environmental management training

an ILO/UNEP Programme
in support of Managers
and Management Institutions

2 PROJECT MANAGEMENT AND THE ENVIRONMENT

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PROJECT MANAGEMENT AND THE ENVIRONMENT

edited by

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PREFACE TO THE SERIES

Economic development and technological progress can be compatible with reasonable protection of the environment. New environmental management techniques are in use around the world, helping enterprises to meet their objectives of profit, growth and survival, while protecting the environment.

A series of training materials in environmental management has been developed to support environmental management training in enterprises, training centres and institutes, universities, business schools, projects, etc. The series was produced and tested by the Management Development Branch of the International Labour Office for the United Nations Environment Programme (UNEP) in collaboration with several management institutions. The project team was co-ordinated and the materials edited by Dr. R.G.A. Boland of the ILO.

The materials are published in five parts (separate books) as follows:

Book 1 - General environmental management
Book 2 - Project management and the environment
Book 3 - Production management and the environment
Book 4 - Environmental management game
Book 5 - Supporting environmental management training materials

A technical manual **Introduction to environmental management** for managers, trainers and consultants will be published separately.

The ILO wishes to thank the UNEP for having supported the programme and all institutions and individuals who participated in developing and testing for their collaboration. Your suggestions on how this programme could be further improved will be much appreciated.

PREFACE TO BOOK 2
PROJECT MANAGEMENT AND THE ENVIRONMENT

The project management series is aimed at project managers, supervisors and the students involved in development projects which may have some impact on the physical or social environment. The typical learner will have three to five years practical work experience; some environmental management experience is desirable.

The book has been designed so that reproduction of the materials for each unit can be freely made for training purposes, **without** specific permission from ILO/UNEP. However, care should be taken to ensure that the learners **use** but do **not** retain the **case guide** materials, since easy access to case solutions could spoil the learning process for future learners.

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BOOK 2 - PROJECT MANAGEMENT

CONTENTS

GENERAL INTRODUCTION

SCOPE OF ENVIRONMENTAL MANAGEMENT

Environmental management promotes due regard for the physical, social and economic environment of the enterprise or project. It encourages planned investment at the start of the production chain rather than forced investment in cleaning up at the end. It seeks to develop integrated systems rather than unrelated bits and pieces and provides for a good relationship with and concern for the local community rather than paying expensive legal fees to fight it.

Some businesses have long understood that environmental protection and economic progress can go hand in hand, for example:

(a) a chemical company (Europe) with minimal capital investment for recycling its water solvents, eliminated 50 per cent pollution from its operations and saved US $ 400,000 per year;

(b) a manufacturing company (Asia) introduced waste recovery for atactic polypropelene production to improve annual profits by US $ 500,000;

(c) an oil refinery (Europe) turned its hydro-carbon pollution into by-products that produced profits of US $ 1 million per year;

(d) a chemical company (Americas) reduced its annual pollutant load by 75 per cent and achieved cost savings of US $ 2 million per year.

Yet, in many countries, industrial companies failed to train and provide for reasonable environment management. The unfortunate results have received international publicity and seriously threatened the profitability, growth and even survival of these enterprises.

The dimensions of environmental management are increasing each year as governments become aware of the political priority of reasonable environmental protection and its links to economic development and technological progress.

Environmental management covers such **general areas** as environment and enterprise objectives, scope and structure of the environment, interaction of nature, society and the enterprise, environmental impact assessment, economics of pollution prevention etc.; such **project areas** as project development, implementation, monitoring and evaluation; and such **production areas** as production management and the environment, product design, technology choice, waste management and production systems.

NEED FOR TRAINING

Special training is needed to deal with the broadening scope of environmental management since widely publicised environmental incidents have motivated governments towards the stricter legal enforcement of environmental standards. Training must have an impact on knowledge, skills **and** attitudes of managers in order to improve environmental management efficiency and effectiveness.

If a company looks at economic questions in an ecological way and at ecological questions in an economic way, it can focus attention on waste avoidance and efficient operations which can increase **profitability.** By carefully investigating new areas in which to develop new products and services, it can achieve **growth.** By avoiding conflict and winning community acceptance with skillful concern for reasonable environmental values it can improve its chances of **survival.**

Since 1981, the ILO/UNEP project to introduce an environmental management training component into management development programmes has carried out workshops and seminars in Asian countries.

These activities have led to the preparation of a whole series of training manuals and FLPs (Flexible Learning Packages). This material, of proven technical quality and learning effectiveness, is now ready for application to environmental management training in developing countries.

