDA's EIA approach.

CIDA's approach to EIA should meet some elaborate criteria of effectiveness in order to be an orderly process with an achievable purpose, not merely consultants' works that are easily mistaken for environmental impact study.

Organizing an EIA process to meet these criteria is important because studies and CIDA's own admission have revealed that some development projects meant to improve the livelihood of people in developing countries, resulted instead in the deterioration of the natural environment in those countries. For example: flooding of arable land drove peasant farmers to less productive and fragile land which led to further environmental destruction; clearing of forests led to loss in bio-diversity; chemical manufacturing released toxic fumes to the environment and some times killed people who lived there.

The results of the judgment can be used to test the success and suitability of a specific EIA, with the hope of replicating the process in similar circumstances.

The criteria listed below are derived from various sources. They are grouped into four sets: CIDA's stated objectives for EIA, the social legitimacy of EIA, technical and procedural legitimacy of EIA, and political legitimacy of EIA. An ideal EIA would meet all criteria.

### **2.5.1 In terms of CIDA's stated objectives for EIA process**

The criteria in this set are derived from CIDA's policies and strategies. For example, CIDA's 1992 policy document stated that environmental considerations will be integrated into decision-making and activities, including EIA as part of the process used to decide whether to fund a project or not. Therefore EIA should result in:

1. effective recommendations to aid decision-makers in making decisions that will take into account the environmental implications of a development project so that a balance between economic development and maintenance of good environmental quality may be achieved. Like economic analysis and engineering feasibility studies, EIA is used as a management tool for officials and managers who must make important decisions about major development projects. Choices between

development and preservation of pristine natural areas are among today's most controversial decisions. Authorities with responsibility for such decisions and the public are confronted with what appears to be sharply conflicting stories about the economic impacts, environmental effects, and social implications of leading land-use options for example, timber harvesting and preservation of bio-diversity (Keeny and Gregory 1992). That is more so in the developing countries where the dream of achieving the standard of living of the western industrialized countries is driving the less developed countries into tough decisions. EIA should therefore, help both CIDA and the countries receiving CIDA's aid to reach decisions that are beneficial to both the environment and the economies of those countries.

2. a thorough analysis of the effects of projects and programmes on the quality of the environment with focus on sustainable resource use including directly related social impacts (CIDA 1986). The present rate of resource use by all the nations of the world poses a threat to the health of the environment and of humanity. Thorough analysis of the effects of projects and programmes on the quality of the environment would aid decisions on resource use.
3. the incorporation of effective mitigation measures in the project design to make those project environmentally acceptable (CIDA 1986). EIA should not be just a requirement to fulfill a legal mandate or complete a process.
4. a promotion of research development efforts which lead to technologies that economize on energy and resources and limit impacts on the environment (Rees 1988). Again, due to limited resources and energy, EIA results can trigger comprehensive research on resource use.
5. environmental and related development training for community groups in developing countries. CIDA has a training programme for professionals from developing countries and research funds for various institutions that study Third World development. Those programmes should be expanded to include training in EIA techniques. Results of an EIA should be able to set the basis of training for community groups, that would otherwise not benefit from CIDA's training programme.

### **2.5.2 In terms of Social legitimacy of EIA**

6. EIA studies should include the participation of the people affected by the proposed project or programme. The EIA studies of the western industrialized countries benefit from the contribution of public involvement. Likewise, the EIA studies of CIDA funded projects should use the rich knowledge of indigenous people, who will benefit or negatively be affected by a project or programme.
7. The environmental impact reports must indicate the interests and preferences of the affected community.
8. The requirement to conduct an EIA must be considered a path to achieving an end (decision) rather than an end in itself.
9. The EIA study must serve the best interest of the community that will be affected by the project, judged in terms of benefits (especially immediate benefits like compensation for lost property) to those communities. It is not surprising that the concept of EIA that has found acceptance in the industrialized world has not been adopted in the developing countries that lack some, if not all, of the values and traditions that generate the plea to assess the environmental impacts of development projects. "In circumstances where the basic human needs of food, shelter and security are under stress, people do not perceive humans as posing a threat to the environment but view the environment as posing a threat to them. Demand is for utilization and intense exploitation of the living earth for its resources. Aesthetic, scientific, educational and future needs are considered unaffordable" (Minister of Environment, India 1992). There is little social pressure or political will (at government level) to introduce EIA into countries where significant numbers of the population are poor and illiterate.

### **2.5.3 In terms of technical and procedural legitimacy**

10. Decisions as a result of an EIA should explicitly account for impacts identified or concerns raised in the EIA process through for example design changes, fair compensation or other forms of mitigation including abandonment of the project should there be highly controversial issues raised in the EIA.

11. The EIA study must not leave the public out of the process of decisions that would affect them.  
Some governments of developing countries do not have the mandate of their people to govern, therefore consider their people as a threat to the government. It is not acceptable that the people are left out of all decisions that affect them. CIDA has a chance, through the EIA process to give voice to the people.
12. Legal instruments for the EIA should be the rule. Where the EIAs have been undertaken in the developing world, there are often no legal requirements or administrative mechanism to ensure that the recommendations of an assessment are implemented (Duffy 1992, pers. comm.). Governments of the developing world have allowed the implementation of environmental assessment recommendations of development projects either as a fulfillment of the government's own legislation, or because it was a requirement of major international funding agencies. Developers investing in the developing countries know that their projects are unlikely to be refused authorization on environmental grounds and so they view the EIA as a marginally relevant and time consuming exercise.
13. EIA processes should improve the database and educational opportunities of the aid donors and receivers alike. There is shortage of information on the ecology and social structures in the developing countries and expertise to conduct the EIA.
14. EIA should be affordable. It should allow the recipient country to contribute the bulk of the financial resources to conduct the study. That will ensure that the process will be continued even after the aid ceases.

#### **2.5.4 In terms of Political legitimacy**

15. EIA procedures should be clearly understood by the countries receiving aid or else those countries will perceive them as a western bias that denies them economic development in exchange for environmental protection. The social needs and values of people in developing countries are changing according to the WCED (1987), to give rise to widespread support for policies aimed at economic growth. Industrial and infrastructure development is imperative to improve the standards of living. Consequently, environmental analyses, or any other procedures thought to be sacrificing

development in favour of environmental protection, are unlikely to be countenanced. This does not imply that citizens of developing countries are not concerned about environmental matters. Their concerns are real but take second place to meeting the basic needs of food, shelter and acceptance. The perceived need by governments of the Third World countries backed by international organizations like the World Bank is for an improved quality of life through environmental exploitation, not for an improved quality of life through environmental conservation (Hill and Fuggle, 1988).

## **CHAPTER THREE**

### **THE EIA CASE STUDIES OF THE THREE GORGES DAM AND MAE MOH POWER PLANT**

To judge the effectiveness of CIDA's approach to EIA, two cases, the Three Gorges Dam project in China and the Mae Moh Power Generation Project in Thailand were examined for this study. The EIA of these cases studied exemplify CIDA's approach to EIA. The effectiveness of these EIAs was judged by contrasting the results of these studies with the evaluation criteria listed in chapter two. As stated in the limitation of the thesis, available information no other EIA in which CIDA was involved could not be released. That information was protected by CIDA's non-access policy. The opportunity to contrast many cases was missed.

The EIAs of the two cases studied were prepared by private consultants through CIDA's Industrial Cooperation Program (CIDA-INC). As stated in chapter one, CIDA-INC is designed to promote Canadian industry abroad. Canadian industry and resource companies can be sponsored by CIDA through this programme to seek markets for their products abroad. Where the activity abroad involves a project that requires the preparation of an environmental impact report, the firm consults with the recipient country and prepares an estimate cost of the EIA. The estimate goes to CIDA-INC with the rest of the project proposal for approval. CIDA-INC can sponsor the EIA study even though CIDA may not be involved in funding the construction of the project.

#### **3.1 The EIA of the Three Gorges Dam Project**

##### **3.1.1 Background and Geographical setting**

It is important to know that CIDA has not confirmed whether it will fund the construction of the Three Gorges Dam Project (Weir, 1991. Pers. Comm.). Other donor agencies like the World Bank, and the Japanese ODA are likely to fund the construction stage (Probe International, 1990). CIDA funded the feasibility study that was conducted by a Canadian consortium made up of two government power companies and consulting firms.

The proposed Three Gorges Dam on the Yangtze river, the third largest river in the world and one of the two longest rivers in China, will be the world's largest dam if it is built. Located 45 km up stream of Yichang (see map Figure 3), the dam would create a 500 km to 700 km long reservoir upstream of the Three Gorges, depending on the height (head) of the dam selected. The proposed heights (heads) range from 150 m to 185 m (Probe International, 1990).

Since the 1950's, there has been a plan to dam the river at the Three Gorges to satisfy the objectives of: electricity production, flood control, and a regulated river discharge.

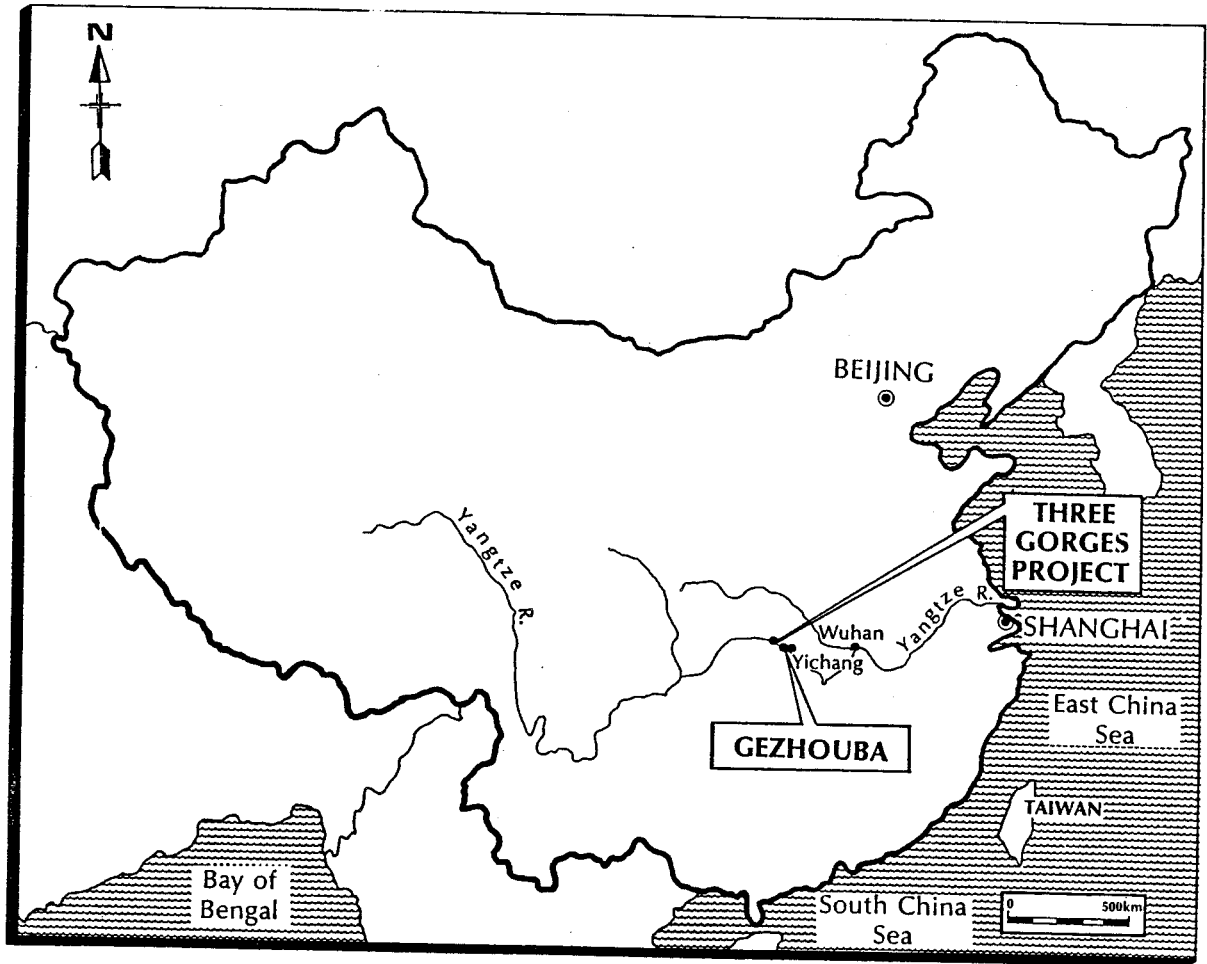
The last goal will improve navigation and allow larger ships of 10,000 tons to reach further in land (see map Figure 3). It is claimed that fish production and irrigation would improve, and 1675 to 1768 Megawatts of electricity will be generated by the dam annually. This capacity would exceed the capacity of any single existing power station in the world (CYJV 1988; Macmillan 1989).



Figure 3.

Map of China showing the Three Gorges.

Source: CYJV, 1987.



The Yangtze Valley Planning Office (YVPO) completed a Feasibility Study recommending a 175 metre high dam with a 150 metre reservoir level to be constructed starting in 1986.

In 1986, CIDA arranged with China's Ministry of Water Resources and Electricity Power to finance a feasibility study to be conducted by a Canadian Consortium. The consortium known as CIPM Yangtze Joint Venture (CYJV), which included three private companies, Acres International, SNC and Lavalin International, and two state-owned utilities, Hydro-Quebec International and British Columbia Hydro International was formed. Their involvement, according to the CYJV, was to provide input to the Chinese Government's decision-making process.

A steering committee including representatives from CIDA, World Bank, and the Chinese Ministry of Water Resources and Electricity Power was formed to supervise the feasibility study. The World Bank also assembled ten experts, five of whom were from China and the rest drawn from Canada, US and France into an international panel of experts whose role was "to evaluate the study and ensure that it met high standards of international practice for such kind of studies." (Probe International, 1990).

### **3.1.2 Legal and Regulatory Context of EIA in China**

Environmental protection laws and regulations have been adapted by the Chinese State Council and various ministries. Some of these regulations are listed below chronologically.

