IE073

UNEP/SACEP Government of Sri Lanka

with Funding Support from
the Government of the Netherlands

Senior Level Expert Workshop to Evaluate Benefits and Constraints of Environmental Impact Assessment Process in SACEP countries

Final Report

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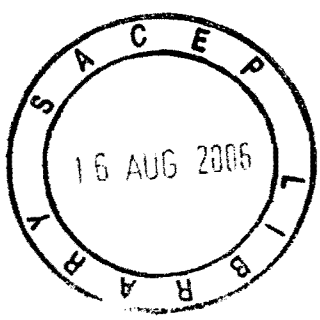

June 1987

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1. THE PROCEEDINGS OF THE WORKSHOP

1.1 The Workshop Participants

In March 1987, the United Nations Environment Programme (UNEP) and the South Asia Co-operative Environment Programme (SACEP), in conjunction with the Central Environmental Authority of Sri Lanka, held a Senior Level Expert Workshop to Evaluate Benefits and Constraints of the Environmental Impact Assessment Process in SACEP Countries. This workshop took place in Colombo, the location of the SACEP secretariat and received funding support from the Government of the Netherlands.

The workshop participants were senior delegates from environmental agencies and other relevant government departments in the SACEP countries. Also attending was the Director of the UNEP Regional Office for Asia and the Pacific, the Director of SACEP, a representative of the Government of the Netherlands and two resource persons from Environmental Resources Ltd., who assisted in conducting the workshop and preparing the report. There were a number of observers representing various Sri Lankan institutions with responsibilities for environmental planning.

1.2 Organisation of the Workshop

The objectives of the workshop were to evaluate the benefits and constraints of the EIA process. Participants were asked to prepare a case study of an environmental impact assessment in their country as an example of the typical benefits resulting from the EIA process and the typical constraints experienced in implementing such a process.

The workshop programme was as follows:

Day 1: Opening Session

Country Presentations

Day 2: Country Presentations

Technical Presentations: Background to EIA

Day 3: Introduction to Casework Simulations

Working Groups: Casework Simulation Exercises

Day 4: Working Groups: Casework Simulation Exercises

Presentations of Working Groups and Summing Up

Closing Remarks

Day 5: Field Trip to Bentota and Hikkaduwa

1.3 Opening Session

The opening session was held at the Bandaranaike Memorial International Conference Hall in Colombo. It commenced with the lighting of the traditional oil lamp.

The welcome address was delivered by Mr K. H. J. Wijayadasa, Chairman of the Central Environmental Authority of Sri Lanka.

Dr Nay Htun, the Director and Regional Representative for Asia and the Pacific, United Nations Environment Programme, gave an address.

The inaugural address was given by the Chief Guest, Mr R. Paskaralingam, Secretary, Ministry of Local Government, Housing and Construction.

Finally, Dr J. Kazem, Director of the South Asia Co-operative Environment Programme, gave a vote of thanks.

1.4 Country Presentations

Participants from Afghanistan, Bhutan, India, Nepal, Pakistan and Sri Lanka delivered country presentations. Unfortunately, delegates from Bangladesh, Iran and the Maldives were unable to attend.

- The delegate from Afghanistan described the environmental policies in his country with particular reference to the benefits and possible environmental impacts of agriculture, forestry and associated industries. To implement an EIA process, the country needed considerable financial and technical support.

- The delegate from Bhutan provided background information on the economy and the sources of environmental impacts-especially shifting cultivation, mining and road construction. While the need for environmental planning in relation to these developments was well recognised, the lack of an environmental institution within government has hindered the implementation of an EIA process.

- The delegate from India explained the EIA process that was introduced in 1979-1980. The implementation of EIA has evolved steadily with greater experience and technical resources. This was illustrated in the case of river valley projects where the initial focus on the engineering component has widened to include the river basin as a whole. Emphasis was also given to forest conservation regulations and the need to produce environmental management plans following the EIA.

- The delegate from Nepal described the work of the Environmental Impact Study Project, with particular reference to mountain roads which are a very significant source of environmental impacts in the country. He explained the benefits of this exercise in terms of identifying mitigation measures and management practices. The major constraints in implementing an EIA process more widely have been lack of appropriate legislation and technical resources.

- The delegate from Pakistan described the Environmental Protection Ordnance of 1983 and the various activities aimed at implementation and raising awareness. An EIA process is being introduced and arrangements worked out for its application within the major development sectors.

- The delegate from Sri Lanka presented the procedures for EIA introduced in 1984 and implemented by the project approving agencies. The steps taken to develop guidelines, standards, technical facilities and to improve implementation were also described. The amendments to the National Environmental Act are expected to strengthen the EIA process. Sri Lanka also presented case studies of the EIA of the Mahaweli Ganga development scheme and a "post-EIA" of a tourist development project.

2 FINDINGS OF THE WORKSHOP

2.1. Background to Environmental Impact Assessment

In preparation for the simulation exercises, the participants received briefing notes on the background to EIA. Following a brief presentation by the resource persons, there was a discussion of the essential principles of EIA. The results of this discussion are presented below.

2.1.1. Why is EIA Needed?

EIA is a management tool used for collecting and analysing information about the environmental effects of projects so as to aid planning and implementation decisions. As such it is used to:-

- **identify** potential environmental impacts;
- **examine** the significance of environmental implications;
- **assess** whether these can be mitigated;
- **recommend** preventive, and corrective measures;
- **advise** whether development should go ahead;
- **inform** decision makers and interested parties of environmental implications.

EIA can thus be used to shape projects and to improve the development planning process. It should be stressed that EIA is **not an academic exercise** but a practical management tool.

2.1.2 What Information Is Needed and For Whom?

The information presented in an EIA should be tailored to the needs of users, such as:-

- the **regulator** will need to know the potential environmental impacts and whether these are acceptable;
- the **developer** will need to know where to site a project and how to mitigate environmental implications;
- the **planner** will need to know whether the impacts are acceptable, and whether it will interfere with other uses;
- the **politician** will need to know who is affected, and in what way.

2.1.3 When Should the EIA be Undertaken?

An assessment of the environmental impacts should be made early in the project cycle and should be linked with the particular steps and decisions so that there is time for the information to be used and incorporated into project planning, design and implementation.

2.1.4 Who is Involved in the EIA?

The parties involved in the EIA should include:-

- o the environment agency;
- o the developer;
- o the institution responsible for reviewing the EIA;
- o the ministry with jurisdiction over the development project;
- o other interested or affected groups.

2.1.5 How is the EIA Carried Out?

The EIA typically consists of three stages.

- o **Setting up the EIA:** this includes:-
  - a screening system, based on experience, that would exclude projects which would require an EIA;
  - a preliminary assessment, entailing an examination of what the key impacts are, what information is needed and what the terms of reference should be;
  - identifying alternatives that need to be considered;
  - deciding how the information can be obtained and in what form it needs to be.
- o **The EIA itself:** questions to be addressed include:-
  - the scope of the assessment and by whom and how this should be prescribed;
  - what changes will occur as a result of the project (not just baseline information);
  - whether these changes are significant;
  - whether they can be mitigated;
  - how the EIA will be reviewed;
  - who will review the EIA.
- o **Using the results of the EIA:** this may include:-
  - modifying the designs/processes to mitigate/reduce the impacts identified as well as manage the use of natural resources more efficiently;
  - setting and enforcing of permits;

- instituting, auditing and monitoring measures;

- management of conflicts.

2.2. The Simulation Exercise

2.2.1 The workshop included a casework simulation exercise designed to give participants the opportunity to go through the various steps in the EIA process in relation to a hypothetical project. Participants were given background information about a proposed development and the region in which it was to be located. The participants were divided into working groups and given three progressive tasks, focussed on:

- identifying the benefits and constraints of the EIA process;

- setting up an EIA of the proposed project;

- organising the technical study and presentation of the results.

2.3 The EIA Process

The working groups produced the following conclusions about the benefits and constraints of the EIA process:

o **Benefits:** the inclusion of an EIA in the project cycle will bring various benefits in that it will:

- encourage inclusion of environmental considerations by developers;

- obtain better information about projects;

- identify interests and trade-offs;

- identify management and mitigation measures;

- bring about co-ordination and consultation;

- increase technical expertise and experience;

- facilitate better decisions.

o **Constraints:** there may be various constraints to the EIA process such as:-

- fragmented authority among government agencies;

- power of major development sectors;

- uncoordinated decision making;

- lack of awareness either within central government or at the local level;

- lack of baseline data/evaluation criteria/analytical techniques;

- difficulty of making judgement;

- need for proven mechanisms for environmental mitigation;

- lack of technical and financial resources.

o **The EIA Process:** the EIA process involves careful management and timing in order to fit into the requirements of the project cycle and decision schedule. It will be necessary to involve other parties for co-ordination and consultation. The following elements should be provided for:

  - scoping/initial environmental evaluation/terms of reference: the information requirements for the study are established;

  - preparation of EIA: the type and magnitude of effects and impacts of the proposed activity and of each alternative are identified and described;

  - evaluation/review: the significance of impacts is evaluated and compared with acceptability criteria;

  - action to be taken: possible mitigation measures are assessed and alternatives compared over all impacts;

  - presentation of results: this includes a description of the method and results of the EIA, and should be in a form that the decision-maker can compare with other, non-environmental information;

  - decision making: the EIA report is used along with consideration of other factors and constraints influencing the decision in deciding what action to take;

  - management/monitoring: this involves checking whether the development conforms to the requirements laid down at the planning stage, and judging the quality of the EIA for future reference.

o **Resources:** the resources required for an EIA to be undertaken include:-

  - qualified multi-disciplinary staff: EIA is by nature a multi-disciplinary process and the study group should encompass experts in the various impact categories considered;

  - data-base: this needs to be prepared according to the impact categories being considered and with respect to the evaluation criteria being used;

  - technical guidelines: these may be issued as specific guidance to the study group and may be drawn up during the initial environmental evaluation;

- analytical facilities: various techniques are available to assist in the identification, analysis and selection of alternatives, impacts and key issues;

- administration: this should ensure smooth running of the EIA process, including a comprehensive consultation procedure and integration of the EIA into the central decision-making process;

- monitoring/ enforcement: this is necessary to ensure that proposed mitigation measures are included in the development;

- information management: the information needs to be presented concisely but not over-simplified.

2.4 Setting up the EIA

The working groups presented the following conclusions about setting up the EIA study for the project:

o **Benefits:** the EIA should be set up with the following benefits in mind:

- assessment of the significance of impacts and comparison of alternatives with regard to sites, raw materials, processes;

- identification of trade-offs with other economic activities and natural resources;

- proposals for mitigation measures;

- involvement of affected parties and resolution of conflict;

- presentation of information for decision makers and the public.

o **Organisation:** the EIA must include:

- responsibility for scoping and preparing study;

- co-ordination with sources of information;

- consultation with responsible agencies;

- review of results;

- use for decision making;

- timing in relation to needs of other parties.

o The **Scope** of the EIA must be considered from geographical, temporal, substantive and financial viewpoints, and should include:-

- baseline;

- the major effects or changes;
- comparison between sites;
- action plan for mitigation;
- management/monitoring mechanisms.

o The **Output** of the EIA should include:

- mitigation plan of action;
- improved design of project;
- reduction of conflicts;
- better understanding of needs of other parties.

2.5 The EIA Study

The working groups presented the following conclusions about managing the EIA study and using the results.

The EIA study should have four major components:

o **Work Plan:** this should be designed so that:-

- studies are focused on opportunities for mitigation;
- timing is co-ordinated with needs of planners and decision makers;
- use is made of existing data sources and relevant expertise;
- mechanisms are set up for reviewing progress and discussing issues with interested parties;
- emphasis is on outputs of study.

o **Information Outputs:** these should include:-

- estimates of major changes expected;
- trade-offs between project and other sectors/resources;
- information targeted at design decisions or mitigation plans;
- information outputs linked to specific users; for example: review committees, interested parties, decision makers.

o **Mitigation Measures:** these should specify:-

- resources needed;

- control technology or design feature;
- compensatory measures;
- use of residues;
- treatment and disposal of wastes;
- monitoring;
- implementation requirements.

o **Conflict Management:** this may be achieved by:-

- public education and consultation;
- rehabilitation or compensation for those affected;
- programmes to improve local resources/facilities;
- involvement of affected parties in deciding on appropriate mitigation.