- Regulation concerning the propagation and conservation of aquatic resources (1957, 1979)
- The environmental protection law of the PRC (1979)
- National Forestry law (1979)
- Wildlife policy act (1980)
- Regulation on environmental assessment and impact statements of water resource projects (MWREP - 1982)
- Regulation on land requisition for state construction (1984)
- Water pollution and control law of the PRC (1984)
- Regulation on environmental protection for development projects (1985)
- Law of land management (1986)

The "regulation on environmental protection for development projects (1985)" requires that an EIA be prepared for the Three Gorges Projects. The EIA must meet the guidelines of the Chinese National Environmental Protection Agency and be approved by the state council.

### **3.1.3 Stages of EIA by YVPO**

One of the mandates of the Three Gorges Dam Project Feasibility Study is to address the issues of environmental impacts. CYJV reviewed all the Three Gorges environmental impact data supplied by the YVPO, and the EIA report produced by YVPO, to present the results of an independent review.

The Environmental Assessment Processes of the Three Gorges Dam Project by YVPO went through roughly four stages.

#### **Stage 1.**

The Chinese government undertook a comprehensive planning of the Yangtze basin in the 1950's. The study included a basin wide research and preliminary analysis of a wide array of issues; from sedimentation, resettlement, fish communities, and water related epidemic diseases.

#### **Stage 2.**

At the end of the 1970's, YVPO researched the Three Gorges area and released a preliminary environmental statement for a 200 metre high normal-pool-level (NPL) scheme in 1981. The main issues addressed then were: reservoir inundation, fisheries, water related epidemic diseases and downstream hydrological modification, particularly at the estuary.

#### **Stage 3.**

In the 1980's, emphasis shifted to dams with lower NPLs.

#### **Stage 4.**

In 1983 the YVPO completed a feasibility report for a 150 metre NPL scheme.

### **3.1.4 The EIA activities of CYJV**

The EIA activities of CYJV examined here are those, after 1983, when the YVPO had completed an EIA that recommended a 150 metre NPL scheme. According to the CYJV, the Canadian involvement was to "assist the Chinese in undertaking an independent study, to international standards, of the Three Gorges Project," while the

Chinese wanted an independent review of their accumulated data and analysis, using world-class techniques (CYJV 1988).

CYJV recruited a few Chinese from YVPO and used environmental data collected by the Chinese over the years. The project area encompassed a broad range of physical, biological and socioeconomic phenomena.

The Chinese government (YVPO) according to CYJV, had accomplished the goal of:

- comprehensiveness (where a complete range of biological, physical and socioeconomic factors were considered plus all potential impacts);
- depth (significant environmental impacts were dealt with in a manner that permitted qualitative and quantitative evaluation of the impacts); and
- completeness (the information analyzed permitted an evaluation of significant impacts locally, nationally and internationally (CYJV 1988).

Activities related to the CYJV EIA review were broken down into four phases:

1) Inception Phase;

In the inception stage, the following took place:

- Initial scoping and collection of data documented in an inception report;
- Redefinition of the study mandate and programme; and
- A project overview meeting held in Montreal Canada.

2) Concept Phase;

In the concept state, the following took place:

- Preliminary compilation of data and assessment of feasibility issues to distinguish between NPL's documented in a concept report which oriented the projects concept. All these were reviewed in a meeting in Wuhan, China.

3) Assessment Phase;

In the assessment phase the following took place:

- preparation of a comprehensive review of existing YVPO EIA studies, assessment of impacts from available data to contrast YVPO's assessment, and presentation of an integrated evaluation of the various schemes including the CYJV-recommended project at a meeting in Beijing, China.

#### 4. Documentation Phase;

In the documentation phase, the following took place:

- preparation of comprehensive environmental review of the feasibility of the Three Gorges Project in a Feasibility Study Report reviewed at a meeting held in Montreal, Canada.

##### **3.1.4.1 The Data acquisition by CYJV**

CYJV characterized the existing environment within the Three Gorges study areas on the basis of information already made available by YVPO. CYJV did not carry a comprehensive field study. To confirm what the Chinese government has gathered, CYJV did a general reconnaissance of the study area by boat and by interpretation of high altitude air photography (CYJV 1988).

CYJV assembled data throughout the first three phases of the EIA (inception, concept and review). In the Inception phase CYJV acquired and reviewed information already available from a variety of international sources, including libraries, specialized research institutes, government agencies and international conservation groups. The information contained in the EIA report prepared by YVPO was used as baseline data (CYJV 1988).

In the Concept phase, discovery measures focused on the acquisition of additional published data available only from Chinese specialists and from departments already involved in EIA in China. The characterization of existing environment was completed during the Review and Assessment phase. At the request of the Chinese government a number of Chinese worked in Canada for periods up to two months, to acquire what the Chinese government referred to as world-class techniques.

Details of CYJV's data acquisition were documented in a working paper (CYJV 1988), which provided information with regard to data requests by CYJV and response thereto, by YVPO, field mission programmes and the feasibility reports.

##### **3.1.4.2 The Identification of Potential Impacts (Scoping) by CYJV**

Early in the first phase of the CYJV's environmental review, a multi-disciplinary scoping process was initiated to identify a broad range of key environmental concerns, data requirements and constraints. The goal of the process was to rapidly focus efforts of the study team on potential key issues.

Scoping was carried out by Chinese and Canadian environmental specialists, world experts in specific fields and project engineers. The process resulted in the identification of environmental components and parameters

likely to be affected by the project. A checklist of project activities most likely to have environmental implications was prepared. The scoping exercise led to preparation of the preliminary EIA matrix which identified cause/effect relationships.

For details, the scoping process further focused the reviews and assessment within specific fields. Environmental components were factored into basic parameters (for example, water quality was subdivided into nine different parameters and endangered species into individual species). Insignificant project/environment interaction according to the scoping exercise were left out.

The approach resulted in a summary matrix for each discipline.

Table 3.

Scoping Matrix used by CYJV. Source: CYJV, 1988

[illegible]

#### **3.1.4.3 The Evaluation of Impact significance by CYJV**

The first step in the evaluation of impact significance was to review the basis for YVPO's prediction of magnitude of anticipated changes to the key environmental components. CYJV reviewed available documents concerning each potential environmental issue identified during the scoping exercise, and the approach taken by YVPO to determining the important environmental components.

The environmental components studied were:

1. Physical Environment (hydrology, micro climate and sediment levels).
2. Water Quality (turbidity, metal concentration in fish and pollution dispersion).
3. Aquatic environment (catch fishery, aqua culture, Yangtze sturgeon, Chinese dolphin, and Chinese Alligator, Poyang and Dong-ting lakes habitats and reserves, reservoir tributary valleys, and the environmental quality of the basin at large).
4. Environmental Geology (erosion and soil instability).
5. Socioeconomic environment (population, land, economic activities and structures around the reservoir area, water bone diseases, landscape, cultural heritage, construction activities, and impacts in the downstream area).
6. Environmental Management (institutional and environmental protection) (CYJV 1988).

A summary of the concerns, conclusions and recommendations on the various components of the parameters are found in the next section.

The second step in the evaluation of impact significance was the look at the resettlement of the population that will be affected by the project. CYJV took the model of resettlement produced by YVPO to assess the quality of the land for agriculture for the relocated people, the dispersal and division of villages, and the issue of "minority areas" (One of the resettlement sites belongs to a minority ethnic group, which for years had been badly treated by the Chinese government according to Probe International 1990).

#### **3.1.4.4 Documentation (final Report) by CYJV**

The CYJV organized the Three Gorges Project Feasibility study into a report consisting of 11 volumes. The EIA report is Volume 8. The preface of volume 8 contained a summary of environmental setting, mandate and scope of work, review of alternative schemes, review of the YVPO EIA, assessment of cost feasibility and recommendations.



### **3.1.5 The summary of CYJV's concerns, conclusions and recommendations**

The highlights of the CYJV concerns were as follows:

1. Concerns about the Physical environment (including hydrological modification, climatic change and sedimentation).

Conclusions:

- Flows downstream will be reduced significantly in the months of October; Flows will vary during peak operations in winter and there will be cumulative effects of hydrological modification over the long term; There will not be significant climate change; Patterns of aggradation and degradation down stream are insufficiently understood and magnitude of effects on estuary dynamics is unknown.

Recommendations:

- Review characteristics of water storage, duration and time of occurrence of draw-down and filling, assess possibility of increasing October flows; Assess effects of significant daily fluctuations; Monitor to validate predictions; Monitor changes down stream and in the estuary and complete ongoing studies.
2. Water quality concerns, including turbidity and heavy metal contamination of fish, and pollution dispersion.

Conclusions:

- Water quality is only a potential problem in tributaries and appropriate mitigation is required for pollution dispersion for reservoirs.

Recommendations:

- Map and analyze flooded soils, model thermal regime before and after analysis and monitor bio-magnificiable pollutants in fish; Model to quantify effects of pollution dispersion and optimize cost, implement mitigation and treat waste water.
3. Aquatic environment concern, including Yangtze Sturgeon, Chinese Sturgeon, Chinese dolphin.

Conclusions:

- Fish catch is enhanced in reservoirs and gas supersaturation is problematic to catch fishery and flows change from April to June; There will be loss of fry for aqua-culture, but enhancement is possibility; Yangtze Sturgeons will adapt to reservoir although their spawning sites are unknown, There is a possible habitat degradation for

Chinese dolphins and natural spawning success, and reduced October flows are during spawning seasons for Chinese Sturgeons.

Recommendations:

- Establish integrated management and stocking programme; Review analogous situations and tolerance in fish; Develop and integrate existing programmes in the estuary and reestablish mitigations; Select and evaluate sites, determine feasibility of cage/cove culture, conduct basic research on birds and locate their spawning areas; Assess dolphin sites, implement mitigation and compensation for dolphin loss and upgrade all stocking programmes.
- 4. Terrestrial environment, including Siberian Crane, Chinese alligator, Poyang & Dong-ting Lakes habitat and reserves, reservoir tributary valleys, and environmental quality.

Conclusions:

- Magnitude of effects on cranes' habitat unknown; There is possible enhancement of alligator habitat; The magnitude of effects on the lakes and reservoir is unknown. The lakes support commercial fishery; The tributary valleys are less disturbed than the main valley.

Recommendations:

- Detailed evaluation of potential impact on cranes, implement alligator programme enhancement, protect cranes, develop reservoir management programmes, study tributary habitats and use, map environmentally sensitive areas and develop long term management programmes.
- 5. Environmental geology, including erosion and soil instability.

Conclusions:

- Erosion is only locally problematic and specific data on erosion sites is lacking. Instability of mitigation is feasible.

Recommendations:

- Site specific studies of proposed resettlement areas to determine appropriate erosion mitigation.
- 6. Socio-economic environment, including: population, land economics, water borne diseases, landscape, cultural heritage, construction activities, and impacts in downstream areas.

#### Conclusions:

- Population, land economic activities and structures in the reservoir area are the most significant environmental impacts. Environmental feasibility is linked to feasibility of resettlement, the main issues being: land availability, definition of host areas and industrial job creation, waterborne diseases namely, schistosomiasis and oncomelania snails are not likely to be introduced in the reservoir areas, and temporary increase in malaria and encephalitis is expected, canyon effect will diminish and changes to fjord-like conditions on the landscape will occur. Long term tourist potential will be reduced and cultural heritage will be inundated (valuable cultural heritage dating back to the earliest period of Chinese history). Construction activities, if properly planned will significantly benefit the surrounding area and Yichang City; and the down stream areas will have better flood protection and better opportunities for retailing local investments.

#### Recommendations:

- Resettlement planning at a detailed level should continue. Social impacts should be assessed and specific plans prepared. A separate organization to coordinate planning and implementation of resettlement should be established. Establish a medical advisory panel to link the project to public health networks; implement preventive measures to combat disease, supply drinking water and treat waste water. Conduct a comprehensive landscape visual impact analysis, develop access to scenic areas and relocate affected cultural features. Complete studies carried out to date on cultural heritage and determine resettlement and development planning.
7. Environmental Management including institutions, and environmental protection.

#### Conclusions:

- Institutional have overlapping responsibilities. A comprehensive plan for environmental protection and coordination with resettlement is required.

#### Recommendations:

- Clarify organizational arrangements, responsibilities and institutional jurisdictions. Establish an environment department, develop a long term environmental protection plan and policy. Provide an adequate environmental budget and establish an environmental advisory board.

### 3.1.6 Summary

The Chinese government wanted an independent review of their data and analysis using what they called world-class techniques (CIDA November, 1992c Press release). This review was an assessment carried out to determine, according to CIDA (1992), whether and how project's goals can be attained in an acceptable manner; in this case acceptable to the governments such as Japan and Canada and organizations such as the World Bank and the Asian Development Bank, which are likely to fund the project. This follows the World Bank's incorporation of strict criteria for environmental protection and human resettlement into its standards of judgment for financing development projects. The term the World Bank uses is "Bankable feasibility study" for a study of this nature, done to determine acceptability to world financial institutions; environmental and resettlement assessments are integral parts of such assessment (World Bank Department of Environment 1991).

CIDA, for its part, aided Canadian firms with development interest in the Three Gorges Dam project by funding its feasibility study. A final decision about the project has not been made. Consequently, the EIA by CYJV will not be expected to be a factor in the decision on whether the Three Gorges Dam project will go ahead or not. That decision has already been made by the Chinese government. It is only a matter of time when the construction will commence. However, the analysis of YVPO's data identified potential impacts as a result of the construction and operation of the Dam on the aquatic and terrestrial environment, and environment geology. CYJV defined the status of these resources and recommended remedies required to preserve them during the construction and operation of the Dam.

CYJV, according to Probe International (1990), analyzed the potential impacts of the project to a degree acceptable by the team of observers assembled by the World Bank. CYJV's EIA report included suggested mitigation measures for: pollution dispersion, geological instability, and aquaculture. It recommended the implementation of those measures in a just, timely and cost effective manner.

CYJV recommended that the Chinese government establish a project Environment Department within the Three Gorges Proponent Organization. Such a department could implement the project plan to enhance further research and compensation, and resource management programmes in the long term. The research proposed was not geared to technologies that economize on energy and resources, but rather to fulfill the objective of controlling the Yangtze river floods and to provide transportation and hydroelectricity.

The department's effectiveness depends on the commitment of the decision-makers in implementing the recommendations of the EIA. It is unclear at this point what the Chinese government would do.

The EIA of the Three Gorges Dam did not create too many additional training opportunities for the local community. However, the representatives of the Chinese Communist Party and workers at the Yangtze Valley Planning Office gathered data and some attended EIA workshop meetings in Montreal, Canada, and Beijing and Wuhan in China. These were not people whose lives were to be directly impacted by the project.

CYJV did not report any participation by the local population in the EIA process, even though YVPO estimated that the reservoir will encompass 610 townships. The local people consulted were Communist Party representatives.

The plans for the resettlement programme were termed as one of the best organized in the world (CYJV 1988). However, there was concern about moving ethnic minorities to other places against their will (Goodland 1989).

The EIA of the Three Gorges Dam was clearly designed to achieve a preconceived conclusion. Its objective was not to study the environmental impacts of the activities and operation, but rather to formulate a "bankable feasibility study" for China and promote Canadian utility companies and consulting firms in China.

### **3.2 EIA of the Mae Moh Mine and Power Plant Expansion**

#### **3.2.1 Background and the Geographical setting**

The Mae Moh power generation project is located in the Mae Moh Basin, 25 km east of the City of Lampang in the northern region of Thailand (see the Map; Figure 4). At the time of the EIA, there was a large open pit lignite mine, and nine operating lignite-fired generating units on the site, with a capacity of 1,425 MW. Two more units were being considered by the Thai government at the time of the EIA, which included a provision for additional water supply for the two units. Investigations of the lignite confirmed that the reserves were sufficient to warrant increasing the power generation beyond 11 units (nine existing and two under construction), with total capacity of 2,025 MW.

In July of 1990, the Thai government decided to construct two additional 300 MW units, bringing the total to 13. In November of that year, the Thai government confirmed that eight additional 300 MW units will be built and that the extension will be called the Lampang Plant. This would bring the total electricity generating capacity of

the Mae Moh Power Plant and the new Lampang Power Plant to 5025 MW by the year 2002. The Thai government would gradually decommission the power generation as the economically viable lignite will be depleted by the year 2027.

### **3.2.2 The Lampang EIA Consultants and Financiers**

The Electricity Generating Authority of Thailand (EGAT) invited a consortium of companies, to undertake a study comprising an Environmental Impact Assessment of the Lampang Project. These companies included: SCHULTZ International Limited (SCHULTZ), Environmental and Social Systems Analysts Ltd. (ESSA) of Canada, and TEAM Consulting Engineers Co., Ltd. of Thailand, referred in the thesis as The Lampang EIA Team (LET). The funding for the EIA was provided jointly by the CIDA and EGAT.



Table 5.

Variation in total generating capacity at the Mae Moh and Lampang site over time.

Year	Mae Moh Plants		Lampang Plant	Total
	M.M. "A"	M.M. "B"		Capacity
	MW	MW	MW	MW
1990	225	1050		1275
1991	225	1350		1575
1992	225	1650		1875
1993	225	1800		2025
1994	225	1800		2025
1995	225	2100	300	2625
1996	225	2400	750	3375
1997	225	2400	1050	3675
1998	225	2400	1200	3825
1999	225	2400	1350	3975
2000	225	2400	1500	4125
2001	225	2400	1950	4575
2002	225	2400	2400	5025
2003	225	2400	2400	5025
2004	225	2400	2400	5025
2005	225	2400	2400	5025
2006	112	2400	2400	4912
2007	---	2400	2400	4800
2008		2400	2400	4800
2009		2175	2400	4575
2010		1875	2400	4275
2011		1800	2400	4200
2012		1800	2400	4200
2013		1800	2400	4200
2014		1650	2400	4050
2015		1350	2400	3750
2016		1050	2400	3450
2017		750	2400	3150
2018		600	2400	3000
2019		600	2400	3000
2020		300	2100	2400
2021		---	1650	1650
2022			1350	1350
2023			1200	1200
2024			1050	1050
2025			900	900
2026			450	450
2027			---	---



### **3.2.3 Legislation**

In Thailand, under section 17 of the National Environmental Quality Act (NEQA) of 1975, as amended in 1978, the Ministry of Science/Technology and Energy has the power to issue notification to proponents of projects which are required to submit an EIA. A specific regulation issued under the Improvement and Conservation of National Environmental Quality Act demanded that EIA be conducted for any dam with a storage capacity of greater than 100 mega cubic metres or has reservoir surface area greater than 15 km<sup>2</sup>, or any thermal power plant with generating capacity over 10 MW (LET 1991).

To obtain approval for project implementation from the government, the engineering and economic feasibility study must be accompanied by an environmental impact assessment and mitigation plan.

The environmental impact evaluation division of the National Environment Board is responsible for administration of the EIA process. It has published guidelines for preparation of environmental impact evaluation. The manual includes general guidelines for preparation of environmental impact reports, supplemental guidelines for specific project categories, initial examination guidelines for specific project categories, and EIA's terms of reference guidelines (LET 1991).

### **3.2.4 Objectives of the EIA**

The terms of reference of the study agreed to by CIDA and EGAT were related to the objectives of the study, the scope of work, identification evaluation and mitigation measures. The terms of reference required that an implementation plan for the recommendations of the EIA study and an environmental monitoring plan be designed.

According to the terms of reference, the main objectives of the EIA were to identify the significant environmental impacts and to recommend mitigation measures. To achieve these within time and budgetary constraints, CIDA and the Environmental Impact Evaluation Division agreed that the study would focus on the following:

- 1 Preparation of an environmental assessment report responsive to the requirements of the relevant government agencies and considerate of public concern over the proposed project;
- 2 maximizing use of existing environmental documentation and monitoring data generated for existing facility;
- 3 the effort would be to concentrate on the most sensitive environmental issues; and

- 4 the detailed study of environmental impact assessment and mitigation options would be limited to those management issues of greatest concern (LET 1991).

### **3.2.5 Scope of Work**

Based on the characterization of the baseline environment and the project description, the impacts of the project construction and operation on the existing environment were identified. Impacts were judged by their degree of severity and examined in the context of the specific circumstances of the site. The consultants worked with EGAT to establish evaluation methods, such as those of the Office of National Environment Board and those suggested by the World Bank Guidelines (LET 1991).

Specific analysis included air dispersion modeling to determine the capacity of the atmosphere in the area to disperse emissions, as well as water quality modeling to determine the impacts of both chemical and thermal discharges to the streams on the aquatic biota and predict impacts to the area's hydrologic budget.

Models were developed for impacts on land resources, water resources, socioeconomic conditions, site ecology and archeology as well as other human use values. The relationships between socioeconomic issues and physical environment issues were addressed; dealing specifically with the competition between the project and area agricultural activities for land and limited water resources available. The effects of site location on air quality and potential resettlement activities were evaluated.

The team of consultants identified alternative sites for the project and potential mitigation measures during the development of the project description. The relative merits and drawbacks of each alternative were described. The team chose Mae Moh Mine, Mae Wang Valley water supply/storage, Mae Moh water supply/storage and Mae Moh and Lampang Power Plan sites for the detailed EIA.

The consultants drew plans to continually characterize project emissions and effluents during the construction as well as later in the operation of the project. Particular emphasis was placed on air and water quality monitoring.

### **3.2.6 The EIA Study Activities and Methods**

The study was formally initiated on November 1, 1989. On November 23-24 of 1989, an initial scoping workshop was held which included members of the study team from SCHULTZ, ESSA, TEAM Consultants and EGAT counterparts. The assessment of environmental effects related to the construction and operation of the

Lampang project was conducted by a multi-disciplinary team of specialists. The study team comprised of specialists in: air quality, water quality, aquatic biology, fisheries, soils, forestry, land use, archeology, public health, socioeconomics, resettlement planning, power plant engineering, mining engineering, mine waste, water management, environmental impact assessment and environmental management.

The next major activity was a workshop in Lampang (see figure 4) on February 19-21, 1990. The objective of this workshop was to conduct the environmental "screening of the effects" induced by the project activities on the resources values in the project area, and to define the major environmental impacts caused by construction and/or operation of the project. The main basis of the approach was the concept of impact hypotheses (a collection of statements that connect development activities with their potential environmental effects on valued ecosystem components).

Valued ecosystem components are defined as resources or environmental features that:

- are important to the local population; or
- have national or international significance; and
- if altered from their existing status, will be important in evaluating the impacts of development and in focusing management or regulatory policy.

This approach referred to as an integrated or "systems" approach is interdisciplinary, aimed towards defining each impact hypothesis and reaching consensus by the study team members on the important issues.

#### **3.2.6.1 Workshops**

The study team set the first workshop on February 19-21, 1990 at Mae Moh Power Plant complex in Lampang province, to discuss and define the major environmental impact hypothesis.

The objectives of the workshop were to:

1. Develop an integrated framework representing the major impacts of the Mae Moh Plant expansion and the Lampang development on the resources of the area.
2. Assess the adequacy of existing information.
3. Identify additional information needs for the project.

The workshop tasks were:

1. Review of each of the construction and operation activities of the existing project and the purpose of the expansion.
2. Identification of the environmental impact issues associated with physical, ecological, human use, and quality of life resource values.
3. Definition of all environmental impact hypothesis
4. Discussion and determination of valid environmental impact hypotheses.
5. Definition of information needs to assess the validity of each impact diagram.
6. Evaluation of the existing information and definition of additional field work required to evaluate potential environmental impacts.
7. Identification and evaluation of both existing and any additional mitigation measures for each major environmental impacts.
8. Outline of all environmental monitoring requirement indicated in the terms of reference (LET 1991).

In addition to the study team, EGAT operational personnel from Mae Moh were invited to participate in the workshop. The participants helped to ensure that a complete understanding of available data and processes was available for the workshop discussions.

The preliminary session of the workshop involved presentations by representatives of the groups that were involved. After the presentations, the participants were divided into three groups related to the three major overall project development components.

#### **3.2.6.1.1 The Project Bounding during the workshop**

Project bounding was established by delineating the geographic area that was likely to be affected by the project, as well as to determine the time period over which the project would have had an effect on the environment of the region.

The temporal boundaries for the project were separated into three phases: existing situation, construction, and operation. Spatial bounds for the socioeconomic assessment focused on a number of levels; macro-level (general changes to the provincial economy, as a result of the proposed construction activity), a detailed assessment of economic effects generated by the project, impact on land use patterns, and the structure of the community in the vicinity of the project site.

The spatial boundary for assessment of air quality effects is defined by the airshed. Effects are determined by the height of the stack, stack exit velocities and temperature, and magnitude and dispersion characteristics of the gaseous effluent. The spatial boundary for assessment of the physical and chemical impacts were the immediate environment of the proposed activities including the area to be developed for water supply, the mine, the ash disposal area, coal storage area, the plant itself and the adjacent water courses. This boundary was used for assessing visual and noise impacts.

The aquatic biology assessment covered the upstream and downstream areas of the proposed development and the related reservoir system. Terrestrial features included the area to be affected directly by the mine expansion and power plant development.

#### **3.2.6.1.2 The Screening of parameters during the workshop**

Three interdisciplinary working groups were established with the appropriate combination of experience and expertise to focus on defining the specific project activities associated with the construction and operation of the power plant. The working groups were asked to construct a matrix with the project activities on the vertical axis and the environmental parameters across the horizontal axis.

The environmental parameters included the physical resources, ecological resources, human use values and quality of life values. The effects of each specific project activity on each defined environmental parameter were discussed. Parameters not affected were eliminated, while a ranking of high, medium and low was assigned to those parameters thought to have been affected by the project activity.

The first step in the screening process was to define the specific project activities associated with the construction and operation of the Mae Moh Mine, the Mae Moh power plant and the water supply system. A matrix was then constructed with the project activities on the vertical axis and the environmental parameters across the horizontal axis (Figure 5). The environmental parameters or valued ecosystem components included the physical resources, ecological resources, human use values and quality of life values.

Figure 5.

Environmental Screening Parameters in the EIA of Mae Moh Mine and Power Plant report.

Physical Resources	<input type="checkbox"/>	surface water hydrology
	<input type="checkbox"/>	surface water quality
	<input type="checkbox"/>	ground water hydrology
	<input type="checkbox"/>	ground water quality
	<input type="checkbox"/>	climate
	<input type="checkbox"/>	air quality
	<input type="checkbox"/>	soils
	<input type="checkbox"/>	geology/seismology
Ecological Resources	<input type="checkbox"/>	forests
	<input type="checkbox"/>	terrestrial wildlife
	<input type="checkbox"/>	aquatic biota
Human Use Values	<input type="checkbox"/>	agriculture/land use
	<input type="checkbox"/>	flood control
	<input type="checkbox"/>	water supply
	<input type="checkbox"/>	power/industries
	<input type="checkbox"/>	aquaculture
	<input type="checkbox"/>	tourism
	<input type="checkbox"/>	transportation
Quality of Life Values	<input type="checkbox"/>	archaeological/cultural
	<input type="checkbox"/>	public health
	<input type="checkbox"/>	socio-economic

In all, five matrices were constructed for screening the construction and operation activities of the entire project: one for the screening parameters and one each, for the Mae Moh mine, the Mae Wang Valley water supply/storage, the Mae Moh Valley water storage/supply, and Mae Moh and Lampang Power Plant. Description of each of the impacts represented in the matrices is represented below.

Figure 6.

Screening of Mae Moh Mine Impacts.