3 DISCUSSION OF ISSUES

3.1 Participants Discussion

Various issues arising from the simulation exercise were raised by the participants and discussed by the entire workshop when it was reconvened after the working groups.

3.2 Responsibilities

Who Should Be Responsible For Doing, Managing and Reviewing the Quality of the EIA?

Participants suggested that the EIA should be carried out by:-

- the sponsoring agency, either with sole responsibility or under guidance from environmental authorities;
- the developer;
- specialist consultants;
- or the relevant ministry, with the help of consultants.

There was general agreement that the management of the EIA should be the responsibility of the central environmental authorities, i.e. a government ministry or, in the absence of such a body, the national planning commission. It was thought that the quality of the EIA should be reviewed by the central environmental agency, or by an interagency committee.

It was also suggested that the relevant ministry should draw up standard formats for EIA's on various project types - either classified by sector or threshold criteria (such as size, cost, etc.).

3.3 Integration

How Should the EIA Be Integrated into the Different Sectors and the Development Planning Process?

It was suggested that the integration of EIA should be done through:-

- the national planning agency, or a central committee with representatives from sectoral agencies (each of which should have environmental units);
- consultation process between sectors and environmental agencies;
- environmental agencies promoting the use of EIA however they can;
- public awareness encouraging other agencies to incorporate EIA;

- increased awareness of politicians;
- institutional arrangements for environmental management during project implementation.

3.4 Effectiveness

How Can the EIA Process be Speeded Up and Used to Improve the Environmental Nature of a Development?

Taken together, these two questions were resolved as follows:

- o The developer could include EIA in the initial development plans.
- o Good use should be made of existing data and expertise.
- o Initial screening and scoping would enable data needs to be tailored to the problems.
- o The process could be speeded up by committees and departments working more efficiently.
- o Standard mitigation measures, criteria or zones for specific sectors should be identified.
- o The report should be shaped to the needs of the decision maker.

3.5 Database

How Important is it to have a Good Database, and How Should this be Established?

Given that better use and coordination of existing data would be of great value, it was suggested that a documentation centre and newsletter be established.

3.6 Resources

How Should Financial and Technical Resources be Identified and Mobilized for Assessment Work?

It was thought that financial resources must come from the project itself. Technical resources could be mobilized through a national roster and from contact with regional organizations.

3.7 General Conclusions

The participants affirmed their commitment to achieving the benefits and overcoming the constraints involved in the EIA process. Most participants were engaged in their governments' efforts to apply EIA more

systematically and with greater effect to major development projects. All recognised that the EIA process can greatly improve the quality of development projects and their implementation when applied appropriately. Equally, they recognised the constraints that faced environmental planners at the early stages of introducing an EIA process.

Naturally, the participants welcomed the efforts of UNEP, SACEP and other international agencies to provide technical and financial resources for improving the implementation of the EIA process. They also were conscious of the political, administrative and technical priorities within their own countries. EIA offers an effective tool in implementing environmental policy, improving development planning and promoting sustainable development, but it is not itself a policy for changing development priorities.

ANNEX A1

ENVIRONMENTAL IMPACT ASSESSMENT IN THE DEMOCRATIC REPUBLIC OF AFGHANISTAN

Afghanistan is a land locked country with an area of 650,000 sq. km., of which 8 million ha. is cultivated, 2.5 million ha. under irrigation. 85% of the population is employed in agriculture. As a focal point for social forestry the Democratic Republic of Afghanistan has undertaken a series of activities in this area, and has achieved progress. Vegetation and ecological mapping play a vital role in designing, formulating and implementing the country's future development and economic plans, particularly in agriculture and forestry. The objective is to prepare an ecological and vegetation map. This unique project is at an advanced stage of completion and is presently associated with a UNDP project. People cultivate poplar trees in close conjunction with agriculture for meeting their domestic needs. Therefore, the initiation of a social forestry programme through research, extensive demonstration and training is urgently needed for the improvement of existing cultivation practices. Creation of large scale plantation of poplars (being the traditionally adopted species) shall substantially fulfil the objective of SACEP in Afghanistan. The implementation of such a programme will offer a valuable opportunity for creation of large scale forests and co-operatives which in turn will strengthen the linkage between the farmers and the government for the overall prosperity of the country.

Afforestation and management is the objective of wood production for industrial and fuel purposes. There exists a lack of technical personnel for approaching the governmental problems in the country. Trained personnel are required for the studies of EIA before the problems become more complicated. Technical assistance from international organisations particularly SACEP in the form of consultants is required for studying and identifying the environmental problems.

This workshop reflects the recognition of the need to co-operate in meeting challenges of environmental hazards and management in our part of the world. Some least developed countries undertake to render finance and come forward to provide financial contributions to ensure such co-operation.

The Democratic Republic of Afghanistan supports the overall goals and objectives of SACEP and is prepared to make efforts towards an effective and useful SACEP role in the Region.

I cannot ignore many other problems which exist in the country, such as waste and air pollution, food pollution and fruit and vegetable pollution, also wildlife, national parks, Bandi-amir (Amir Dam) and so forth. Finally, the need for integrating environmental, economic and social considerations with planning and decision making, strengthens the Environmental Impact Assessment (EIA) process.

ANNEX A2

ENVIRONMENTAL IMPACT ASSESSMENT IN BHUTAN

Bhutan is a predominantly agricultural country with about 90% of the population engaged in the agricultural sector. Shifting cultivation is being practised and in the process, enormous forest resources are being destroyed for want of more land, causing soil erosion and landslides, resulting in floods in lowland areas. In order to prevent this, the Royal Government of Bhutan encourages terracing of fields and planting of trees. The Government also provides improved seeds, fertilizer, pesticides and also techniques in multiple cropping. In order to prevent erosion, afforestation programmes are also being carried out by the Forest Department and watershed management projects have been introduced in different agricultural projects.

Though Bhutan has little, and light industry, significant impacts upon the environment have been brought about by mining of gypsum, cement, mica, dolomite, graphite, limestone etc. Such mining industries have destroyed forest resources, which are raw materials as well as fuel in some of the wood based industries. As such, to prevent pollution and to protect erosion, the Royal Government has enforced stringent rules on the field of mining, and such mining agencies take up afforestation programmes at mining sites after the mining operations have been completed.

The construction of roads in a mountainous country like Bhutan has been affecting the environment, though these roads are an essential part of communication. Hence the technical cell of the Public Works Department is trying to minimize the impact through its engineering skills as far as possible.

It is very important for Bhutan, being the least developed country, to be conscious of the importance of environmental planning at a very early stage.

Bhutan's environmental needs have to be studied carefully and criteria for development tailored to suit its special characteristics. Sound environmental management and formulation of mandatory regulations should be enacted.

Keeping in view the experience of environmental problems faced by similar countries, Bhutan should also try to set up an environmental organisation at Ministry level, which would deal with the EIA process for any development project to be undertaken. No project so far has been implemented with EIA process due to the lack of expertise or environmentalists of our own. As a matter of fact, since there is no separate Environmental Organisation, it has been difficult to make the EIA process effective.

ANNEX A3

ENVIRONMENTAL IMPACT ASSESSMENT IN INDIA: CASE STUDY OF A RIVER VALLEY PROJECT

The Ministry of Environment, Forest and Wildlife, is entrusted with the responsibility of EIA in sectors such as industrial projects, thermal power plants, mining, development of townships and river-valley projects (multi-purpose, hydro-electric, flood control and irrigation).

EIA Procedure

EIA in India was initiated in 1979-1980, and over the years guidelines/checklists have been evolved for collecting environmental information for scrutiny of the project from environmental aspects. Detailed feasibility reports are prepared at the state level. On receiving complete environmental information a project is discussed in an inter-ministerial environmental appraisal committee for a final decision. When the projects are of major category, field visits are also undertaken for an on-the-spot assessment of the project. Monitoring of the suggested safeguards are ensured through the constitution of Monitoring Groups.

Major Environmental Issues

These include:

- submergence of sizeable forest area;
- loss of flora and fauna;
- rehabilitation of oustees particularly the cases in which Tribals are involved;
- siltation of reservoirs;
- health aspects.

The minor issues could be listed as:

- microclimatic changes;
- seismicity;
- damage due to urbanisation.

All these years more and more emphasis has been on the engineering aspect of a river-valley project. But now is it proposed to adopt an integrated approach covering catchment area, engineering work and commercial area development. Due to lack of this integration, catchments were degraded adding to silting of reservoirs. The potential of irrigation created at such a huge national cost was not optimally utilized. It is, therefore, now proposed to adopt an holistic approach to ensure the complete benefits from the project.

Due to growing energy needs, more and more small irrigation schemes are planned. These projects considered in isolation may not have any noticeable impact, but cumulatively may affect the environment considerably. To take more care of this issue, a River Basin Approach is also proposed. This would require preparation of a master plan for the development of the entire river basin consisting of existing, proposed and on-going schemes. Constitution of a river-management authority is also under consideration for implementation of the schemes on a river.

To maintain the vegetation cover of the country which at present is barely 12% as against the expected figure of 33% the Forest Conservation Act (1980) has been instituted. As per this Act, diversion of forest land for non-forestry purposes would require prior approval by the central government. Utilization of 'X' ha. of forest land, according to the Act, would require reforestation of 'X' ha. of land in non-forest area and 2X ha. of land in a forest area. This is all to ensure maintenance of vegetation cover upon which various ecological systems depend.

For final approval of a given river-valley project, the requirements are:

a) EIA

b) Action Plans on:

- catchment area improvement;
- command area development;
- rehabilitation Master Plan;
- detailed plans of protection of wildlife;
- time targeted compensatory afforestation plan;
- geomorphological studies of rim of the reservoir for its stability;
- detailed monitoring mechanism.

ANNEX A4

ENVIRONMENTAL IMPACT ASSESSMENT IN NEPAL: CASE STUDY OF A ROAD PROJECT IN THE NEPALESE HILLS

Road development plays an important part in the Nepalese economy. Planning, construction, management and supervision of roads are generally carried out by His Majesty's Government Roads Department. Local people or local communities also construct roads (generally fair weather) in co-ordination with the Road Department. There are altogether 5925 km. of roads of which 2724 km. are black-topped and the rest gravel and fair weather.

Mountain and hills occupy 2/3 of the country. The topography is rugged. The geology is weak and the rainfall (89%) is in the form of monsoon. Hence, road construction in this region, without environmental considerations being taken into account, may lead to serious problems for the natural environment.

Two roads (one is finished and black-topped and the other still needs to be improved and black-topped) were taken as case studies in order to know their present impacts on the environment. The study was done by the Environmental Impact Study Project with its own staff, in consultation with the roads department.

Since there exists no fixed methodology for EIA, baseline environmental information was collected through developing questionnaires, checklists and using existing information. Impacts were identified, evaluated and assessed through value judgement.

In both cases, forest clearance on both sides of the road is a common phenomena.

Erosion is common on uphill as well as downhill sides, at several places. Unscientific road drainage has created new gullies on the sides of the roads. An increase in traffic has led to noise and dust pollution and has also increased the risk of road accidents. Movement of more people has resulted in transfer of vector diseases and other crimes, which, in turn, has created insecurity in village life.

It has been observed that road construction has given certain benefits to the local people such as: employment generation, enhancement of cottage industries, income from visitors, income from taxes, enhancement of rural development and quick health services.

It has been recommended that there should be an integrated approach in order to help the development of growth centres as well as the hinterland to co-exist. Improvement of the road drainage, minimum amount of slope cutting, construction of retaining and breast walls, minimum use of heavy machinery and blasting, and re-vegetation on exposed slopes have also been suggested.

The Environmental Impact Study Project has been entrusted by His Majesty's Government to carry out EIA, but it lacks proper legislation and technical expertise. Although the 7th Plan (1985-1990) has made EIA mandatory for all the development projects, it lacks proper implementation. Recently, the National Planning Commission has opened a new section on environment and this will probably be able to pursue the EIA. Also His Majesty's Government's attempt to enforce separate environmental legislation would help to fulfil the task more effectively.