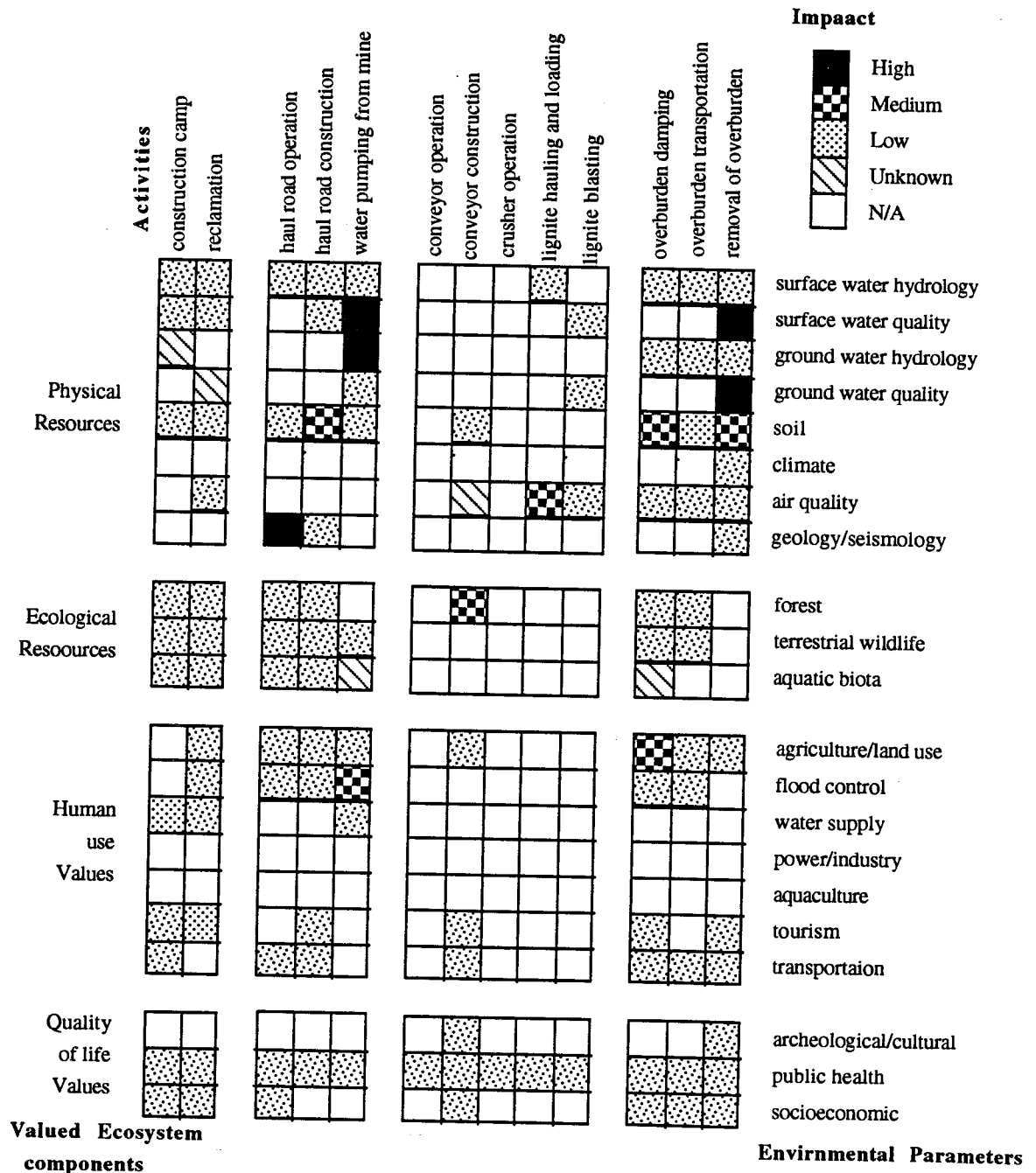


Figure 7.

Screening of Mae Moh and Lampang Power Plan Impacts.

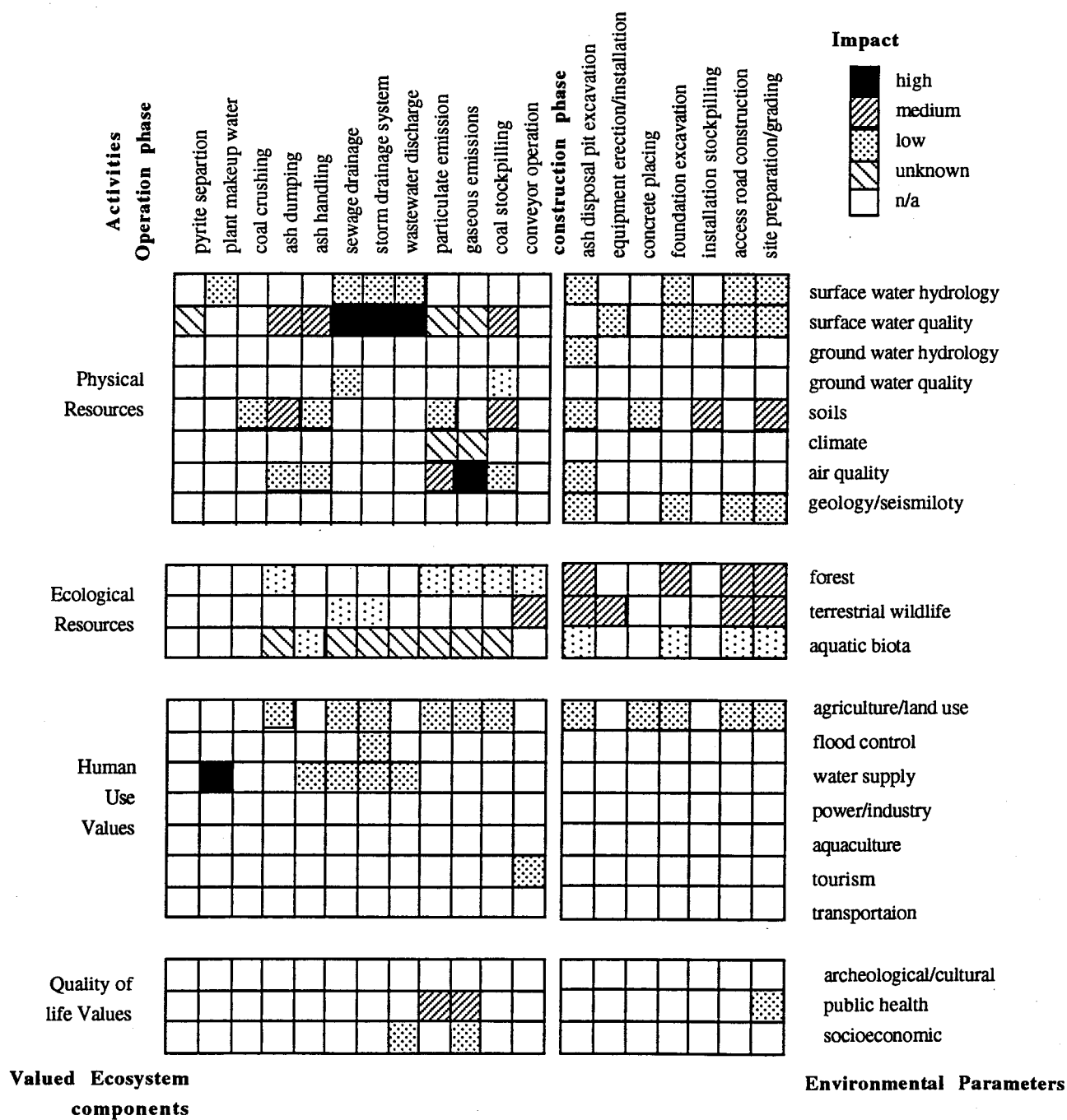




Figure 8.

Screening of Mae Moh Valley Water storage/supply impacts.

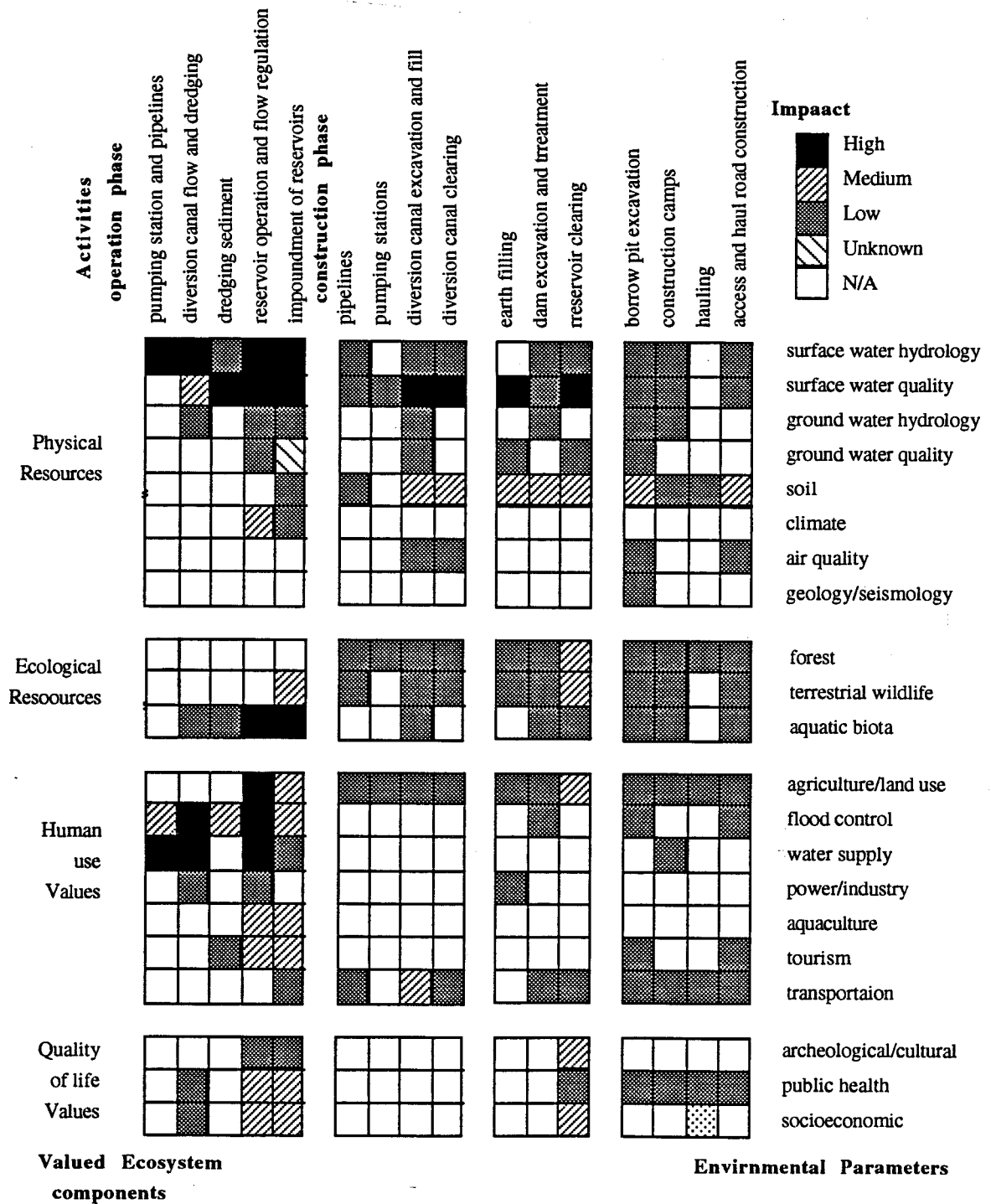
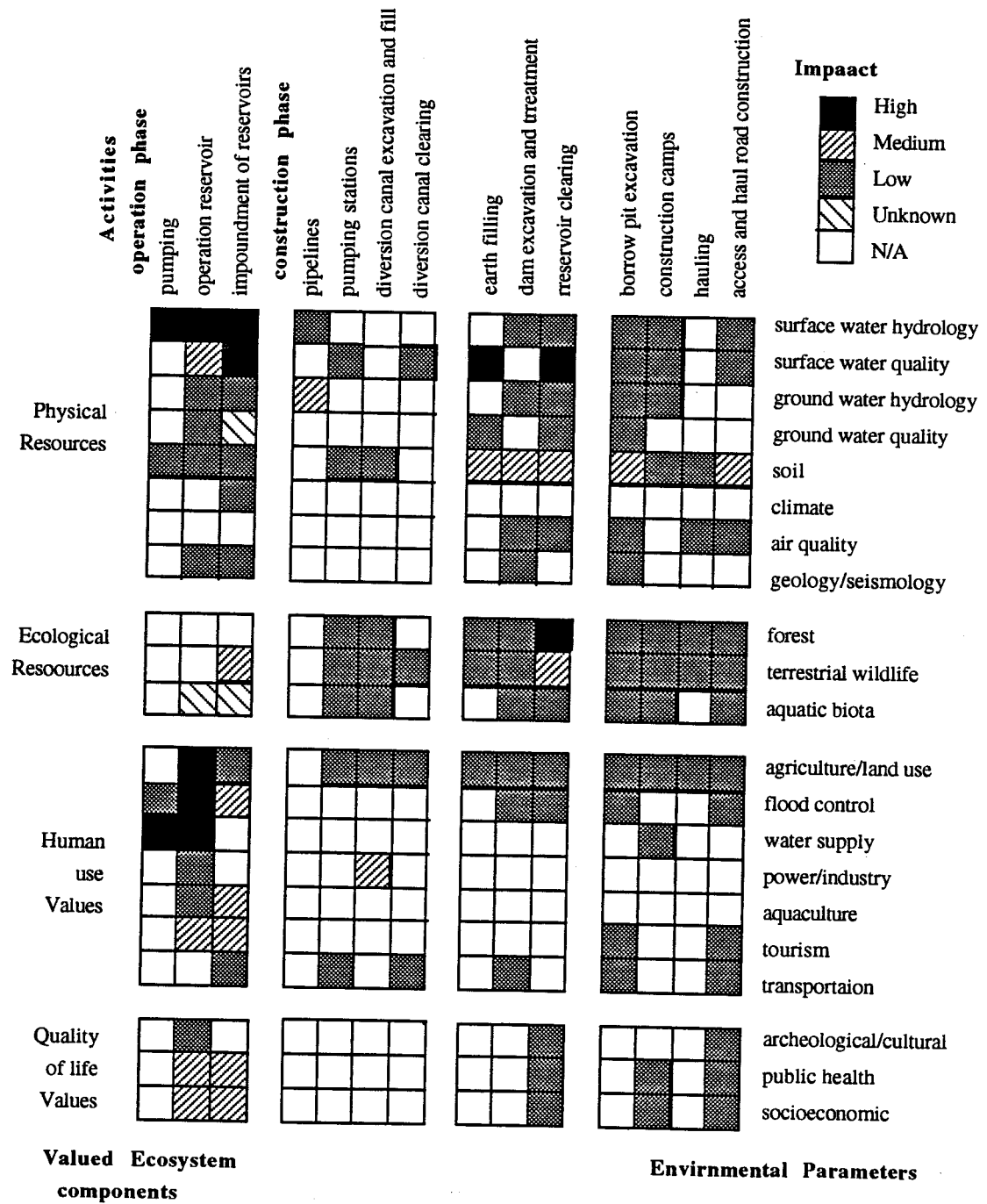


Figure 9.

Screening of Mae Wang Valley water supply/storage impacts.



### **3.2.6.1.3 The Impact hypothesis**

The results of the screening conducted by the working groups were analyzed in the second phase of the workshop to determine the type and extent of environmental impacts rated in the high impact category. The workshop participants identified valued ecosystem components as the critical process because these were the limiting factors to discussions on impact hypotheses and monitoring programmes.

The working groups in the second phase of the workshop were restructured to include participants with the appropriate combination of expertise. Group members were familiar with those project activities and environmental impacts identified in the high impact category.

### **3.2.6.2 Impact Assessment**

The Mae Moh EIA focused around three essential levels of environmental effects analysis including:

1. a set of impact hypotheses;
2. a set of cross impact matrices; and
3. a set of cumulative impact hypotheses.

To determine possible environmental impacts related to the project construction and operation, the methods listed above were applied using available data. These methods are defined later in the chapter.

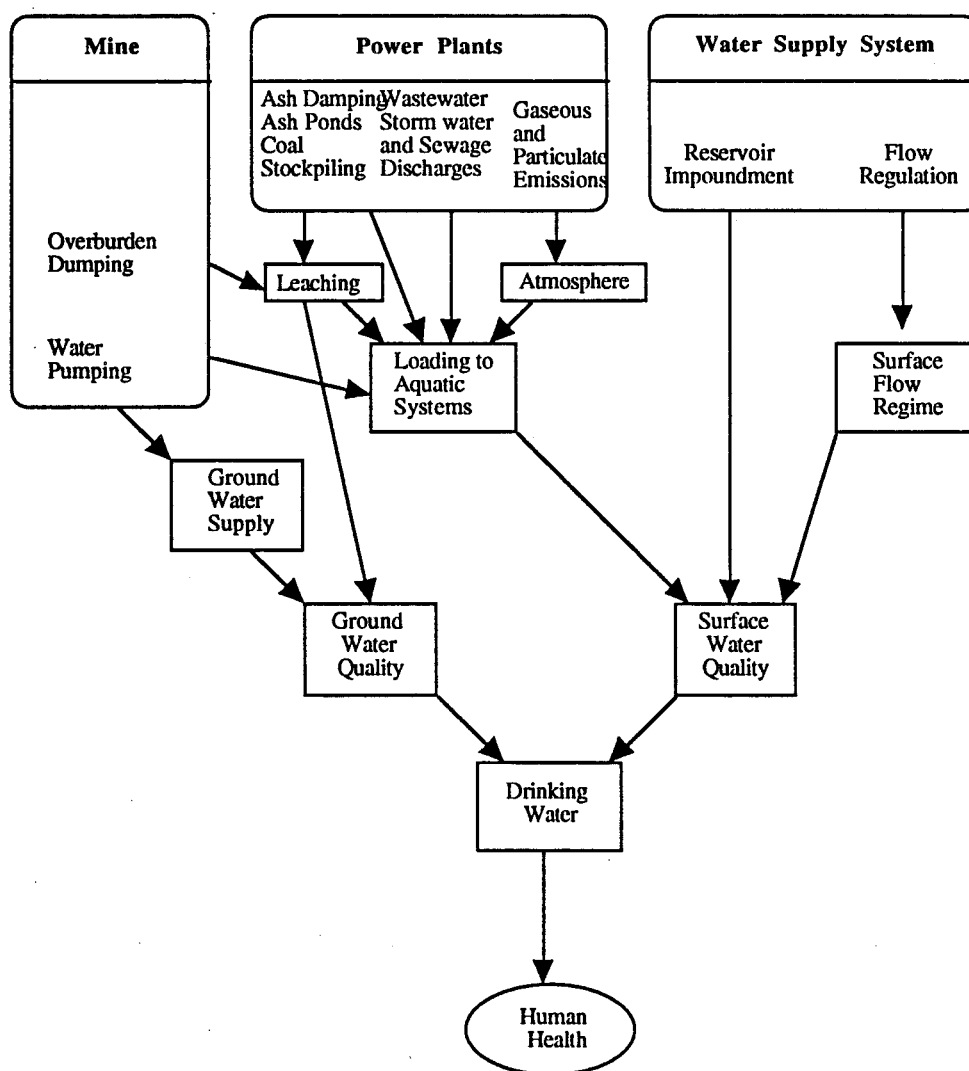
Draft impact hypotheses were prepared to guide the second phase of workshop discussions.

The impact hypotheses were:

1. The project activities (water management, plant construction and operation and mine operation) will have effects on the drinking water quality thereby adversely affecting human health. These activities are linked as shown in the figure below.

Figure 10.

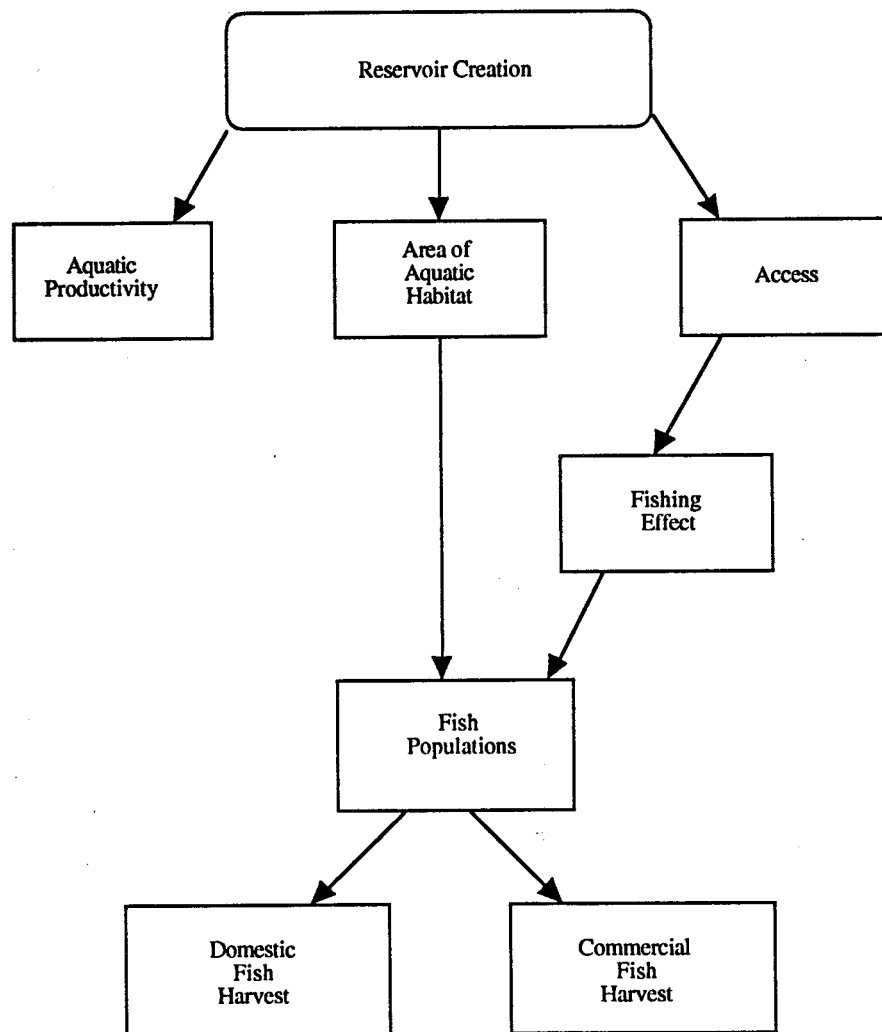
Effects of mine, power plant and water supply system on water quality and human health.



2. The effect of reservoir creation on aquatic populations and commercial fish harvest is likely to be significantly positive. Reservoir creation is linked with fish harvest as shown on the diagram below.

Figure 11.

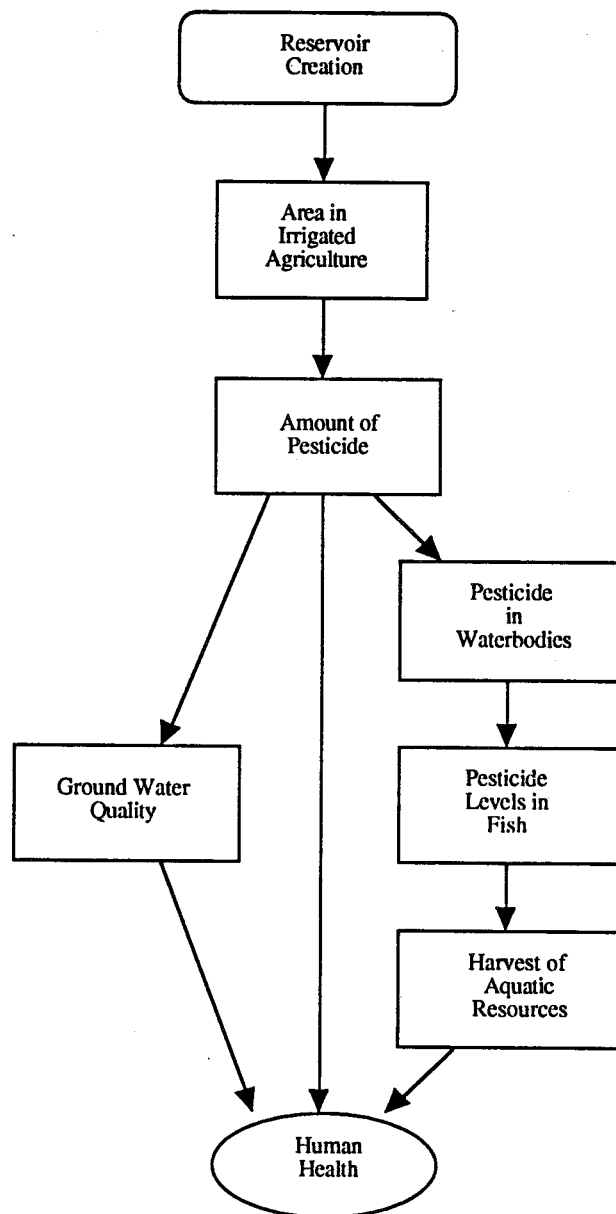
Impacts of reservoir creation on fish harvest.



3. The creation of a reservoir will allow agricultural activities down stream. However, chemicals used in irrigation and pesticides would accumulate in fish resulting in human health problems.

Figure 12.

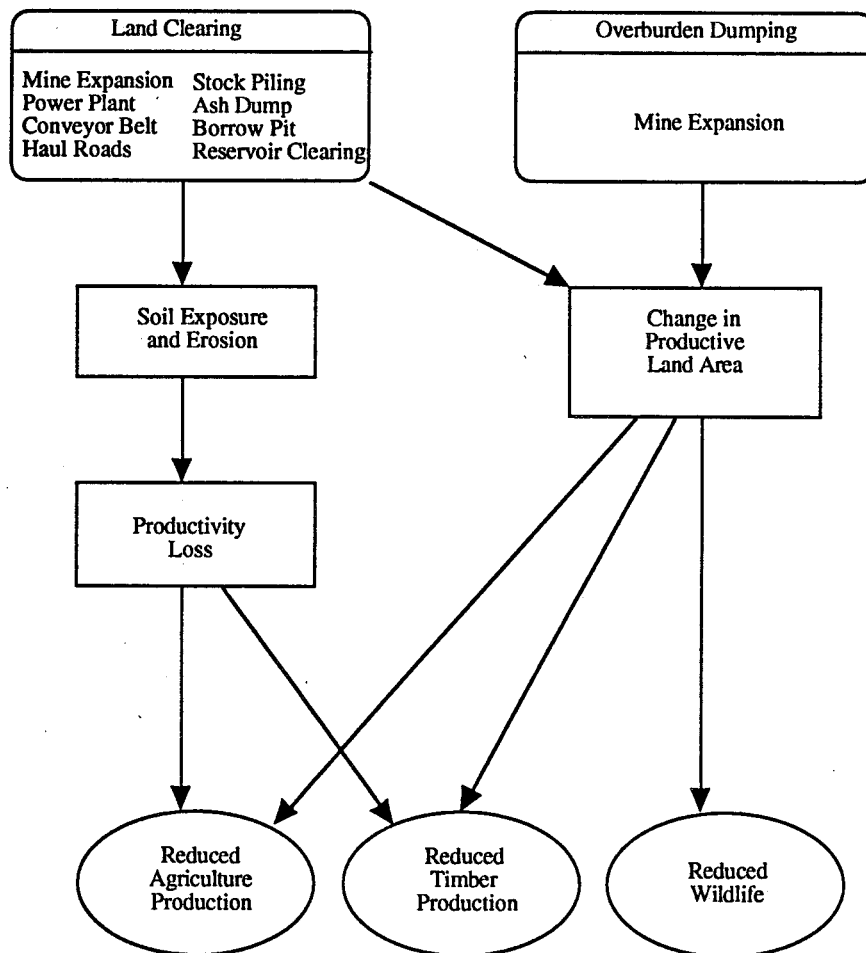
Impact of reservoir creation on pesticides, fish and human health.



4. The construction of the power plant and ancillaries, the roads, transmission lines and the mine site loosens the soil and may cause soil erosion. Construction will also consuming agricultural land forcing the people to more fragile lands that are susceptible to erosion.

Figure 13.