ANNEX A5

ENVIRONMENTAL IMPACT ASSESSMENT IN PAKISTAN

Pakistan Environmental Protection Ordnance 1983

Pakistan Environmental Protection Ordnance 1983, has been promulgated and enforced with effect from February 1984. It extends to the whole of Pakistan and its territorial waters, exclusive economic zone and historic waters. Under the Ordnance, Pakistan Environmental Protection Council and Pakistan Environmental Protection Agency have been established. The Council is headed by the President of Pakistan. The Chief Executive of the Agency is a Director-General who is appointed by the Federal Government. At present its functions are being discharged by the Secretary, Ministry of Housing and Works. The Council is a policy making body and has been assigned specific functions as detailed in the Ordnance. The Agency is the executive arm of the Council.

Environmental Quality Control Standards

The concerned E&UA Division has recently finalized Environmental Quality Control Standards for municipal and industrial wastes with the help of local and foreign experts. Institutional infrastructure at Federal and Provincial Government level required to enforce and monitor the Quality Standards has also been evolved. Initially, the Quality Control Standards will be relaxed and a 1 year lead time will be given to the existing industries and the municipalities to set up treatment facilities. After 5 years from the date of effectiveness of these standards, the ultimate standards would be enforced without any exception. The industries set up subsequent to the effective date, however, shall be required to follow the ultimate standards. These measures are, therefore, hoped to go a long way in mitigating the pollution caused by industrial and municipal wastes in Pakistan to a great extent.

Environmental Management Training

To conserve and optimally utilize the country's natural resources and to organize the development process in the best interests of healthy environment, environmental management training for the government functionaries is being introduced in the country. The training would be imparted at the Government Training Institutes as part of the in-service training and would be made obligatory for all government officials. Details of the curriculum and teaching kits are being worked out in consultation with ESCAP. The latter has recently fielded a Mission for this purpose in Pakistan. The Government also plans to organize a regional Seminar on Environmental Management soon after the basic requirements to impart training are finalised.

Environmental Impact Assessment

To ensure the integration of environmental dimensions in the development process, the requirement of carrying out Environmental Impact Assessment at the planning stage is being introduced in Pakistan. Specific instructions in this regard have been issued at Federal and Provincial level. It is backed up by the force of law through the provision of this requirement in Pakistan Environmental Protection Ordnance

1983. To give incentive to the industrialists, the Government of Pakistan has allowed duty-free import of anti-pollution equipment/devices into the country. The ESCAP is also helping Pakistan in the development of detailed guidelines for carrying out EIA of development projects in all sectors of the economy.

Environmental Education

A three year comprehensive project has already been taken in hand by the Government in the area of Environmental Education. The main objectives of the project are:

a) to conduct curriculum research and development for incorporating environmental topics in school curricula and to produce model curricula;

b) to involve teachers/professors and other educationalists in the development of curricula for Middle, Secondary and Higher Secondary levels;

c) to infuse approach at the middle and secondary school level;

d) to organize training programmes and workshops on environmental education and management for educationalists, decision makers, planners, administrators and trainers.

Environmental Profile of Pakistan

An Environmental Profile of Pakistan defining in greater depth the issues, problems and priorities and providing direction in future efforts to deal with the management, conservation and rehabilitation of the Environment and Natural Research is under preparation. It is expected to be completed by the end of March 1986. This would then provide a firm base for reviewing the work being done on National Environmental Policy for its finalization.

National Conservation Strategy

For the conservation of natural resources the Government has decided to formulate a National Conservation Strategy (NCS) which is synonymous with the National Environmental Strategy. The NCS is intended to pursue the objective of defining policies, plans, organisation and action to:

- ensure the sustainable use of Pakistan's natural resources;
- preserve the genetic diversity of Pakistan;
- maintain essential ecological processes.

(The Strategy will also provide the basis to develop the means to avoid costly mistakes in the future use of resources; identify and draw attention to new techniques and technologies for resource conservation and improvement in many cases; expand economic and social opportunities and offer opportunities for better human welfare with reduced risk of hardship due to environmental deterioration or collapse.) This work will be undertaken with the help of IUCN technical assistance for which necessary spade work has already been done.

ANNEX A6

ENVIRONMENTAL IMPACT ASSESSMENT IN SRI LANKA

Environmental Impact Assessment (EIA) was introduced as a mandatory requirement for all public and private sector projects from 1 January 1984 by a Cabinet of Ministers decision. The Central Environmental Authority, established under the National Environment Act No. 47 of 1980, was designated as the Agency responsible for coordinating environmental impact assessment work with the 15 other agencies identified as project approving agencies. Each project approving agency is responsible for the implementation of the Environmental Assessment Procedures through screening of projects, convening scoping meetings involving all interested parties and ensuring that the developer will undertake a detailed Environmental Impact Assessment where necessary.

The EIA procedures developed consist of 5 major steps, namely:

a) Initial Environmental Examination (IEE).

b) Scoping.

c) Environmental Assessment (EA).

d) Environmental Action Plan (EAP).

e) Supplementary Environmental Report (SER).

The experience in EIA work during the last few years indicates that the majority of the projects can be cleared for Environmental Implications either at the 1st or 2nd stage of the environmental assessment procedure. At either of these stages appropriate mitigatory measures to be incorporated at the design stage of the project itself are recommended for compliance by the developer. Selection of alternative sites, or alternative processes too may be recommended on the basis of information provided in the Initial Environmental Examination and the available scientific and technical data. Since 1984, the Central Environmental Authority (CEA) has devoted much time and resources to strengthen the EIA process by developing environmental quality standards and criteria, environmental guidelines and questionnaires and nominating a network of laboratories that can undertake monitoring of projects for compliance with recommendations. A review procedure has also been developed for the progress made by each project approving agency in the implementation of EIA procedures.

Two large scale development projects, namely, the Accelerated Mahaweli River Development Programme and the establishment of the Industrial Promotion Zone at Katunayake have been subjected to detailed Environmental Impact Assessment even prior to the mandatory requirement of the environmental impact assessment process.

Amongst the major constraints experienced, which could be listed as requiring immediate attention, are the lack of trained manpower and resources, difficulties encountered in predicting and quantifying impacts and lack of adequate scientific baseline data.

It is hoped that with the increasing public awareness and concern over the environment, the proposed amendments to the National Environmental Act and streamlining of the institutional framework for the implementation of EIA procedures, the EIA process will become an invaluable tool for the protection and management of our environment.

Copies of the Handbook on Environmental Impact Assessment prepared by the Central Environmental Authority (CEA) have been distributed to the participants in the Senior Level Expert Workshop on the EIA process.

Annex B
Background Brief Note on Environmental Impact Assessment

(Prepared by Environmental Resources Ltd)

1. INTRODUCTION

This paper has been prepared to provide background information on the stages in the environmental assessment process.

It has been prepared for the Senior Level Expert Workshop to Evaluate Benefits and Constraints of EIA Process in SACEP Countries, Colombo, Sri Lanka, 2-5 March 1987.

1.2 Central Aims, Questions and Difficulties in Environmental Assessment

1.2.1 The key aims of an environmental assessment are to:

- o understand the likely consequences of new developments;
- o identify measures by which the impacts can be mitigated;
- o provide an input to decision making.

The environmental assessment should provide answers needed by policy makers, planners, engineers, affected groups and government agencies to help them understand the implications of proposals and to take the necessary decisions.

1.2.2 The major questions that need answering are:

- o What are the key impacts?
- o What is their significance? to different groups? to different sectors of the economy?
- o What are the mitigation measures? What are the options? At what cost?

The key difficulties involved are:

- o How to be comprehensive and focus on key issues at the same time.
- o How to predict change.
- o How to judge whether impacts are acceptable, and if not how to decide what needs mitigation.
- o How to ensure the information is used to take the necessary planning, design and engineering decisions.

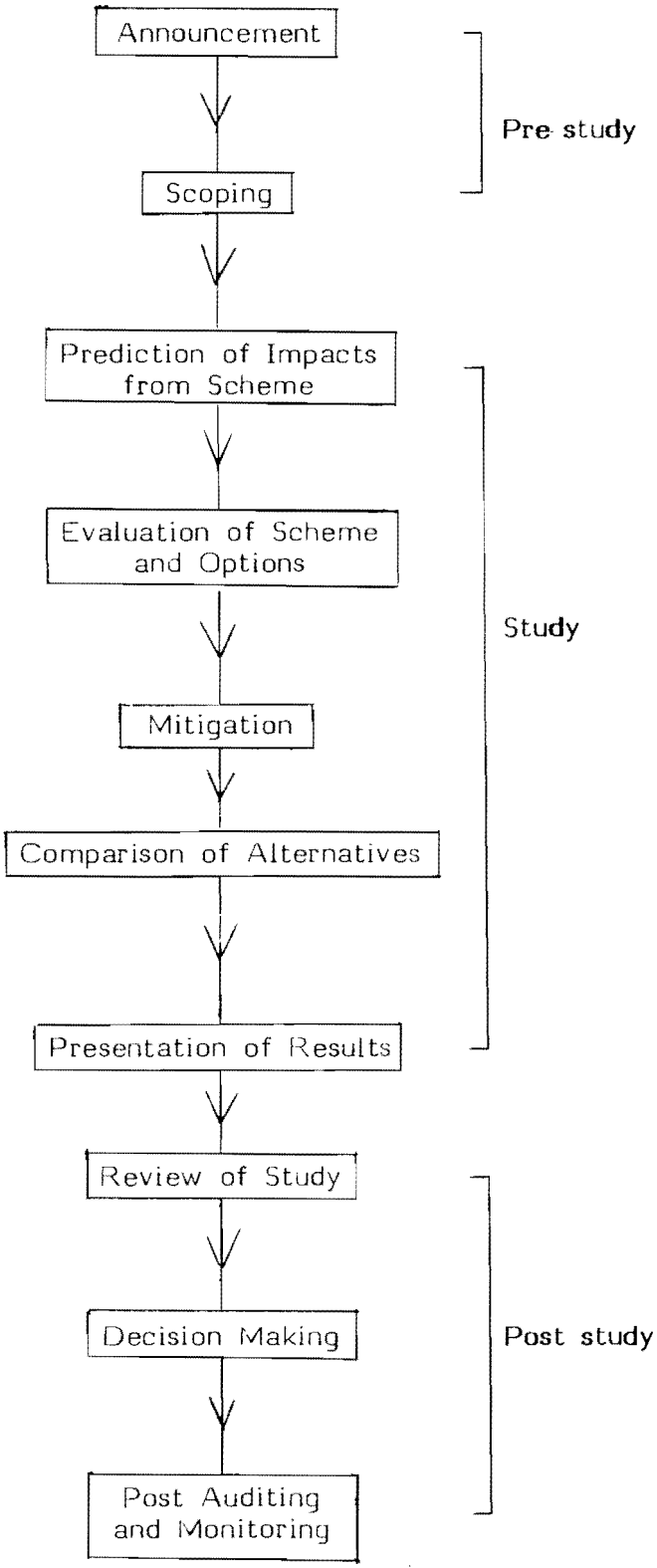
1.3 Aims of this paper

This paper outlines the stages in environmental assessment and identifies specific activities and methods that may assist the environmental impact assessment (EIA) team or decision maker in answering the key questions and solving the difficulties outlined above.

In practice, environmental assessment procedures vary in different countries. This paper is not intended as a guide for establishing a system, but as a background note outlining the key activities and showing how these fit into the framework of assessing the environmental consequences of development.

2. OVERALL PROCESS OF EIA

2.1 An Environmental Impact Assessment in general consists of 10 stages. These are shown in Figure 2.1:



These stages are discussed in Section 3.

Of course, in practice EIA is not usually one single sequence of events. The process is iterative and there is often a need to carry out parts of the sequence a number of times. For example, during evaluation or review further information requirements may be identified before decisions can be taken.

3. PROCEDURES AND METHODS

3.1 Announcement

This first stage of an EIA in the pre-study period involves notifying interested parties of the particular proposal for a new development.