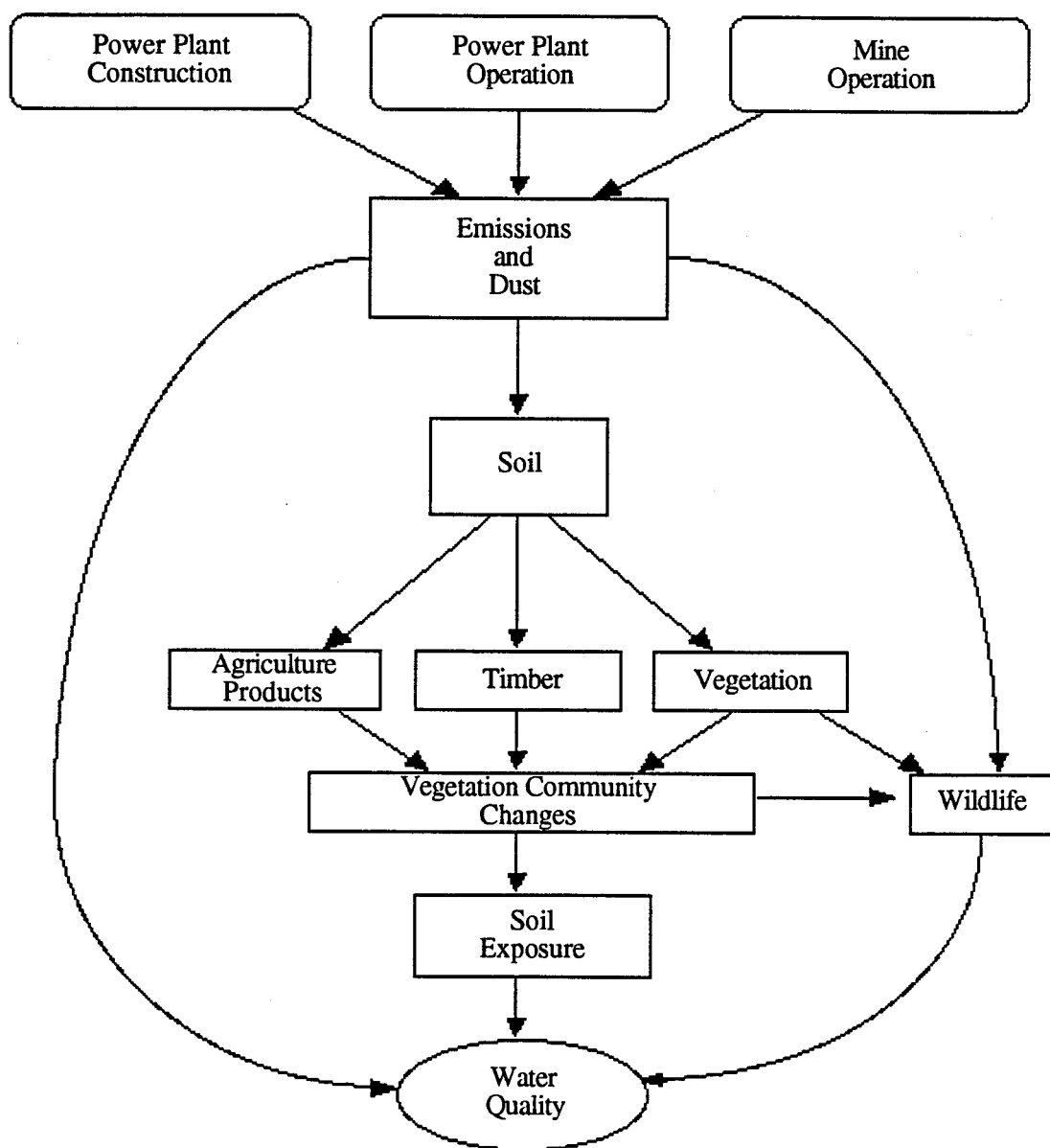
Impact of Land clearing and overburden dumping on agriculture, timber and wildlife.



5. Particulate matter and sulphur oxides generated by various mine and plant activities may affect terrestrial resources in the area.

Figure 14.

Impacts of emissions and dust from power plant and mine on agriculture, timber, wildlife and water quality.

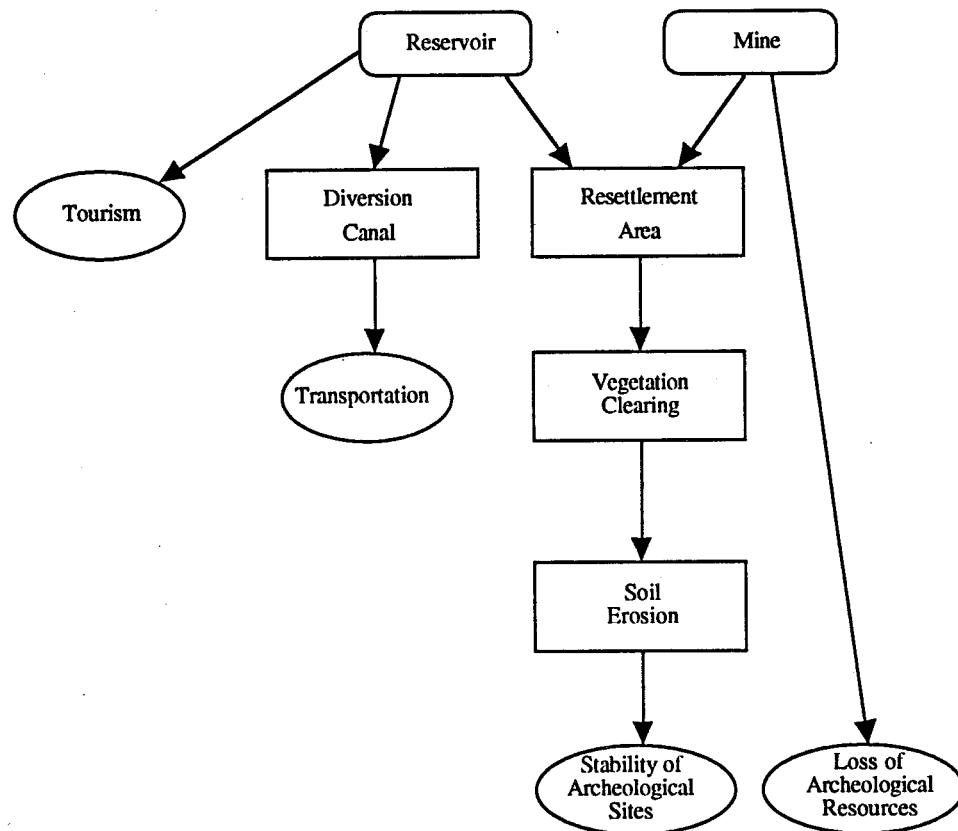




6. The mining and plant construction and operation will affect settlement.

Figure 15.

Impact of reservoir and mine on tourism, transportation, and archeological resources.



There were also hypotheses for cumulative impacts on air quality, water quality, agriculture, socioeconomics, infrastructure, archaeological resources, global warming and jobs. At the conclusion of the workshop, data and information deemed relevant for the completion of the EIA were identified.

The EIA results focused around three essential levels of environmental effects analysis including:

1. a set of impact hypotheses;

Impact diagrams schematically represented the impacts of single or multiple project activities on a single resource or value in the project area (e.g. fish and ground water). The resource or value contained as an end point in the impact diagram must be one that: has importance to the local population (e.g. fish, drinking water, and agricultural products); has national or international profile (e.g. tropical rain forest and endangered species); or one which, if altered from its present status, will be important in evaluating the impacts of development and in focusing regulatory policy (e.g. levels of phytoplanktons causes the decline of fish stock);

2. a set of cross impact matrices;

Single entry matrices representing the effects of a single project activity on a single resource (e.g. impacts of clearing the forest on the quality of water in the area, or impact of mine discharge on the fish stock); and

3. a set of cumulative impact hypotheses.

These schematically represent the impacts of multiple project activities on a single resource value through all time (e.g. fish stock potentially impacted by changes in water quality occurring from project activities, regional air quality impacted by emissions from the power plants, or impact on the regional economy by the development in the entire valley).

To determine possible environmental impacts related to project construction and operation the above methods were applied using available data.

The resettlement of the people in and around the proposed facilities was commissioned under a separate study.

That involved:

1. A socioeconomic survey of prospective evacuees;

2. Property survey;
3. Survey of possible resettlement sites;
4. Assessment of resettlement sites and selection;
5. Formulation of alternative resettlement schemes;
6. Infrastructure and agricultural planning;
7. Physical layout; and
8. Costing and scheduling of the resettlement programme.

### **3.2.7 LET's Conclusions**

The conclusions reached by the LET of the EIA of the Mae Moh Mine and Power Plant expansion project were as follows:

- The data base was extensive and provided good yet incomplete representation of the environment in the Mae Moh Valley and the surrounding region.
- A number of major environmental issues were identified which require mitigation and monitoring.

These included the following:

1. Project activities (e.g. water management, plant construction and operation, and mine operation) will have detrimental effects on surface water quality, thereby adversely affecting human health.
2. Operation of the mine, power plants and water supply system will affect aquatic resources and hence, through the food chain, human health.
3. The effect of reservoir creation on aquatic populations and commercial and domestic fish harvest is likely to be significantly positive.
4. The negative impact of the reservoir on human health, caused by increasing pesticide use for agriculture and irrigated lands, is assessed as likely, but with unknown magnitude.
5. The construction of Lampang power plant and ancillaries, including the conveyor corridor and access roads, the transmission right-of-way, and expansion of the existing mine site at Mae Moh, will occupy land which might otherwise be used for agriculture or timber production.

This presents a change in the actual and/or potential production in the area. Further, construction and mine expansion may cause soil erosion, resulting in changes of the productivity of immediately adjacent land as well as contributing to sedimentation in the nearby watercourses.

6. Particulate matter and sulphur oxides generated by various mine and plant activities may affect terrestrial resources in the area. Impacts may be felt directly by the foliage of forest and/or crop vegetation, or indirectly via gradual changes in soil chemistry.
  7. Construction and operation of the mine, power plants and water supply systems will require resettlement of significant numbers of people offsetting the negative impacts, the increase in employment opportunities will be a positive impact. The net result is a socioeconomic impact on the area.
  8. Creation of new reservoirs and mine expansion will attract tourism, faster transportation systems. These may have impact on the archaeological resources of the area.
  9. Atmospheric emissions and fugitive dust, caused by the construction and operation on the mine and the power plant, will have an adverse effect on human health.
  10. Water storage in the reservoir will result in greater amounts of water in the dry seasons for irrigation.
- A number of cumulative impacts were also identified as follows:
    1. Increased levels of sulphur dioxide released by the power plant will lead to acid rain.
    2. In case of low volumes of flow, agriculture that is dependent on irrigation water will be jeopardized.
    3. The Mae Moh project and the power plant will be one of the largest in Thailand resulting in significant socioeconomic impacts at a national level.
    4. A total of 110 million tones of carbon dioxide will be released into the atmosphere by the year 2026.

Given the magnitude of the existing development and planned expansion, it was not possible to assess all possible impacts and their magnitudes. Considerable base line data were required before such assessment could be made.

In summary, while the available data had not permitted identification of all possible issues, it was believed that the most significant issues have been recognized and that suitable mitigation and monitoring were feasible. It was, therefore, considered that application of mitigative measures, as identified in the final report would make it possible for the project to be completed in compliance with the environmental standards and the regulations of the National Environmental Board of the government of Thailand, the World Bank and CIDA by spending a little more money to increase levels of mitigation.

### **3.2.8 The Environmental Impact Report**

Following the workshop, field studies to acquire additional information for the project proceeded. The Canadian team returned to Bangkok in November of 1990 to meet with the Thai counterparts for the writing of the final report. This study schedule was based on the assumption that a great deal of information, environmental documentation and monitoring data was already available for the existing facilities. Also the study was limited to those resource management issues of greatest concern.

The draft report was submitted on January 10, 1991. Comments from EGAT were received by the team between February 11 and March 7, 1991.

### **3.2.9 Summary**

The EIA of the Mae Moh Power Plant was a legal requirement of the Thai National Environment Board under the National Environmental Quality Act. It is expected at the time of writing that the Thai National Environment Board will enforce the recommendations of the EIA study. These recommendations include: adaptive responses to unknown impacts and mitigation programmes, education programmes for environmental awareness and environmental audit. Some of these measures could influence the design of the dams, mine, and power plans. The legislation does not clearly state the consequences of violation of any of the recommendations or lack of implementation.

LET (1991), stated that, over the years, the method of approach to EIA has been evolving and remains in transition. Recent trends are towards an integrated or *systems* approach similar to one adopted for the EIA of Mae Moh Mine and Power Plant expansion project.

Specifically, LET used a new concept of impact hypothesis. The guidelines for this process are modifications of the World Bank's EIA guidelines. Simply, impact hypothesis are stated (a collection of statements that connect development activities with their potential environmental effects on valued ecosystem components) and contrasted with the results of the EIA evaluation.

The objective of the EIA was different from that at the Three Gorges: to identify significant environmental impacts attributed to the expansion of the project and recommend mitigation measures.

The EIA process was structured such that:

- 1 a number of environmental impacts would require adaptive environmental mitigation;
- 2 it would allow statistically sound and well-designed monitoring programme;
- 3 environmental education is included in the mitigation;
- 4 energy conservation programme is included in the process;
- 5 it would reduce energy demand by power pricing; and
- 6 it would allow environmental audit at two or three years interval.

Like the CYJV's study, the major drawbacks of the process were those related to the: decision to increase the capacity of the power production at this site which was reached before the EIA was done. LET's workshops did not include the local people. The participants were "experts" drawn from Canada and Thailand. According to the EIA report, the local people would be brought in as labourers, thus losing the training opportunity that the process would offer for the local people.

## CHAPTER FOUR

### CONTRASTING THE RESULTS OF THE CASE STUDIES WITH THE EVALUATION CRITERIA

This chapter is devoted to contrasting the results of CIDA's EIA approach in the case studies with a list of evaluation criteria to determine the effectiveness of CIDA's approach in meeting the criteria. The results of the EIA of Three Gorges Dam and Mae Moh Mine and Power Plant are contrasted against the fifteen criteria identified in chapter three.

#### **4.1 EIA should be an effective aid to decision-makers in making decisions that will take into account environmental implications of a development project.**

The EIA of the Three Gorges Dam by CYJV was intended to provide international recognition of the EIA conducted by YVPO. The Chinese government hoped to get international funding for the project (from the World Bank, Japan, the Asian Development Bank or Canada), while CIDA involvement was to aid Canadian firms with development interests in the project. The decision about when the construction of the project will take place has not yet been made. The construction of the dam is in the Chinese government's Ten Year Plan which was developed before CYJV's EIA. Therefore, the results of the EIA did not aid decision-makers in deciding whether to construct the dam or not.