Whether or not this stage occurs in practice very much depends on the system and procedures operating in a particular country. It is only necessary to notify those parties who have the right or duty to comment or review. In many jurisdictions announcement forms the first stage in public participation in the process.

The benefits of early involvement of interestd parties may be reduced opposition and thus easier data access later on in the study.

3.2 Scoping

3.2.1 "Scoping" is a term that originated in the US that describes the stage of establishing the information requirements for a particular environmental impact study. This stage is very important as it can provide clear directions for the EIA work.

Scoping may include the following:

- o Preparation of **background information** on the proposed activity.
- o **Notification and involvement of interested parties** (other than the proponent and the competent authority) and collection of their views on the alternatives and their potential impacts.
- o Determination of the **scope of the study** including agreement on:
  - identification and selection of alternatives to be assessed;
  - identification of important impacts or significant issues to be considered in the study, a key part of this being the screening out of irrelevant issues; determination of how the important impacts are to be predicted, evaluated, etc. and in particular the depth of study required for different impacts;
  - agreement on other requirements for the study and the environmental impact statement (e.g. content of EIS).

The views of interested parties may be taken into account in defining the scope of the study.

- o Preparation of **guidelines** for the study setting out the scope of the study.

  These guidelines may be issued as specific guidance to the study group and set out in writing the agreements reached on the scope of the study during the pre-study stage.

Scoping may continue through the study period as the study scope is adjusted to take account of new information and changing circumstances.

Scoping is an important element in the EIA process as, if carried out properly, it can:

- o provide the link between the competent authority and the study group, so that the competent authority can ensure that the study (and the EIS) addresses relevant topics and presents the results in a form that will be useful for decision-making;

- o enable other interested parties to make their concerns known; the competent authority can, therefore, ensure that the study is a comprehensive examination of the alternatives and impacts that are of interest to all parties;

- o by establishing agreement at the outset on the alternatives and issues to be examined during the study, scoping should help to reduce the possibility that the competent authority or other parties will request further information following completion of the statement.

It is important to note that "interested parties" may include other government regulatory authorities, (e.g. nature conservation agencies) and the public, their representatives and interest groups. Experience in the US suggests that involvement of other parties, particularly other government agencies, is of particular importance for the success of this stage.

The scope of the study also depends on the definition of 'Environment' in the particular jurisdiction. In some cases 'Environment' is defined narrowly to include only pollution aspects (air, water, noise, waste) of a scheme while in others the term may be used more widely to include socioeconomic effects.

3.2.2 Various techniques have been developed to assist in the identification and selection of alternatives, impacts and key issues. These include checklists and consultation. These are described briefly below. The reader is referred to the reference section at the end of the paper for more detailed information.

i) **Checklists** are the simplest aid to identifying impacts. They may provide a list of potential environmental aspects which may be affected, or of actual impacts, or they can provide lists of questions on alternatives or mitigating measures that should be considered. They provide a useful check by which the absence or presence of factors can be noted. Many EIA guidelines from national and international sources contain checklists which may be helpful in scoping.

ii) **Consultation.** The key issues will depend on the concerns of the various parties affected. Advisory groups, questionnaires, public hearings and expert panels can all be used to involve and obtain information from interested parties.

3.2.3 In the pre-study period it will of course be necessary to refer to any guidelines on scope of EIA (including definition of 'Environment' and on procedures for scoping (including timing and requirements for participation) that may have been drawn up in the particular country. For example in the Netherlands and the US there are clear procedural guidelines for scoping, allowing a period of time for comment and suggestions from interested parties. In the USA there are procedural requirements specifying the format and content of Environmental Impact Statements.

There may also be international requirements such as World Bank guidelines that will need to be taken into account and will again effect the scope of the study.

3.3 Prediction of Impacts

3.3.1 The main activities at this stage are:

Identifying and describing the type and magnitude of effects and impacts of the proposed activity and of each alternative:

In particular:

- o identifying/quantifying causes of impact (discharges, etc);
- o identifying/quantifying direct environmental impacts in short and long term;
- o identifying/quantifying indirect and secondary environmental impacts in both short and long term.

The main impact categories may include:

- atmospheric pollution;
- water and soil pollution;
- noise;
- effects on fauna and flora;

- effects on landscape and visual impact;
- human health impacts.
- socioeconomic impacts.

Impact prediction for each involves markedly different data requirements and the monitoring methods and models available also vary widely.

The data requirements will of course depend on the units in which the evaluation criteria are expressed (see 3.4); if the air quality standard is in annual average ug/m^3, then this is the form in which air pollution needs to be predicted.

Table 3.3

Impact Category	Examples of effects requiring predictions	Examples of models/ methods available
Atmospheric Pollution	Change in levels of substances in air; physical and chemical changes in climate	Mathematical models, e.g. Gaussian plume dispersion models, physical models, e.g. wind tunnels
Water and Soil Pollution	Effluent discharge causing change in river water quality; leaching into soils and ground water; changes in surface water hydrology	Mathematical and hydraulic physical models
Noise	Charges in ambient sound and vibration levels, human annoyance	Mathematical and physical models, e.g. for simulating absorption and sound field tests
Flora and fauna	Physical disturbance and environmental contamination of plants and animals and their habitats	Empirical dose-effect and pathway models Habitat valuation methods
Landscape and visual	Physical disturbance, landscape features and characteristics, cultural historic impacts, effects on amenity	Imaging methods, visual mapping Site line analysis visual mapping, landscape valuation methods
Human health	Air quality, visibility water quality, noise, etc	Dose-effect and pathway models
Socioeconomic	Effects on employment, communtiy characteristics, infrastructure, local economy	Use of multipliers, attitude surveys

Although it is difficult to generalise, many EIA's do not require expensive modelling efforts in order to provide answers at a sufficient level of detail to satisfy the needs of the users. Simple models provide estimates which, given the enormous uncertainties in environmental systems, are sufficient as a measure of the extent of change. Complex models take account of more variables, but the uncertainties remain and an honest analyst may still be unable to present the decision-maker with a more accurate answer.

3.3.2 Uncertainty in Prediction

Even if there is adequate time and money to carry out a proper environmental assessment it must be recognised that there are considerable **uncertainties** associated with environmental prediction.

This is because:

- Firstly the **environment is a complex, dynamic system** involving interactions that are difficult to determine and often poorly understood. As a result, there is often no way of making an objective prediction of the likely extent of impact. It is then necessary to rely on expert judgement; such judgements take account of characteristics and relationships within the system, how these may change in the future and how they will be affected by the proposed activity. Scientific experts often differ radically in their assessment of future impacts.

- Secondly, those changes that are of particular interest and relevance to a decision-maker are often those that are **impossible to quantify:** e.g. loss of an area of ecological importance. Alternatively, it may be possible to make predictions about the environmental change (e.g. the effect on water quality) but then there will be no basis for assessing the consequential loss (e.g. of fish). As a result there is a tendency in environmental assessments to predict what can easily be predicted but not provide information that is relevant to the eventual decision.

- There is also the **problem of where to stop.** Any major new development will give rise to secondary associated developments which will in turn bring about consequential changes. For example, a major new town is likely to boost the size of the local villages, bring about larger roads, etc. in the area and at the same time cause other changes in the rural economy of the surrounding region. At what stage does the study team ignore further consequential impacts of these induced developments?

Uncertainty is an unavoidable component of all predictions and it needs to be made explicit and managed in an EIA if a decision-maker is to understand the full implications of different alternatives.

Various methods have been developed to manage uncertainty in e.g. data collection, model selection and development, and presentation of results. These include the use of probability and probability elicitation methods, error analysis, sensitivity analysis and the use of different techniques for presenting and explaining uncertain results.

Detailed information on these techniques can be found by referring to the references provided at the end of the paper.

3.4 Evaluation

The key activities at this stage is the evaluation of the significance of impacts, that is, judgement about which impacts found in the study are considered important and therefore need to be mitigated. The acceptability of impacts can only be decided by comparing impacts with pre-defined acceptability criteria. For example, air quality standards existing in the country provide an indication of acceptable pollutant levels. Where standards have not been developed, standards and guidelines established in other countries may provide useful guidance on impact acceptability. Where no standards or guidelines exist, the EIA study team may need to define acceptability criteria based on their own professional judgement and knowledge of the field. The process of evaluation thus involves:

- defining criteria for acceptability;

- comparing the impact levels with these criteria.

The criteria for acceptability need to be made explicit when presenting the study results.

3.5 Mitigation

Assessment of mitigation measures is an integral part of EIA and an activity of key importance in the overall process. Information on measures available to reduce, prevent or compensate for impacts and their costs has a major role to play when weighing up the alternatives at the decision-making stage.

In most cases, a preliminary evaluation of the significance of impacts will be carried out in parallel with impact prediction to identify those key areas requiring particular attention in terms of impact mitigation. This will be followed by an assessment of mitigation measures available and appropriate given the particular nature of the problem and circumstances.

Because of the considerable uncertainties associated with prediction, it is not unusual for the decision group to be faced with the information that there is a low probability that a particular undesirable effect will occur. There is then the choice of spending additional money to reduce that risk or taking some other form of action. Such action may involve monitoring the change and taking action at a later stage if necessary; but for some risks this option may not be available. It is important that these risks are handled explicitly, with a clear statement of the decision and the contingencies planned.

Thus the mitigation plan drawn up by the EIA study team may include:

- technical design features to mitigate certain impacts at the development stage;

- monitoring plans to check that impacts stay below acceptance levels during construction and operation of the scheme;

- contingency plans to manage any risks that may occur as a result of the development in the future.

The mitigation stage will involve repredicting and reevaluating impacts to determine whether the measures lead to acceptable levels of the impacts.

Comparison of Alternatives

In this stage the alternatives are compared over all impacts. The level of assessment at this stage very much depends on the requirements of the EIA laid down at a national level or requested by those commissioning the study. Thus, this stage may involve:

- simple comparison of alternatives by presenting the information in a particular manner;

- actual selection of the preferred alternative using evaluation methodologies.

Methods for simple comparison include matrices, ranking and rating.

Matrices are useful for organising and presenting information in a systematic way. Various approaches have been developed where, for example, the degree of uncertainty of significance of the impact described in the matrix is highlighted using various symbols and colour codes.

In cases where the information on the predicted size of the impacts is insufficient for comparison, base measurements can be transformed into subjective terms using value judgements, by employing ranking and rating techniques.

Ranking is the ordering of alternatives into ranks which may be:

- numerical (first, second, third, 1, 2, 3);

- alphabetical (A, B, C, D);

- verbal (good, better, best).

Rating is the expression of impact using a scale which reflects the relative difference between alternatives.

This may be:

- verbal (no impact, slight, significant, major and can be described by numbers or letters);

- numerical (where alternatives are scored on a scale of impact, eg, 0 - 10).

These descriptive and numerical values form **scales** which provide a measure of impact based on significance rather than physical magnitude. The use of these scales for impact evaluation, in particular numerical scales, facilities explicit **amalgamation.**

Methods for defining the prefered alternative include weighting and scoring and other multi-criteria methods, dominance analysis and pairwise comparison.

The reader is refered to the reference section for more detailed information on these methods.

Great caution needs to be taken when using any of the methods listed above. Quantitative approaches, in particular, that develop some kind of score to aid in the amalgamation and synthesis of information on impacts, although attractive have serious pitfalls. The reasons include the following:

o Firstly and crucially they rely for the formulation of the scores, on the judgements of a particular group (often just the study team but a wider population is sometimes canvassed). The results therefore only reflect the opinion of this group.

o In practice a decision often rests on one or two issues on which full information is required; by following a scoring procedure for all the issues there is a danger that certain detailed information required by the decision group is obscured (by conversion to a score).

o In developing quantified approaches, there is a danger that the resulting numbers do not reflect the significance of the original impacts but once numbers have been produced they take on a significance of their own.

In addition they are often complex, requiring considerable skill and time if they are to be properly used; and it is often difficult for the non-experts to understand how the conclusions have been formed. It is important to remember that EIA's are addressed to non-experts (politicians, administrators, industrialists and the public) as well as to experts.

There is, however, undoubtedly need for guidance on how to overcome the problems and pitfalls in comparing alternatives in an environmental impact study in producing an assessment that meets the needs of the decision-maker and public.

The following points are recommended when evaluating impacts:

- o wherever possible, the impacts should be described in the units in which they were measured;

- o verbal rating should be used in preference to ranking (since ranking provides less information and observes the extent of the differences);

- o verbal ratings should be used in preference to numerical rating (since numerical ratings give a spurious suggestion of accuracy and objectivity and can tempt the user to add numbers and encourage the reader to convert all the impacts to a common scale by weighing and summing to give total scores which as well as the problems above are often wrongly executed);

- o where possible, there should be explicit identification and presentation of the views of different groups.

3.7 Presentation

The main activity at this stage is preparation of the report of the environmental impact study, (an Environmental Impact Statement (EIS)) or some other form of presentation.

In general the EIS is likely to be aimed at two audiences.

- o Firstly the decision-maker(s) who will use the report to assist him in making his decision on the proposal. The decision-maker therefore needs a document that:

  - addresses the issues relevant to the decision;

  - expresses the information in a form that he can easily make use of (and in particular that he can relate to information available to him on other aspects of the proposal);

  - and that is clearly presented and easily understandable.

- o Secondly, the report may be more generally read by other interested parties including elected representatives, local and central government officials, regional inspectors, provincial and municipal politicians, representatives and officials as well as members of action groups, individuals directly affected by the decision and members of the general public. The report will therefore need to show clearly that the different issues of concern to them have been properly examined and presented and the EIS needs to show clearly the environmental implications of all the "reasonable alternatives".

In general, an environmental assessment presentation should meet the following requirements:

i) The information should be clearly presented. It should be possible for the reader to understand how the conclusions have been developed.

ii) The impacts on different groups and interests in the community should be clearly shown.

iii) Where relevant, information should be presented on the different phases of the activity and on indirect, secondary and cumulative impacts.

iv) The methods used to make predictions and extent of uncertainty associated with the predictions should be described.

v) The criteria used in evaluation should be explicitly stated.

vi) The information should be in a form that the decision-maker can compare with other, non-environmental information. For this reason information relevant to the decision should not be presented only in the form of ranking, rating or scoring. The information needs to be concise but not degraded through over simplification.

vii) Where possible, the information should be organised to highlight the most important impacts associated with each alternative.

viii) The presentation and the methods used should be understandable to the non-expert.

ix) Information on mitigation measures and on residual impacts should be summarised clearly in the report under the relevant impact categories.

3.8 Review

At this stage the environmental impact report should be reviewed in order to see if it is comprehensive and acceptable. This may involve simple review by the study team to see if the assessment has been comprehensive enough to provide the necessary information for decision-making. Alternatively, review procedures may require that the report be scrutinized by the courts or by government officials or by an independent body to confirm that the format and content comply with legal requirements. There may also be provision for public review and comment, giving the public the opportunity to check whether their concerns have been adequately addressed and represented in the report.

This stage is also likely to involve a detailed review and reassessment of mitigation measures to confirm that all possible impact reduction methods have been thoroughly examined.

3.9 Decision Making

In this stage the environmental assessment report is used along with consideration of other factors and constraints infuencing the decision in deciding what action to take.

Various methods exist for amalgamating and aggregating information and indicating the implications of choosing different alternatives for decision-making (see 3.6). These include cost-benefit analysis, multi-attribute utility theory and other multi-criteria methods.

Decision analysis is another analytical method that may be useful in decision making. Its particular feature is that it compares the outcomes of alternative actions taking explicit account of uncertainty. It allows the user to incorporate uncertainty into the analysis through the use of subjective judgement and to see the implications of uncertainty to the decision.

References provided at the end of the paper contain detailed information on the above techniques.

3.10 Post-Auditing and Monitoring

It is important to stress that EIA is only one component of continuing environmental management.

Post-auditing and monitoring are important not only for checking whether the development conforms to the requirements laid down at the planning stage, but also useful for judging the quality of the EIA for future reference. Monitoring will indicate how well the actual impacts resulting from the development compare with the predictions made by the study team.

4. GENERAL CONCLUDING COMMENTS - ADMINISTRATIVE AND RESOURCE PROBLEMS IN EIA

4.1 Administrative Problems

4.1.1 Environmental assessments have often been "tacked on" to other studies and not part of any central decision-making process. Inevitably many people form the view that environmental assessments are undertaken more as a public relations exercise rather than for the purpose of providing information that will be acted upon.

In many countries, developed as well as developing, protection of the environment is not a priority. Given other competing priorities the aim of environmental assessment may at best be to minimise environmental impact to the extent that it does not interfere with the implementation of the development.

4.1.2 Timing of the Study

To be effective an environmental assessment should be started as early as possible and in parallel with other studies so that the environmental consequences can be taken into account from the earliest planning stage: advice can therefore be provided on the impacts of alternative approaches to a problem (e.g. oil versus coal fired power stations), to the siting or routing for a new development etc. Mitigation measures can also be incorporated at the project design stage.

It is important that advice on environmental impact should be provided at each stage in the planning and implementing procedures; relegation of such information to a separate report at the end of the development planning process often means that the results of the assessments are ignored by those directly involved in the project itself.

4.2 Resource problems

Environmental assessments are often severely constrained by a shortage of resources.

o Elapsed time

Prediction of the way in which the environment will change following a particular activity requires information about the existing environment. Inevitably the environment changes through the year; and the climatic conditions of a particular year will have a considerable impact. It is not unreasonable, therefore, to suggest that a picture of existing environmental conditions can only be built up by a number of years' field work. If the information is to be available in time for decisions the **actual time** available for field work will in many cases be less than six months. In some cases, depending on the issue under consideration, this problem can be remedied by data from other sources; but more usually it adds another dimension of uncertainty to prediction.

- **Manpower**

  By its nature, environmental assessment requires detailed specialist knowledge about subjects as diverse as plant growth to meteorology, from sedimentation to aircraft noise. A major environmental assessment may require expertise from ten to twenty specialists all of whom need to be experienced in problems of prediction and evaluation.

- **Money**

  Obviously the lack of money equates also to lack of time and manpower. The constraint imposed by shortage of money may mean that it is difficult to carry out a thorough environmental assessment. The range of specialisation necessary may be impossible and it may be impossible to carry out a proper field assessment.

4.2.2 Solutions

There is no ready answer to these problems. It is a question of allocation of resources and to some extent it reflects the priority that is given to environmental impacts by developers and public authorities. With better management of EIA there is more of a chance that:

- valuable results are obtained in short time periods and with minimum manpower;
- time and resources are not wasted on an elaborate EIA where the environmental issues are such that a short review is sufficient.

ANNEX A

ENVIRONMENTAL IMPACT TERMINOLOGY

ENVIRONMENTAL IMPACT TERMINOLOGY

Activity — An activity subject to EIA, either a policy (including legislation), a plan (including strategic and local land use plans and programmes) or a project (normally involving construction, engineering or other works).

Alternatives — Alternative means of achieving the objectives of an **activity**, including alternatives to the proposal and alternative means of achieving the proposal (alternative sites, processes, schedules, etc.).

Amalgamation — Data or information on a number of different **impacts** can be implicitly or explicitly amalgamated to summarise the results. Explicit amalgamation would usually involve **weighting** of **scored impacts** and their summation to give a total impact score.

Cause — The characteristics of an **activity** that causes an **effect** in the environment.

Competent Authority — The authority responsible for ensuring an EIA is carried out.

Decisions — The decision on whether or not an **activity** should proceed, and if so, in what form.

Decision factor — A factor to be considered in the **decision.**

Decision maker or group — The individual or group responsible for the **decision.**

Environmental impact — See **impact.**

EIA — See **Environmental Impact Assessment.**

EIS — See **Environmental Impact Statement.**

Environmental Impact Assessment (EIA) — A **process** whereby an assessment is made of the environmental impacts which may be expected to result from the proposed activity and its **alternatives.**

Environmental Impact Statement (EIS) — The report of an **environmental impact assessment.**

Environmental Impact Study The study undertaken to prepare an EIS.

Guidelines Guidelines are designed to provide rules or guidance for carrying out EIAs. They are usually formulated by governments.

They may be:

- **General:** covering all EIAs for all types of activity.
- **Generic:** referring only to EIAs for particular types of activity.
- **Specific:** referring to the EIA for a particular activity.

Guidelines may be:

- **Procedural,** for example describing the tasks to be undertaken during the EIA, activities requiring EIA and EIS content;
- **Technical,** describing how to undertake the tasks identified (techniques, methods, etc.).

Impact A change in environmental conditions affecting man, man's use of the environment, natural systems or resources. Impacts may be described in terms of a single **impact parameter** (e.g. change in SO_2 concentration) or a combination of **impact parameters** grouped into an index (e.g. the change in an air pollution index based upon SO_2, smoke and nitrogen oxides).

Impact parameter The environmental characteristic measured or predicted to indicate the **magnitude** of **impact.**

Interested parties Individuals and groups concerned with the **activity** and its consequences.

They will include:

- The **proponents:** the individuals/groups proposing the **activity;** for policies and plans, legislative measures and many other major developments, this may be a government or public authority.
- The **competent authority:** the authority responsible for ensuring an EIA is carried out.
- **Regulatory agencies:** national, regional or local authorities responsible for ensuring other regulations are complied with (planning laws, pollution laws, health and safety at work laws, etc.) and their research and monitoring organisations.

- **Interest groups and individuals:** those directly affected by the proposal and those with some form of sectoral interest (e.g. environmental groups, industry groups, other official/non-official bodies, public, etc.). Some interest groups may have statutory interests.

Individuals or groups who have particular responsibilities within the interested parties will include:

- The **study group:** the individual or group carrying out the **environmental impact study.**
- The **decison maker:** the individual or group responsible for deciding whether or not the **activity** should proceed and if so in what form.
- The **reviewer:** the individual or group with responsibility for determining whether the EIA has been carried out correctly and/or whether the EIS is adequate for **decision-making.**

Key Issues — **'Key issues'** or **'concerns'** are topics that are of major importance in a particular EIA and are usually of a general nature (community disturbance, loss of recreational opportunities). It will be necessary to translate such issues into specific **impacts** that are investigated studied during the EIA. The selection of appropriate **impact parameters** to represent these issues is a key to effective EIA.

Magnitude — The size of **impact.**

Method — A systematic, structured approach for carrying out one or more of the stages of the EIA process.

Multi-Criteria Analysis/ Multi-Attribute Utility Theory (MAUT) — Evaluation methodologies:
Cost benefit analysis,
Weighting and scoring, using notional units or a utility function approach.

Pre-study period — The first stage of **environmental impact assessment** during which the EIA **scope** is defined.

Proponents — The individual or group proposing the **activity.**

Ranking — The simple ordering (1st, 2nd, 3rd, etc.) of **alternatives** according to **significance** of **impact.**

Rating — The verbal or numerical description of **alternatives** according to the **significance** of **impact** (see **verbal scales** and **scoring**).

Regulatory agencies — National, regional or local authorities responsible for ensuring laws and regulations are complied with.

Reviewer The individual or group with responsiblity for determining whether an EIA has been carried out correctly and/or whether the EIS is adequate for **decision-making.**

Scoping The process whereby the EIA **scope** is established. Scoping is also a term used in the US to describe the formal procedures adopted during the **pre-study period** with particular reference to identification of groups affected by an **activity,** identification and selection of **alternatives** and agreement on terms of reference for the EIS.

Scoring The expression of **significance** of **impacts** in numerical units.

Screening The elimination of an **alternative** because of the relative or absolute severity of an **impact** associated with that **alternative.**

Significance The importance of an **effect, impact** or other factor in the assessment. Significance may be **evaluated** during the **study;** or it may be determined prior to the **study** (e.g. by standards, or other environmental objectives).

Study group The individual or group carrying out the **environmental impact study.**

Verbal scales The verbal description of **alternatives** according to the **significance** of **impact** (e.g. no impact, slight impact, moderate impact, severe impact). This may be done using verbal terms or these terms may be translated into letters, numerals or symbols to represent the verbal scale.