Decision about the construction of additional units to the existing Mae Moh Power production complex was made before the EIA. Like the Three Gorges Dam, the results of the EIA did not aid decision-makers in deciding whether to increase the number of units of the power plants or not.

#### **4.2 EIA should result in a thorough analysis of the effects of the project on the quality of the environment, with focus on sustainable resource use.**

The EIA of the Three Gorges Dam project by CYJV identified potential impacts on the physical environment (hydrological modification, climate change and sedimentation), water quality (turbidity, metal concentration in fish and pollution dispersion), aquatic environment (fishery, aquaculture, water birds), terrestrial environment (birds, reptiles, quality of the basin, reservoir), and environmental geology (erosion, and soil stability) as a result of the construction and operation of the Dam. The process defined the status of these resources and recommended what remedies will be required to preserve these resources during the construction and operation of the Dam. That means the EIA process successfully analyzed the potential impacts of the project on the quality of the

environment. However, the focus was not to study the impacts on sustainable resource use but rather the economic benefits as a result of power generation and flood control.

The EIA of the Mae Moh Mine and Power Plant Project identified potential impacts on the physical resources (surface water and ground water, soils, climate, air quality), ecological resources ( forest timber, terrestrial wildlife, aquatic biota) human resources (agriculture and land use, water supply, aquaculture, aesthetics) and quality of life resources ( Archeological/cultural and public health) as a result of the construction and operation of the mine and power plant. Impact models were prepared in the EIA process. The analysis of the models suggested methods of mitigation and monitoring processes.

Therefore the EIA process was effective in identifying the potential impacts of the construction and operation of the mine and power plant.

#### **4.3 EIA should result in the incorporation of effective mitigation measures in the project design to make the project environmentally acceptable**

The Three Gorges Dam EIA report prepared by CYJV concluded that pollution, geological instability, and aquaculture contamination should be mitigated. It recommended that these measures be implemented in a just, timely and cost effective manner.

The mitigation proposal if implemented would influence the design of the dam, although the size of the dam has already been agreed upon (a 150 m Normal Pool Level). Its effectiveness can only be determined at the project design stage.

The EIA of the Mae Moh Power Plant project identified mitigating measures for the impacts on the physical, ecological, human and quality of life resources of the study area.

The process was structured such that;

- 1 a number of environmental impacts would require adaptive environmental mitigation;
- 2 it would allow a statistically sound and well-designed monitoring programme;
- 3 environmental education is included in the mitigation;
- 4 energy conservation programme is included in the process;
- 5 it would reduce energy demand by power pricing; and
- 6 it would allow environmental audit at two or three years interval.



The mitigation measures, if implemented, could influence the design of the dams, mines, and power plants. The effectiveness of mitigation can only be determined at the project design stage.

**4.4 EIA should result in the promotion of or research development efforts which lead to technologies that economize on energy and resources, and limit impacts on the environment**

CYJV's final EIA report for the Three Gorges Dam recommended that the Chinese government establish a project Environment Department within the Three Gorges Proponent Organization to implement the project plan and enhance further research and compensation, and resource management programmes in the long term. The research proposed was not geared to technologies that economize on energy and resources. Rather, fulfill the objective of controlling the Yangtze river floods and providing transportation and hydroelectricity.

The environment department's effectiveness depends on the commitment of the decision-makers in implementing the recommendations of the EIA. It is unclear at this point whether the Chinese government will implement this recommendation.

The EIA process of the Mae Moh Power Plant followed a new concept called Impact Hypothesis (a collection of statements that connect development activities with their potential environmental effects on valued ecosystem components). Its guidelines were modified from the World Bank's EIA guidelines. Simply, impact hypotheses are stated and contrasted with the results of the EIA evaluation.

The EIA recommended further research (data collection and analysis) on unknown impacts and strong monitoring of the effects of the mitigation measures that would be implemented.

It produced links between resource use and human health (for example, how mining affects water quality and results in poor human health). It also produced links between the use of one resource and others (for example, how the use of coal affects water quality, that affects aquatic resources). There was also a link between the use of pesticides to increase farm production. The pesticides are washed into the drinking water sources or fish ponds, and eventually end up as a health problem for the same people who used the pesticides. It effectively kept a list of links between resource use and environmental degradation that may lead to human health problems, and recommended further study of the links that were not known to have any mitigation measures.

#### **4.5 EIA should result in environmental and related training opportunities for community groups in developing countries**

The EIA of the Three Gorges Dam did not create any additional training opportunity for the local community. Only the representatives of the Chinese Communist Party and workers of the Yangtze Valley Planning Office gathered the data that were used by CYJV. Some of those workers attended EIA workshops in Montreal Canada, and Beijing and Wuhan in China.

In this regard the EIA was not effective. The only people who benefited educationally were those from the Canadian consortium. The benefits to them were their consultancy fees and involvement in studying an environment that they knew little about.

In the EIA of Mae Moh Power Plant, the public (but not the local people) was involved in the scoping process. The participants were mainly comprised of experts drawn from Canada and Thailand. According to the EIA report, the local people will be brought in as labourers. Training opportunities for the local people may not occur in the future.

#### **4.6 EIA should involve the participation of the people affected by the project or programme**

The EIA of the Three Gorges Dam was based on data collected by the Yangtze Valley Planning Office. That group consisted of government employees. The EIA did not report evidence of participation by the local population. Public consultation was limited to representatives of the Chinese Communist Party.

The EIA of the Mae Moh Power Plant had the best opportunities to involve the local people in the process, because it involved scoping that drew participants from government representatives to international observers.

Much of the impact study was around the impacts on the health and the agricultural production of the people who live around the project area, but none of the local people were involved in the process. The report said that the local people would be hired as construction workers in the mine and construction sites.

#### **4.7 Impact reports must indicate the interests and preferences of the community affected by the project**

CYJV's report on the Three Gorges Dam EIA explained that the Chinese government representatives involved in the EIA expressed the need to protect the needs of the people that will be affected by the project. The EIA report, however did not reflect the interest of the local people to the degree they would have wanted to be represented due to their absence in the process.

Although the resettlement programme was judged by CYJV as one of the best organized in the world, it did not mention any concern about moving ethnic minorities to other places against their will.

The EIA of the Mae Moh Power Plant was concerned with the health of the community and agricultural potential of the land that the people depend on for their livelihood. It suggested the study of the links between environmental impacts with public health, and the study of impacts of introduction of irrigation and the use of chemical fertilizers and pesticides to the health of the community. It revealed impact on the lifestyle of the community as more people from cities will come to the area as construction workers. The benefits in terms of employment for the community was mentioned but remains uncertain.

These, however, reflected the ideas of the EIA team, not the interests of the local population.

#### **4.8 The requirements to conduct an EIA must be considered a path to achieving an end (decision) rather than an end result itself**

The EIA of the Three Gorges Dam was clearly not a means but rather an end. Its objective was not to study the environmental impacts of the activities and operation of the Dam, but rather to have an independent review of the EIA prepared by Yangtze Valley Planning Office.

Commissioned through the CIDA Industrial Cooperation Program, it was intended to assess the environmental implications of the project in order to justify international funding. If funding was secured by the Chinese government, it is hoped that Canadian firms would get contracts at the construction level.

Decision on whether to approve the project or not will not be based on the findings of the EIA study as the Chinese government seems to be in favour of the dam from the beginning. Therefore the process was ineffective in leading decision about the approval of the project. Although it recommended some mitigations measures that would be appropriate to guide the construction and operation of the dam.

Decision regarding the expansion of the Mae Moh to 11 units and the mine to supply the amount of coal needed, was reached before an EIA study was commissioned. Again sponsored through the CIDA-INC, Canadian firms that were involved in the study saw an opportunity to participate in the construction of a dam, power plant and mine operation. The EIA was CIDA-INC's requirement for approval of sponsoring those firms to market there technologies abroad. Its impact hypothesis process however, reached various recommendations on how to proceed with the construction and operation of the project. It strongly recommended further studies on impacts that had no

known mitigation measures, and proposed strict monitoring. Again it was itself an end, therefore ineffective as a tool on decisions about alternatives to the expansion of the plant.

**4.9 EIA should serve the best interest of the society that will be affected by the impacts of the project, judged by immediate benefits**

The EIA of the Three Gorges Dam identified benefits in the form of flood control medical advisory which will link the project to any public health problem.

The EIA of the Mae Moh Power Plant had recommendations that would benefit the local people who live in the area. They include well designed: solid waste disposal systems, erosion control systems, collection, treatment and discharge of contaminated run off and mine waste water.

The local population will benefit from water for their irrigation, jobs as labourers, and forest product transportation improvement as a result of new roads built to the project site. When implemented the recommended mitigations would improve the condition of the environment, which is already highly contaminated by the operation of the present nine (9) plants.

**4.10 Decisions as a result of EIA should explicitly account for the impacts identified or concerns raised in the EIA process**

Among other things, the EIA of the Three Gorges Dam recommended filling gaps in the data collected by YVPO, environmental monitoring, effective planning and full support for the local people including compensation. Decisions about constructing the dam will rest on the political process in China. The EIA report did not include ways by which the results of the study will be used in the decision to construct the dam.

The EIA process was not designed to account for the impacts identified. It recommended compensation, but did not have any legal jurisdiction to impose the compensation. Therefore it was ineffective in accounting for the impacts which were identified.

The EIA of the Mae Moh Power Plant was a legal requirement of the Thai National Environment Board under the National Environmental Quality Act. It is expected that the recommendations of the EIA study which included among other things; adaptive responses to unknown impacts and mitigation programmes, education programmes for environmental awareness, and environmental audit, will be implemented by the Thai National Environment Board. The legislation however does not clearly state the consequences of any violation of the implementation of the recommendations of the EIA.

Compensation for the people who would be affected by the project was not mentioned in the report. Again the EIA was ineffective in accounting for the impacts that were identified.

#### **4.11 EIA study must not leave the public out of the process decisions that would affect them**

The EIA process of the Three Gorges Dam did not include consultation with the local public.

The EIA process of the Mae Moh Power Plant also did not involve the local people in the decision reached in the study. Only workers for the Electric Generating Authority of Thailand (EGAT) were invited for the workshop in Lampang. They were the only local people involved in the EIA process outside of the team of experts. Both EIAs were therefore ineffective in identifying the need to involve the local public in the decision that would affect them.

#### **4.12 EIA legal instruments should not be the exemption rather than the rule**

It is unclear, which legal instruments of the EIA were used for the EIA of the Three Gorges Dam. The Chinese government regulation on protection of the environment requires that an EIA be prepared for the Three Gorges Dam. That the EIA must meet the guidelines of the National Environmental Protection Agency and its findings be approved by the State Council. However, the main objective of CYJV's study was to reach an independent evaluation of the EIA earlier conducted by Yangtze Valley Planning Office, in order to convince donors and lenders like the World Bank to fund the project.

The participants in the process used guidelines adapted from the Canadian Federal Environmental Assessment Review Office and the World Bank. Both guidelines do not have legal jurisdiction in China.

The EIA of the Mae Moh Power Plant is mandated by the Thai National Environmental Quality Act. Although the regulation requires the comparison of engineering and economic feasibility studies to obtain approval for project implementation, the EIA was conducted after decision was already made about the expansion of the power plants at Lampang. As required, the screening guidelines of the EIA team were compared with those developed by the Thai National Environment Board, and the EIA terms of reference were acceptable to CIDA and EGAT. Therefore the process was effective in following the EIA legal instruments.

#### **4.13 EIA processes should improve database and educational opportunities for the donors and receivers**

The EIA of the Three Gorges Dam had a vast database which was used for the evaluation of the impacts. The CYJV did not collect new data to reach their conclusions. Critiques of the project as well as supporters of the

project benefited from the same database. The study was therefore effective in providing data for storage and educational purposes.

Like the EIA of the Three Gorges Dam, the EIA of the Mae Moh Power Plant used much of the information already collected. Raw data was collected to assess the impacts of the construction and operation of the Plant on physical resources, ecological resources, human resources and quality of life. The data, according to the EIA report, will in the future be used as an educational resource. That includes the EIA process which was new and innovative.

The process was effective in setting a data bank and was educative especially for the consulting team from Thailand that worked with the teams from Canada.

#### **4.14 EIA should be an affordable processes**

The cost of the EIA of the Three Gorges Dam was not revealed by CYJV. China contributed personnel and ground base data. It Chinese government obviously could not afford the EIA. It did not have sufficient funds to pay for it. Therefore the process was not cheap.

The EIA of the Mae Moh Power plant was funded by CIDA and EGAT. The contribution from the Thai government amounted to 20% of the cost of the EIA. The contribution of the Thai government was desirable, but insufficient.

#### **4.15 EIA procedures should not be perceived to be sacrificing development in favour of environmental protection**

The EIA of the Three Gorges Dam was for the largest hydroelectric dam in the world. It reveals two major objectives of the Chinese government; flood control, and hydroelectricity generation. Other objectives included navigation improvement and fishing. These economic benefits would be considerable, according to the Chinese government and outweigh the cost in environmental impacts.

The EIA was not perceived as sacrificing development in favour of environmental protection. Instead critics say it compromised environmental protection to favour development. Therefore it was effective in supporting policy aimed at economic development in China.

For Canada, the construction of the dam would support industrial growth. Exports from Canadian industries would be needed in the construction of the dam.

For Mae Moh project, the supply of electricity up to year 2027 was the major goal of the Thai government. The decision to expand the plant was reached before the EIA was conducted. The EIA study was designed to guide the construction and operation of the plant, not as tool to select the best alternative energy production source. Economic benefits governed the decision to expand the plant.

The EIA report was not critical about the decision to increase the electrical supply, but presented ways of how to construct and operate the additional units and mines. Therefore the Thai government did not perceived the process as a way to sacrifice development in favour of environmental protection.

Table 6

A table showing the summary of the effectiveness of the EIAs of the cases studied.