Weighting The assessment of the relative **significance** of different **impacts** to enable the **amalgamation** of **impacts.** In explicit weighting, numerical weights are assigned to each **impact** to allow weighting and summation of **scored impacts.**

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Annex C
Casework Simulation Materials

(Prepared by Environmental Resources Ltd)

I DESCRIPTION OF ARCADIA:

ITS PHYSICAL GEOGRAPHY, ECONOMIC BASE AND RELEVANT GOVERNMENT POLICIES

1 Physical Geography

Arcadia is a physically self-contained country bounded by the ocean and a hinterland mountain range, which rises to 5,000 ft. The climate is marine tropic monsoonal.

The land systems are principally mountains, foothills, coastal plain and coastline. The traditional agricultural economic activities follow this natural division with shifting cultivation in the mountains; livestock, plantation and forestry in the foothills; and rice and mixed vegetable farming on the plain. The coastline has always been busily worked for fishing and shellfishing.

There is a major inland lake where fishing and fish farming form an important part of the economy.

2 Economic Trends

Arcadia has changed little over centuries, until about thirty years ago when new communication links gave it greater access to the nation and the outside world through the new port, inter-regional highway and modern international airport. These new communication and transport links were formed to give better access to the inland regions.

Economic activity has changed due to industrialisation, mechanisation of agriculture and competition from other sectors of the economy. This is affecting the settlement pattern, throwing greater pressure on the urban areas, giving rise to increased pollution, conflicts in land-use and potential desertification problems.

Table 1. Trends in Employment: Percentage by Sector

	1950	1985
Agricultural, etc	50.0	25.0
Industrial	15.0	30.0
Service	35.0	45.0
	100.0	100.0

Source: Regional Survey of Population and Business Activity, 1987; National Survey, 1950.

3 Relevant Government Policies

An examination of government policies indicates the following:

(i) Economic objectives

- To develop natural resources and industry where they will promote the national income through generating foreign exchange currency and providing employment.

- To ensure that the location of new residential, commercial, industrial development and supporting infrastructure complements existing facilities and development programmes.

(ii) Infrastructure objectives

- To establish, where possible, that all future residential, industrial and commercial developments have programmed infrastructure (water, sewerage, roads and communication).

- To ensure that the unnecessary duplication of services and facilities, and any under-utilisation, is avoided at the local and provincial levels.

(iii) Environment objectives

- To appreciate the natural inter-relationship of land uses and hence activities which conflict and complement each other.

- To ensure that adverse human impact on the environment is minimised through the use of appropriate pollution control technology.

- To safeguard areas of outstanding natural beauty and ensure water resources are protected.

(iv) Management objectives

- To work towards the co-ordination of development programmes by the respective government departments and provincial administrations.

- To develop pollution control codes and development control procedure at the local administrative level.

II INSTITUTIONS AND LAW

1 Government Structure

1.1 Arcadia has a national assembly presided over by the President.

At the central government level there are:

- sectoral **executive** ministries: for example, responsible for public works, health, education, etc;
- state ministries responsible for **policy and coordination:** these are primarily concerned with sectors that affect a number of different executive departments;
- the interior ministry that is responsible for the provincial level.

1.2 Arcadia has 10 provinces of which Bahara is the most economically developed. The national capital (also called Bahara) is located in this province.

Each province has a provincial assembly. The government structure includes:

- a provincial secretariat (responsible for provincial policy);
- a provincial inspectorate: these work to the executive ministries;
- there are also **state undertakings:** eg, for water supply, etc.

1.3 Finally, there are local assemblies which are run by local mayors. The local government structure reports to the relevant provincial inspectorates but, in political terms, the local assemblies have considerable power.

The structure is shown in Figure 1.

2 Environmental Responsibilities

2.1 National Level

No one ministry has overall executive power. Implementation of environmental management activities falls within the traditional responsibilities of numerous departments and their local agencies.

It was recognised that in order to develop an institutional structure to enable environmental policies to be progressed, it would be necessary to establish a new ministry. It was decided to set up a policy and coordinating ministry under a state minister to be responsible for environment and resources.

The responsibilities of the ministry include:

- protection of the natural environment;
- ensuring the protection of the resource base;
- development and environment;
- population.

The duties of the ministry include:

- to develop policy;
- to coordinate programmes and projects;
- to act as a catalyst;
- to provide information for the other ministries, provincial government, etc;
- to manage conflicts between government departments.

The ministry exercises its power through inter-ministerial committees. It has the strong backing of the President.

There is a considerable body of environmental legislation and this is enforced by the different executive departments (eg, agriculture, Department of Industry, etc).

A considerable amount of the government's resources are used to train groups at the national and provincial level. While they can identify action that needs to be taken, the enforcement duties are carried out normally by the provincial inspectorates.

2.2 Environment Law

The key laws and regulations are set out in Figure 2.

This law establishes basic duties for the protection of the environment. It provides for further regulations, including systems of environmental incentives, environmental obligations to be attached to operating licences, public participation, protection of resources and cultural heritage, provision for environmental quality standards and pollution control.

Considerable progress has been made in the subsidiary legislation.

They are currently drafting regulations to implement an environmental impact assessment procedure.

Figure 1: Organisation of Central and Local Government Agencies

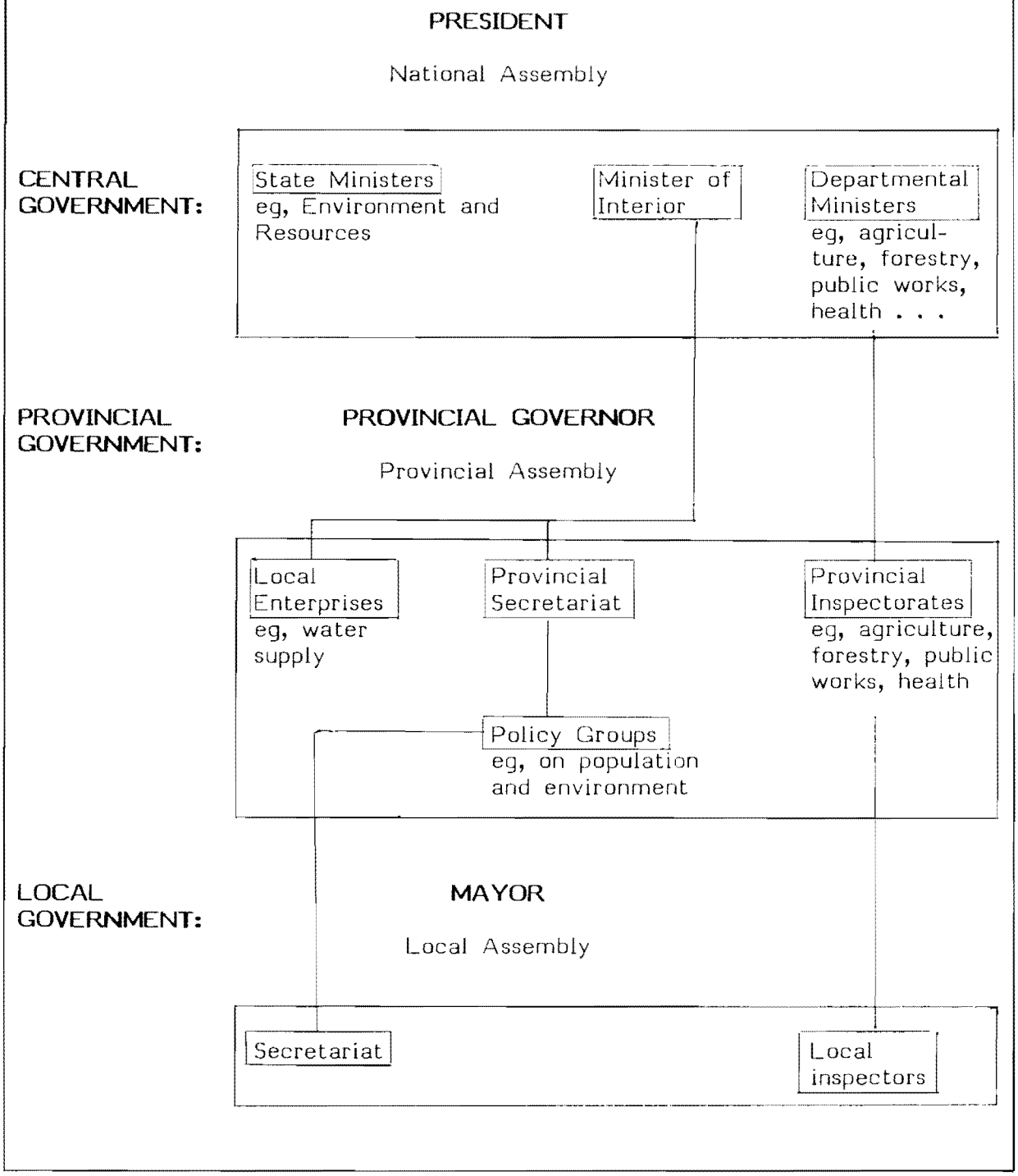


Figure 2: Existing Environmental Regulations

Subject of Laws

Obligation of persons to protect the environment

Protection of the environment to allow future development

Utilisation of man-made resources

Allocation, development, use, reuse, recycling, management and supervision of natural or man-made resources

Protection of inorganic, organic, man-made, and cultural resources

Establishment of environmental quality standards

Analysis of environmental impacts of new development projects

Prevention and abatement of pollution on a sectoral basis

Establishment of institutional mechanisms and agencies

Procedures for awarding compensation to individuals harmed by environmental pollution

Procedures for determination and payment of costs for restoring damaged environment

Liability for damage from pollution of the environment

III THE BAHARA PROVINCE

1 Development

With the exception of some international trade through its port, the province's economy had been little affected by other regions. This situation is now rapidly changing as the economic base shifts from agriculture and local craft industries to mining and light manufacturing industry. Alongside this shift has been the recent construction of major new transport links, notably the new regional highway along the west shore of the lake and the airport.

Within the region population was traditionally distributed between the capital, Bahara City, three urban centres around the lake and Rivertown, inland from Bahara City.

The reasons for rapid growth in Bahara are three-fold:

- there has been a significant natural population increase;
- mechanisation of agriculture has led to rural depopulation;
- industry has provided an added incentive to migration to the towns;
- tourism has developed rapidly along the northern shore of the lake.

The traditional agricultural activities have followed the natural land divisions with shifting cultivation in the mountains; livestock and plantation agriculture and forestry in the foothills; and rice and mixed vegetable farming on the alluvial slopes and valley plains. The lake is intensively fished.

2 Urban Areas

The settlement pattern and location of villages and towns reflects the intensity of cultivation along with the impact of transport and tourism. The five principal towns are:

- Bahara City: the provincial and national capital and centre for adminsitrative and cultural activities as well as for manufacturing, commerce and retail trade;
- Deeport: originally a fishing village, it has grown into a major population centre and port for lake passenger and light freight shipping; industrial activity is mainly in agricultural processing; fishing activities are in decline;
- Laketown: an important tourist centre supporting a thriving freshwater fishing industry;

- Rivertown: an expanding new town based on several old village centres; economic activity is primarily in forestry, hydroelectric power and manufacturing industry;

- Eastown: the only major town to the east of Lake Wye due to the rugged terrain, it is also a port for passenger and light freight shipping, and hydroelectric power, fishing, and forestry form the main economic activities.

In addition, there are many smaller towns and villages with populations ranging from less than one hundred to a few thousand. The principal centres are shown on Map 1.

3 Population

The population of the Bahara Province is just over 4.3 million; the average density is about 360 people per km^2 but 85% of the population live in the urban areas. The dominant trend has been movement towards the larger towns and cities by the young, economically active population, away from the farming and small village sector.

Industrial and transport location factors are superceding the more traditional village hierarchy system based on agricultural service areas as the principal settlement pattern determinant. New processing industries and the growth of the service sector have brought about rapid growth of the larger towns in recent years. The new and expanding industrial base will further encourage urban drift and concentration in the more established towns.

4 Economic Activity

General

The growth in industrial and service activity over the past ten years has been considerable. This has been the primary factor in the increased prosperity of the province, measured by an average annual increase of 6.2% per annum in disposable income per person. In conjunction with this has been a significant rise in regional gross domestic product. This strong economic development, coupled with population growth and movement has placed a heavy emphasis on the need for planned provision of social services (eg, schools, hospitals) and physical facilities such as water supply and treatment, and the maintenance and extension of the road network.