Criteria No.	Mae Moh		Three Gorges	
	Effective	Ineffective	Effective	Ineffective
1		X		X
2	X		X	
3	X		X	
4	X		X	
5		X		X
6		X		X
7		X		X
8		X		X
9		X		X
10		X		X
11		X		X
12		X		X
13	X			X
14		X		X
15	X		X	

## CHAPTER FIVE

### CONCLUSIONS AND IMPLICATIONS

#### 5.1 Conclusions

The conclusions of this thesis are based on the results of contrasting the results of the EIA case studies with the evaluation criteria listed in chapter three.

1. The most important point is that, the EIAs of the cases studied did not meet the fundamental criterion that EIA should be an effective aid to decision-makers. The recommendations of the cases studied were not used to guide the decision-makers in deciding whether to go ahead with the two projects or not. The decision to expand the Mae Moh Power Plant was made before the EIA was commissioned. Like wise the decision to dam the Yangtze river at the Three Gorges was reached before the Chinese government requested that CYJV review the EIA study completed by YVPO.
2. Another important criterion not met by CIDA's approach to EIA in the cases studied is public participation. The public involved in the cases studied comprised of mainly representatives of the Thai for the Mae Moh project and Chinese governments for the Three Gorges Dam project. That involvement was not enough to affect and change the agenda set by the consultants, which was guided by terms of reference written by CIDA and governments of Thailand and China. The consultants hired by CIDA used guidelines of their choice (mainly those of the World Bank EIA process), although CIDA's approach to EIA was largely meant to be guided by guidelines of FEARO which require a public review with a panel.
3. The absence of local communities in the EIA process of the cases studied resulted in EIAs that were externally initiated and expert dominated. The approach did not involve the local communities and broke the circle of interdisciplinary research linked to development of projects of the calibre of the Three Gorges Dam and Mae Moh Mine and Power Plant. Research of that nature requires the involvement of three main groups of people (scientists, management and land use planners, and the local people of the area) to plan and carry out recommendations of a research project. Early involvement of these groups provides time for ideas and relations to develop in order to build the ground for the application of the results of any study.
4. The EIA approach in cases studied placed it between the agents of planning and development, and the local populations who are unfamiliar with sophisticated legal and scientific or analytical process. It therefore missed



the opportunity to include the interests of the local people in the planning process and to include EIA into local frames of project evaluation.

5. The EIA of the cases studied did not have a clear legal process to enforce compliance with the recommendations of the EIA report.
6. In spite of the shortcomings listed above, the EIA of the cases studied met some of the criteria stated in Chapter Two. The approach in the two cases studied was successful in identifying impacts and analyzing the effects of the two projects on the quality of the environment. The two EIAs recommended mitigation measures to guide project design. Both EIAs mentioned chances of employment and opportunities for better economic well being for the local people, especially in Thailand, therefore portraying an image that the projects were not to sacrifice economic development in favour of environmental protection. A large quantity of data was generated for the two studies, which would be used for education. Thai and Chinese members of the EIA teams, promoted, through the recommendations of the two EIAs research and development efforts which would lead to technologies that would economize energy and resources.

Although the two cases have some shortcomings, there were lessons learnt in China and Thailand. It is appropriate to say that CIDA's approach in the two cases studied contributed to better understanding of the bio-physical and socioeconomic states of the project areas. Considering this, the answer to the question. "Is CIDA's approach effective in affecting the fate of proposed projects in developing countries?" relies on the implementation and monitoring of the mitigation measures recommended in the two EIA reports.

EIA still remains an evolving process with a lot of room for improvement.

## **5.2 Implications**

- 1 Considering that the EIA of the two cases studied in the thesis did not aid decision-makers in deciding whether to go ahead with the projects or not, it is therefore prudent that CIDA must introduce EIA approaches that will aid decision-makers in deciding on the fate of projects. The inclusion of environmental consideration in decision-making is important to promote sustainable development. The EIA approaches must be understood by the receiver countries or else those countries will perceive them as acting against economic growth.
- 2 The EIA cases studied in the thesis did not explicitly demonstrate any motive to involve the people that will be affected by the projects, neither were their values considered in the evaluation of the environmental impacts of

those areas. In order to include the local people in the EIA process, CIDA must structured its EIA process so as to:

- i include the values of the people who will be affected by the development into the prediction, interpretation, and evaluation of impacts to encourage realistic option or alternatives for proposed activity early in the planning process;
  - ii determine the relative environmental effects on different interest groups and the indigenous people;
  - iii foster implementation of environmental management and rehabilitation plans which are socially acceptable to the local people;
  - iv allow for appropriate decision-influencing mechanisms that allow indigenous people to express their values of the land;
  - v readily identify development projects likely to have significant environmental consequences which are expected to change the livelihood of the indigenous people;
  - vi have ongoing management that will include the indigenous people;
  - vii assess indigenous environmental knowledge;
  - viii understand local resource use; and
- 3 CIDA must gear its aid to impact evaluations that encourage societal responsiveness and lead to realistic alternatives. Problems associated with development should be solved instead of the attempts made to stop developments such as building a dam, factory, sewer lines etc. that developing countries need so badly.

### **5.3 How to Improve CIDA's EIA approach**

#### **5.3.1 Early Evaluation of impacts of the project or programme on the indigenous people;**

Most EIAs in the western industrialized countries, are undertaken after preliminary design or detailed designs are prepared. Two examples cited here are: Rafferty Alameda and Oldman dams in Canada. As the courts contest whether the dams should be built or not, and whether the Federal government should conduct an EIA, engineering work proceeded on the site. The point is evaluate early, or late evaluation encounters resistance.

When EIA is introduced at a later stage, alternatives are limited to identifying mitigation measures. Reactive assessments have to rely on the decision-makers' ability and willingness to terminate a project if the EIA identifies severe unavoidable adverse impacts. These decisions are unlikely in developing countries after they have invested considerable sums of money in project planning, and preliminary construction work.

Therefore, to improve its approach to EIA, CIDA must incorporate it early into feasibility studies, so as to assess the adverse effects of each development option pro-actively, and to evaluate real alternatives.

### **5.3.2 Focus on Environmentally Significant Matters**

Personnel trained in impact evaluation and financial resources to conduct an EIA are likely to be limited in most developing countries, therefore, it is essential that efforts be focused on those projects that will have significant environmental effects. Based on the public process, actions that are unlikely to have far reaching environmental consequences must be exempted from stringent EIAs. Where far reaching environmental consequences are expected, the evaluation should produce trade-offs between environmental costs and economic development and social well being.

### **5.3.3 Formulation of Alternatives**

Today, most developing countries follow the pattern of development of the western industrialized countries. This trend is unlikely to change in the near future. Because of that, CIDA's decisions after an EIA cannot be "stop or go", but rather those that formulate a sensible compromise in which development is planned, designed and managed to minimize environmental degradation.

These decisions can be achieved by consensus reached among all the parties that are involved. Where consensus cannot be reached, educating the people by involving them in the process, and training others to handle the technical, ecological, economic and cultural merger is important.

### **5.3.4 Socially Responsive Environmental Planning**

In deciding between development options, CIDA must use methods that have a social context. It is equally important to recognize that the value of components of the environment differ from group to group and depend on their needs and aspirations. It must be emphasized that the outcome of an evaluation will depend on the criteria used, and these criteria are bound to differ from group to group and are subjective.

Affected people or groups of people should, therefore, be an integral part of the evaluation procedures. They can identify the environmental components they value, and contribute towards the formulation of appropriate development strategies to protect them.

### **5.3.5 Decision-making Appropriate for Development Planning**

If CIDA's claim of encouraging environmental management is to take root in developing countries, the process must be integrated into the local development planning. Bearing in mind that Canadian style EIA as it is may not work in those countries because it is an adversary process between those in favour, and those against a development (the battle of development versus environmental preservation). The resulting win/lose decision-making process is quite different from that used in project planning in most developing countries (the mixed-scanning approach in which decisions are made without much information or analysis).

### **5.3.6 Ongoing Management**

CIDA's EIA approach must accept the inevitability and desirability of infrastructure and industrial growth. Such procedures, should, therefore, focus on management options to minimize environmental problems rather than gathering data solely to influence initial decisions or prevent development. Emphasis should be on finding solutions to environmental problems rather than on attempting to achieve environmental favourable decisions. After all most developing countries already have terribly degraded environments. CIDA has to focus on managing the existing situation in order to minimize further degradation.

## **5.4 Proposed improvement to the CIDA approach to EIA process (Participatory EIA approach PEA).**

### **5.4.1 Participatory Rapid Community Appraisal**

The first task of PEA is to analyze the community understanding of EIA. In order to realize the level of understanding of the perceived impacts of a project or a programme in a community, the proponent should run an appraisal of the values and practices of the community's heritage in relation to the proposal.

Where the community has knowledge of environmental assessment or project impacts, the proponent should collect information on the resources available within the community that can be used to conduct an environmental impact assessment.

Where knowledge is lacking, the proponent must educate the community education about the changes a project or programme will bring to the community. The education programme should be translated into the local language and delivered by the leaders of the community. The mode of delivery information must be one that is familiar to the community (i.e. inform of plays, songs, story telling and dance). A library of the recordings of the information should be kept at the local community centres, churches or kept with the community leaders.

The information package should contain the following:

- methods of sensitizing the community;
- identification of ecosystem components (the community should be a component);
- identify anticipated types of changes;
- identify institutions/or develop institutions and legal systems.

#### **5.4.2 Local Resources Assessment**

With the help of community leaders, the proponent assesses the resource potential of the community.

The list of resources should include:

- natural resources that will be committed to the assessment;
- human resources;
- financial resources;
- institutional resources;
- legal frame work; and
- time.

#### **5.4.3 Screening the project**

After the resource potential of a particular community is assessed, the proponent assembles a team to screen the project. The purpose of the screening is to determine at what level of EIA (no formal EIA report, Preliminary EIA, or Comprehensive EIA) the proposed project will be assessed. This is determined in collaboration with Canadian EIA legislation, and relevant EIA regulations of CIDA and the partner country. It is important that the right level of EIA is determined at this point to avoid delays.

#### **5.4.4 EIA Work Plan**

For each project or programme a detailed EIA work plan is submitted by the consultant charged with the responsibility to conduct EIA. The plan should outline among other thing the scope of work, legal and theoretical frameworks of analysis, methodology, a draft out line of the EIA, a draft report schedule and budget allocated to the EIA. The level of the technical expertise that will be used to conduct the EIA is important.

#### **5.4.5 Prioritize issues of importance to decision-makers (Scoping):**

Given that most countries at the receiving end of CIDA's aid have limited financial and human resources, EIA studies can not address all issues. Only issues of importance to the proponent, the government of the partner country, and the community are addressed. The scoping exercise is achieved through workshops held in the project area. Up to three workshops can be organized; preferably in three consecutive days.

##### **5.4.5.1 Day One (Scope I)**

On the first day of the workshop the following takes place:

1. The proponent states the background of the project to reveal its purpose and objectives;
2. Presentations are heard from CIDA, the partner country, an international organization representative and the Local community leader.

The later part of the day should be spent for an informal tour of the project area.

##### **5.4.5.2 Day Two (Scope II)**

The group breaks into groups to develop value trees for ecosystem components, anticipate types of changes and perceived impacts. No rigorous analysis and mathematical statements are necessary at this point. Each group would structure a hierarchy of objectives, for example preservation of unique environments, ground water management, management of environmentally sensitive areas, maintaining heritage, etc.

Each group later present their work to the rest of the workshop participants. A list of objectives that encompasses those factors that are important to all groups (an integrated set of objectives) is produced.

The final step for the day is to identify the key objectives that are more important from the viewpoint of each group. This list is used to set priorities among the ecological components and parameters to be studied. The final product of the day is a matrix of relationship between project activities during construction and operation and the impacts on various components of the environment of importance to the participants. This matrix will be a guide to the rest of the EIA.

##### **5.4.5.3 Day Three (Scope III)**

The third day should be devoted to develop study strategy.

1. The first step is to select a study team. Workshop participants should play a big role in the choices made.

The study team should include;

Actors;

a - community representatives;

Even when the project is not intended to benefit the local community, they should be actively involved in the study to ensure that their values are taken into consideration in the EIA process.

b - impact assessment professionals;

Practitioners who are involved in the field of impact assessment and have a professional stake in the quality of work to be done.

c - Planners;

Individuals who assume the responsibility of identifying and coordinating activities.

d - developers;

May be proponents or administrators of the proposal. In CIDA's case developers are the industrial groups seeking CIDA assistance to promote Canadian industry abroad.

e - government;

The government of partner country seeking CIDA's assistance. Some governments are known to be deliberately repressive, however for the sake of achieving some degree of cooperation their ideas must be incorporated.

2 - Delineate study boundaries:

a - geographic

b - database

i) primary data;

ii) secondary data.

#### **5.4.6 Preparation of EIA Report**

This is the stage in which all major EIA activities are carried out. With the guidelines of the scope and objectives of the project that were established during the workshop periods, the project study team sets to conduct the detailed EIA. The major activities of the study include: the collection of necessary data, impact prediction and evaluation, formulation of environmental management plans and documentation of the findings, conclusion and

implications of the studies. The report produced should be available in a format that is easy to read and can be accessed by the decision-makers and the local community.

Quite often the EIA reports are very bulky and full of technical language that bewilder the local communities (Duncan, 1991) .

### **5.5 Evaluation of PEA.**

This framework for environmental assessment is sensible doable and an improvement over CIDA's current practices. However, the incorporation of its concepts require not only a change in skills but a change in policy. Analysts accustomed to having a great deal of discretion in decision structuring must learn to share that power with the public. Those analysts accustomed to making explicit choices must make explicit trades, and those analysts accustomed to building biological processes must recognize the importance of social values.

The author believes that, PEA will form a basic structure of a decision- tool which is appropriate to facilitate environmental decision-making.

There are still questions that require further exploration when considering EIA remaking in developing countries as EIA continues to be a learning process in Canada and else where in the world and the role of CIDA in financing the studies. For instance in the areas of legislation that govern the EIA studies, legal capabilities and legislative measures that would provide the basic public involvement and incentive to use EIA as a decision tool need to be identified. Whether CIDA and the governments of developing countries are sufficiently organized to participate in what is becoming the only meaningful way (meaning EIA) to manage the environment would have to be assessed on a case by case basis. At the present time, CIDA has made a good start, leaving a lot of room for improvement.





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