All major economic sectors have increased their proportion of employment except agriculture, which has suffered a reduced work force due to continuing mechanisation and improved methods of agricultural production.

Manufacturing employment has grown, with natural products used increasingly as raw materials, in line with the goal of import substitution.

Because of the lack of a coherent industrial development strategy, much of this development has occurred in an informal fashion as entrepreneurs have responded to new demands from the urban centres. This has resulted in areas of scattered small industry on the outskirts of the main cities, as in the otherwise rural residential and agricultural area west of Rivertown.

Allied to this growth in economic activity has been:

- the expansion of the towns;
- increased employment in construction of buildings and infrastructure;
- growth in personal services, commerce and retailing;
- development of tourism as an employment generator.

Rural Employment

There are about 200 villages in the region occurring singly in remote areas, sometimes as family units or in clusters. Their distribution is a function of the distribution of arable land. The principal villages have prosperous rural service catchments, in addition to important service facilities, which should keep them economically healthy, whereas some of the smaller villages may be expected to be incorporated within expanding urban areas or abandoned.

Agriculture

Farm output has shown a healthy rise with the wide adoption of modern techniques and crop diversification. Plantation crops have extended along the foothills and new intensive animal farms, concentrating mainly on pigs and chickens, are beginning to start up in the lower foothills and the upper slopes of the river valleys to replace scattered, small inefficient farms in rural residential areas. Mixed vegetable and fruit growing and paddy farming are concentrated along the rivers and lakeside.

Fishing

Successful capture fisheries operate from Eastown, although the Deeport fishing industry has declined. There is ample freshwater fish stock in Lake Wye, which is exploited using mostly traditional, but a few modern, vessels.

Power Supply

The oil-fired power station outside Bahara City is the major supplier of electricity to the region's power grid, although the cost of importing oil and maintenance problems make it increasingly less viable.

Hydroelectricity-generating schemes on head waters of the River Cee basin and on the River East have provided an important sub-regional augmentation to the power grid as well as helping the decentralisation of industry and the growth of the forestry industry in this area.

Forestry

Although export quotas have remained stable, there has been a significant increase in domestic use of forestry products. An extensive programme of reforestation has begun in order to stabilise overworked slopes and upland areas resulting from previously poor cultivation techniques and to provide for a future source of wealth in timber products.

Tourism

As the Government sees tourism as an integral part of the region's economic planning, the regional plan will seek to give every encouragement to the successful display and management of such attractions as: the indigenous culture, festivals, scenic and beach resorts and other features of the region.

The old fishing port of Laketown has recently grown rapidly in response to the development of tourism, with particular attractions of nature reserves on Bird Island and the nearby foothills.

IV PROPOSED DEVELOPMENTS:

EXCERPT FROM ENGINEERING CONSULTANTS REPORT

1 Capacity Requirements

Current generating capacity in Bahara Province consists of an oil-fired power station in Bahara City, hydroelectric power plants at the Bahara dam and mini-hydro schemes on the Rivers Aye, Bee and East.

While there is some further potential for expanding hydro-capacity in the region, and a number of mini-hydro schemes have been proposed to support the rural electrification programme, the National Power Commission has concluded that a further 1,700 MW of thermal generating capacity will be needed in the Laketown/Bahara City region by 1990:

- to support rapidly expanding power requirement of the region - growing at 10% per annum;
- to replace the 900 MW of oil-fired capacity in Bahara City, which is now 15-20 years old and uses imported oil as its fuel source.

It is proposed to bring on 4 x 275 MW sets by 1992 and 1 x 600 MW set by 1997.

2 Fuel System Alternatives

Three fuel systems are available for the new thermal station:

- imported fuel oil;
- indigenous coal (to be developed at Minetown deposits);
- imported coal.

Imported fuel oil is considered the least satisfactory alternative, principally on account of cost and the drain on foreign exchange. The preferred option is the use of indigenous coal of 2% by weight sulphur content, and which yields a 15% by weight ash content.

A second alternative would be the use of imported coal of 1% sulphur content and 12% ash content, costing of the order of $40 per tonne. But there are potential problems with the transport links.

3 Siting Options

Four possible sites to locate a new coal-fired 1,700 MW thermal power station have been identified (see Map 2).

4 Impacts of Power Station Development

4.1 Emissions

The principal air pollutants emitted from combustion of coal in high-temperature pulverised coal furnaces, such as those used in power stations are given below, together with estimated total emissions from the completed 1,700 MW power station.

	Emission Factor	Estimated Total Emissions
Sulphur dioxide (SO_2)	40 kg/tonne coal	2.7 kg/s
Particulates (including fine particulates/smoke)	1 kg/tonne coal	0.15 kg/s
Nitrogen oxides (NO_x)	8-13 kg/tonne coal	1.2-1.8 kg/s

4.2 Air Pollutant Impacts

4.2.1 Health effects

Potential health impacts are likely to be the main concern of emissions from coal combustion in tropical and sub-tropical regions. Table 4.2(a) gives a summary of the likely health effects.

Table 4.2(a): Likely Health Effects

Pollutants	Health Effects
Sulphur Dioxide	Respiratory problems, generally in combination with the inhalation of fine particulates.
Particulates/Smoke	The contribution to ground level concentrations from power stations is generally small.
Nitrogen Oxides	A significant increase in photo-oxidant concentrations in the atmosphere is possible.

4.2.2 Ecological effects

Although the ecological impacts of acid precipitation from short range or long distance transport of SO_2/NO_x emissions is generally of lesser consequence in tropical and sub-tropical countries than in certain northern hemisphere countries, there should be an awareness that adverse ecological impacts in Bahara may in the future be identified.

5 Control Options

The following control options may be considered:

- reducing sulphur level of fuel;
- increasing stack height;
- flue gas desulphurisation;
- NO_X control.

5.1 Lower Sulphur Coal

Imported coal is available at 1% sulphur, costing approximately some $5-8 per tonne less than the 2% sulphur indigenous coal. Using 1% sulphur coal would approximately halve ground level concentrations.

5.2 Stack Height

Increased stack height reduces ground level pollution but the cost increases exponentially with stack height.

5.3 Flue Gas Desulphurisation

FGD removes about 85% of sulphur emissions but the capital cost for the 1,700 MW power station would be very high.

5.4 NO_X Control

This can be achieved through lower temperature combustion but it is unlikely that such control methods would be cost-effective given the number of days in the year when NO_X emissions may be of concern.

6 Effluent and Surface Water Pollution from a 1,700 MW Coal-Fired Power Station and from Development of Perankara Coal Deposits

6.1 Coal-Fired Power Station

Effluent and surface water pollution derive from the following sources in a coal-fired thermal station:

- direct cooling water discharge;
- cooling tower blow-down;
- boiler blow-down;
- effluent from boiler-water treatment plants;
- coal storage run-off.

6.2 Direct Cooling Water Discharge

Direct cooling systems could produce effluent water 5-10°C higher than the local water, although this could be reduced if cooling towers were built. A detailed thermal/hydrological model would be necessary to assess the effects more precisely.

6.3 Cooling Tower Blow Down

A 1,700 MW power station with assisted recirculating cooling system (without mechanically assisted draught cooling) would discharge some 1-3 m^3/s of water containing various chemicals and salts, some of which are added to the cooling water. The latter will include corrosion inhibition/scale inhibition salts such as $FeSO_4$, chromates, alum and certain biocides to inhibit fouling by algal or plant growth. Some concern has been expressed over the use of certain corrosion inhibitors such as chromates and over certain biocides.

6.4 Boiler Blow-Down/Effluent from Boiler Water Treatment Plants

These amount to much smaller volumes of water, containing similar types of salts as those described for cooling tower blow-down, although possibly in rather higher concentrations. Biocides would not be present.

6.5 Coal Storage Run-Off

Drainage of rain water from stockpiles of coal can give rise to quite seriously polluted effluent if not properly controlled. The principal contaminates are iron sulphates from the dissolved pyritic content of coal. Monitoring, and possible treatment, may be necessary for pH, $Fe^{2+/3+}$ and sulphates.

7 Possible Water Pollution from Development of Coal Deposits

7.1 Method of Extraction and Sources of Pollution

The coal deposits mostly lie within 20-70 m of the surface, allowing the coal to be extracted by open-cast methods. This involved removing very large amounts of overburden. The water pollution from the initial top-soil removal and the subsequent mining activities would be of the following nature.

7.1.1 Run-off water

Run-off after storms would give rise to serious associated pollution problems. The disturbed land and overburden is very susceptible to erosion, particularly with light tropical soils. Such erosion effects can be ameliorated by spreading and terracing of the overburden, planting of trees/vegetation and use of ditching and settling ponds. Silting of the streams and the River Aye would, to some extent, be unavoidable.

7.1.2 Groundwater contamination/interruption

Aquifers can become polluted both as a result of disturbance to the water table itself and because of polluted water in the mine leaching to the aquifers. Iron and sulphate contamination are likely to be the principal forms of pollution, along with low pH. The interception of aquifers by mining can mean that local sources of groundwater, used by villages/towns some distance from the site, can be affected.

7.1.3 Water effluent from coal preparation/beneficiation plants

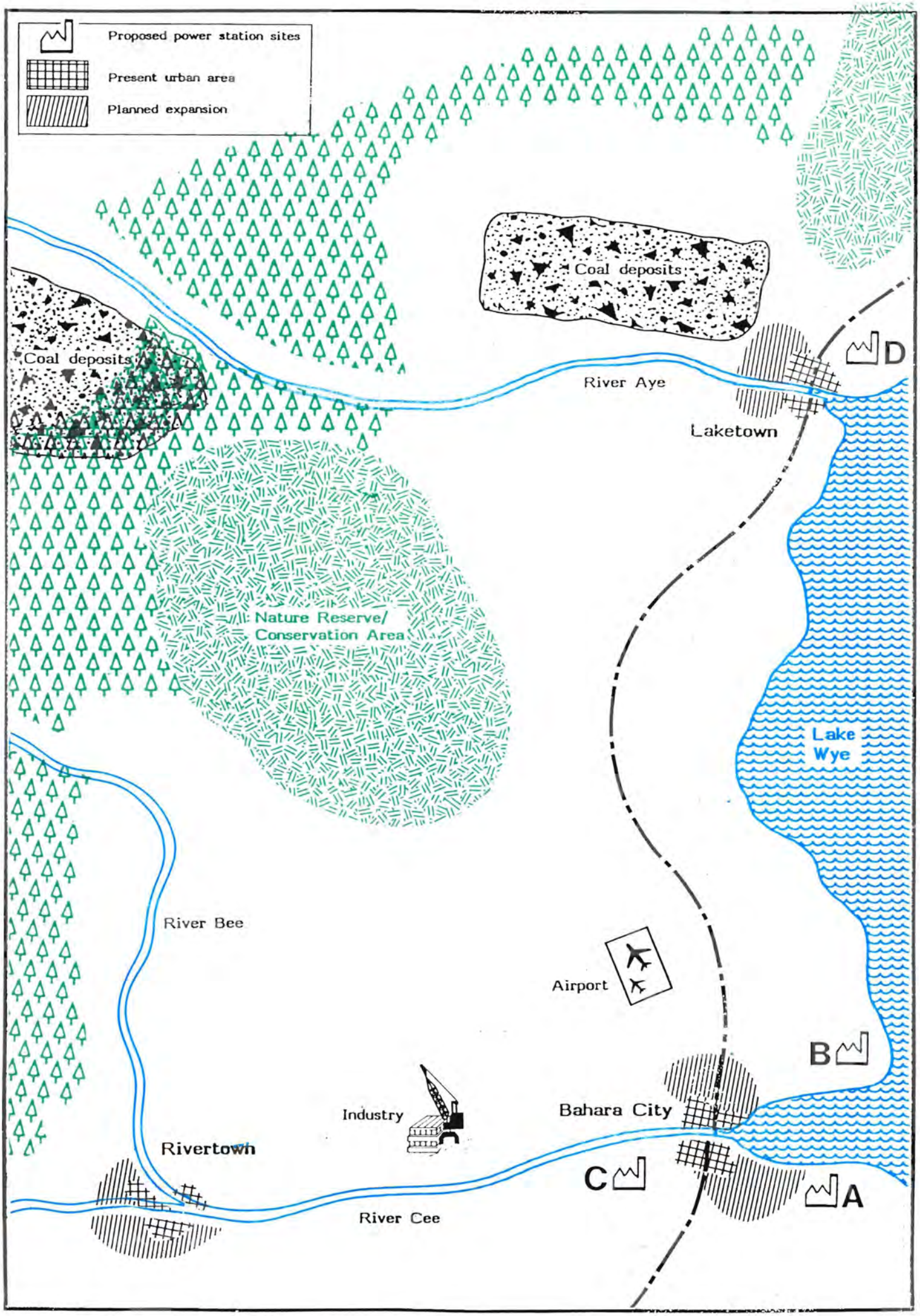
Coal, when mined, contains other solid and metal contaminants, some of which are usually removed, along with a proportion of the sulphur. The treatment generally involves a closed cycle although some storm water overflow and other small sources of effluent from such treatment plants would be likely. The principal contaminants of such effluent would again be solid content, dissolved iron and sulphate, other metals, some toxic to fish, and high pH.

7.1.4 Coal stockpile run-off

Water pollution from this source would be the same as that described for power station coal piles (see Section 6.4).

7.2 Amelioration of Impacts

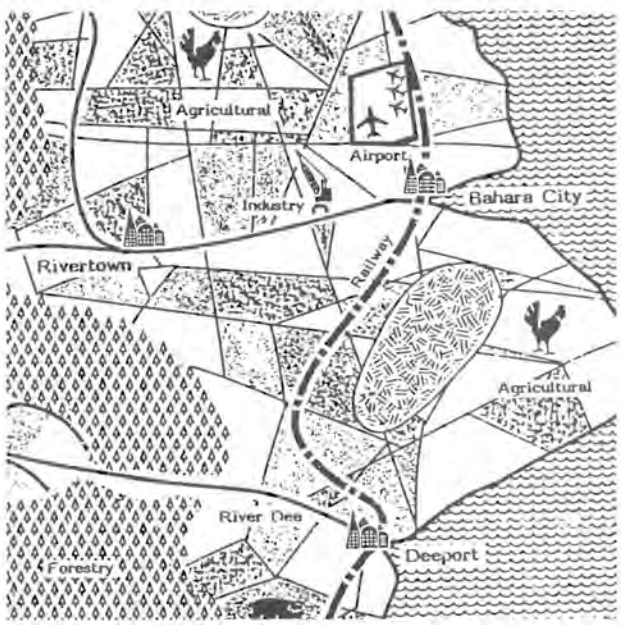
It can be seen that the potential water pollution of the River Aye, and possibly of some local groundwater, could be considerable as a result of the development of the coal deposits. In order to assess the likely scale of the pollution load on the river and to determine optimum means of limiting the pollution effects, particularly that of rain water run-off from the overburden, a pilot coal extraction scheme has been operating for the last 9 months, mining approximately 10,000 tonnes of coal/year. It is not yet possible to draw conclusions on the level of water pollution likely from development of the mine.


Proposed power station sites
Present urban area
Planned expansion
Coal deposits
Coal deposits
River Aye
Laketown
D
Nature Reserve/
Conservation Area
Lake
Wye
River Bee
Airport
B
Industry
Bahara City
Rivertown
C
A
River Cee

EIA Workshop: Colombo 1987

Senior level workshop to evaluate benefits and constraints of the EIA process in SACEP countries

Casework Simulation A



Workshop organised by the United Nations Environment Programme in collaboration with the Central Environment Authority, Sri Lanka with the cooperation of SACEP and funding support from the Government of the Netherlands

March 1987

ERL

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SIMULATION A: INSTRUCTION TO PARTICIPANTS

A.1 Task

You have been selected by UNEP to form a Task Force to help the country of Arcadia to develop its environmental assessment process and draw up the necessary regulations and guidelines. You have been asked shortly after your arrival, to make a presentation to a sub-committee of the Cabinet. This sub-committee includes the Minister of the Environment, Minister of Economic Development, Minister of Agriculture and Fisheries and Minister of Social Affairs.

The aim of this presentation is to convince the sub-committee of the need for environmental assessment, to outline a process and list the types of problems and constraints that they may be expected to face in implementing the process.

The subjects that must be covered in the presentation are shown in A.4 below; you may cover additional points if you feel it appropriate.

A.2 Background Materials

You have been provided with the following background materials:

(i) a short note on Arcadia and its development plans and objectives;

(ii) a short description of the existing government structure and the types of environmental regulations currently enacted;

(iii) a more detailed description of one of the provinces (around the Capital) called Bahara;

(iv) information about a proposed power station and coal field development.

(i) and (ii) you will find of particular relevance. It is not necessary to read (iii) or (iv) in any detail for this simulation.

A.3 Approach

We suggest you adopt the following approach.

(i) Spend half an hour acquainting yourselves with the information about the country and the government structure (background materials (i) and (ii)).

(ii) Discuss what you see as the key benefits and problems associated with environmental assessment.

/contd.

(iii) Discuss what organisational and regulatory approaches can be used to ensure that the maximum benefits are achieved and the difficulties are overcome.

(iv) Discuss how you would advise Arcadia to implement an environmental assessment process, taking account of these points.

(v) Prepare the presentation.

A.4 **Presentation & Outputs**

A written presentation covering, at the maximum, two sides should be prepared.

It should cover the following points:

- aims and benefits of implementing an environmental assessment process in Arcadia;
- a summary of potential difficulties that will need to be overcome;
- key points that you would recommend in relation to designing an environmental assessment process (eg, when is an environmental assessment required, what should it cover, who should be responsible for what aspects);
- the likely resource implications (people, time, money).

The presentations will form part of the output of this workshop.

EIA Workshop: Colombo 1987

Senior level workshop to evaluate benefits and constraints of the EIA process in SACEP countries

Casework Simulation B

Workshop organised by the United Nations Environment Programme in collaboration with the Central Environment Authority, Sri Lanka with the cooperation of SACEP and funding support from the Government of the Netherlands

March 1987

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Environmental Resources Limited
106 Gloucester Place, London W1H 3DB

SIMULATION B: INSTRUCTION TO PARTICIPANTS

B.1 Task

The Government of Arcadia were so impressed by the advice that you gave on the environmental assessment process that they have asked UNEP to allow you to return to help sort out a major environmental issue that has arisen.

As the attached newspaper cutting shows, there is a need for additional electricity-generating capacity but there is major concern that this will damage the environment and associated economic activities.

You have just arrived, you have been asked to study the background documents and make a presentation to the same sub-committee of the Cabinet as before. This presentation is designed to convince the Government of the need for an environmental assessment, how it should be carried out and who should be involved. The presentation should cover the subjects listed in A.4.

You have been warned that some members of the sub-committee are very hostile to the idea of an environmental assessment; they believe it will merely delay the building of the power station and achieve little else.

B.2 Background Materials

In the background materials with which you have already been provided you will find: (iii) background information on the Bahara region; (iv) information about the proposed development.

You can assume that even though the Arcadia Government may not have taken all your advice in relation to the proposed environmental assessment process, they will provide the necessary institutional and regulatory support for this environmental assessment.

B.3 Approach

We suggest you adopt the following approach.

(i) Study the attached newspaper cutting and the two maps. Additional information, should you require it, about the province and the proposed development are included in the background materials (iii), (iv).

(ii) In relation to this particular development, decide why an environmental assessment is needed and what you see the specific difficulties to be.

/contd.

(iii) Discuss how to implement the work, who should be responsible, who should be involved, how the work should be carried out, how long should be allowed for the work, etc.

(iv) Discuss how and when the information should be used and by whom.

(v) Prepare a presentation under the headings set out in B.4 below.

B.4 **Presentation & Outputs**

A written presentation covering, at the maximum, two sides should be prepared.

It should cover the following points:

- what are the likely benefits of an environmental assessment being carried out on the proposed power plant;
- organisation: who should be responsible, who should be involved and in what way;
- what should be the general scope of the assessment: what information is required by whom and at what time;
- other advice.

The presentations will form part of the output of this workshop.

SIMULATION B (Attachment)

Extract from the Bahara Times

"NEW POWER STATION WILL DAMAGE TOURISM, FISHING" SAYS UNIVERSITY EXPERT

Addressing Parliament yesterday, the Minister for Environment and Resources said that he was aware of the claims being made by Professor Zed that the proposed new power plant would have disastrous consequences for the tourist industry around Laketown as well as local fishing interests. He stated that it was government policy to ensure the protection of the country's resource base; but at the same time, he criticised the conservation interests for alarming the public before any decision had been made on the siting of the plant or the development of the coalfield.

In a separate statement yesterday, the Chairman of the Bahara Chamber of Commerce warned members of the Rotary Club that there was inadequate electricity-generating capacity in the province and this was already having an impact on the region's economic development. He stated that the proposals to expand the hydroelectric generating capacity would provide too little, too late. The only solution was a crash programme to build a coal-fired power station.

The Rotary Club meeting was chaired by the Minister of Recreation. He sympathised with the need for more electricity but added a note of caution. Tourism, he said, was a major money-earner for both the region and the country as a whole. The investment decision for the Bahara airport assumed that this would attract a major increase in tourism. This was proving to be the case: the lake, the bird life, the spectacular scenery, had made the Laketown Resort Complex a major success. There was serious concern that coal mining, let alone a power station, would have a major impact on the river and the northern shores of Lake Wye.

EIA Workshop: Colombo 1987

Senior level workshop to evaluate benefits and constraints of the EIA process in SACEP countries

Casework Simulation C

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March 1987

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- what are the information outputs: what information is to be used by whom and when;

- what possible mitigation measures do you plan to investigate;

- where there are conflicts in relation to land and water uses, etc, how will you propose that decisions are taken?

The presentations will form part of the output of this workshop.

SIMULATION C (Attachment)

Excerpts from Government Reports

1 **Report from Ministry of the Interior**

'A meeting was held last week with the Mayor and Councillors of the Laketown District. We were informed that there was considerable unrest in the rural areas because of the proposals for coal mining and a new power station. Local farmers fear that they will have to vacate the land as the mining progresses. Villagers fear that the whole area will be laid waste and levels of pollution in the river will damage their water supply and local fishing. Village headmen are concerned that it will entirely change their way of life. The Mayor told our representative that he was fearful that there could be massive local demonstrations'.

2 **Report from the Department of Fisheries, Ministry of Agriculture and Fisheries**

'Our scientists have drawn attention to the sensitivity of lake fish to changes of temperature. There are considerable worries that if lake water or river water is used as cooling water within the power station, then this could give rise to (a) an increase in temperature and (b) the presence of chemicals used to prevent corrosion and algal build-up. They point out that this could lead to a reduction in fish followed by a reduction in the bird life that depends on the fish'.

Annex D
List of Documents submitted by Participants

LIST OF DOCUMENTS SUBMITTED BY PARTICIPANTS

- Environmental Impact Assessment in Bhutan
- Guidelines for Environmental Impact Assessment of River Valley Projects Department of Environment, Ministry of Environment and Forests, India.
- The Environment Protection Act, 1986. India.
- Environmental Impact Assessment of a Road Project: A Case Study in Nepalese Mountains.
- Environmental Impact Assessment in Pakistan.
- Post Environmental Impact Assessment of a Tourist Development Project in Sri Lanka.
- Case Study: Environmental Impact Assessment of a River Basin Development Project in Sri Lanka.

Annex E
Sources of Information about EIA in selected countries

(Prepared by Environmental Resources Ltd)

SOURCES OF INFORMATION ABOUT EIA IN SELECTED COUNTRIES

1. USA

Ms. Anne Miller,
Office of Federal Activities,
US E.P.A.,
201 M. St., S.W.,
Washington D.C. 20460
USA

2. The Netherlands

Ms. Janny Ratelband,
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3 Canada

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Quebec K1A 0H3.