FOR THE OPERATING MANAGER

Environmental management training must be **relevant** to the current problems of both the enterprise and the community. Such training heightens the awareness of operating managers to environmental issues, strategies and alternatives. It helps them to use environmental language and concepts and to seek creative alternatives in anticipating and dealing with potentially difficult environmental situations.

Training for environmental management is essentially **preventive** in that it encourages management policies and decisions which **avoid confrontation** with the community on environmental issues. It helps managers to communicate effectively with technical staff on environmental problems in the search for cost savings or **the generation of new income** for the enterprise.

FOR THE TRAINING MANAGER

The training manager responsible for organising environmental management training, will find ILO materials readily available **to fit local training systems** in companies, projects, etc., since any unit can easily be adapted to include local cases and data.

The whole of the FLP training series in environmental management requires only flip charts, tables and chairs. No expensive equipment is needed. Any one unit may be used independently **or** in a series **or** as part of a longer programme, **or** with additional speakers and materials.

Above all, FLPs are cost effective. They can be run by general management trainers (quickly trained by the ILO), or, when technical specialists are used, the FLP system enables them to be **better trainers,** i.e. with the wide variety of learning materials available in each unit there is less need for long technical lectures and **active** «learning by doing» may be extensively employed.

FOR TRAINERS AND TEACHERS IN INSTITUTES

For trainers and teachers in training institutes, universities, business schools, etc., the ILO environmental management materials are readily available to fit existing programmes.

The instructor can use the materials to lecture formally or can encourage extensive learner participation. No special equipment is required for any of the FLP series; any one unit may be used independently, or in a series, or as part of a longer programme, or with additional speakers and materials.

With such a variety of learning materials available in each unit there is less need for long technical lectures and more opportunity for «active learning by doing». The instructor may select those parts of any unit to be assigned for work before, during or after the formal class sessions. «Active learning by doing» may be employed and the technical specialist is thus enabled to be more efficient and effective in managing the learning process.

FLP MATERIALS

FLP (Flexible Learning Packages) are four-hour intensive learning units which are flexible as to mode of instruction, general and local content, culture, language, etc., and are immediately applicable for use in companies, training institutes, universities, business schools and projects that have an environmental management training component.

Each FLP unit includes a workpack and a case guide and can be used in a variety of ways according to the requirements of the instructor, the learners and the situation. Each unit can be used individually or in a series co-ordinated with other materials and activities. It can be **translated into the local language** and be adapted to include local materials, minicases, exercises etc.

Each unit consists of a workpack and a case guide as follows:

Workpack - retained by participants, includes:

- learning objectives for the unit;
- a study note of about four pages consisting of seven major points (with sub-points) that provide the key inputs which may be supported by learning patterns, programmed learning, films, etc. as appropriate;
- a main case, three or four pages long, highlighting five key questions to facilitate controlled and structured analysis; a second case may be added for special environmental issues;
- four to six minicases covering a whole variety of decision situations relevant to the main topic;
- exercises with solutions to enable the learner to practise appropriate calculations;

Case guide - used but **not retained** by participants (to avoid solutions becoming known to future learners), includes:

- answers to the main and secondary cases;
- answers to minicases;
- quiz of 20 questions;
- answers to the quiz.

Thus the FLP system provides:

- units of environmental management training which fit easily into a general system of management development;
- tests and measures of the need for specific areas of environmental management training;
- training materials that can be used not only by technical specialists, but also by experienced general trainers who may not always be experts in the technical content, but are well able to manage the learning situation effectively;
- cost-effective learning materials which are easily adapted to the varying requirements (time, content and learning style) of the various learning situations of developing countries;
- an action-planning component in each learning unit which encourages the learner to plan the application of newly acquired knowledge, skills and attitudes to specific practical issues.

Overall, FLP is a system of management development which differs from and contributes to conventional methods of training. It combines practical small group activities, studies, case analysis, minicases and exercises in a controlled learning environment which guarantees consistent quality each time. Continuous feedback and monitoring in the learning process ensure that skills are acquired rather than being only partially understood as is sometimes the case with traditional management training methods.

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PROJECT MANAGEMENT AND THE ENVIRONMENT

Unit PM.1 Project Development

International Labour Office Geneva

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Unit PM1: Project development

WORKPACK

(Retained by participants)

Contents

PROGRAMME AND TIMETABLE

		Mode	Time
1.	Introduction	MG	15
2.	Quiz	IND	15
3.	Study/Lecture	SG	45
4.	Case	SG CSG	45 30
5.	Case presentation and solutions	MG	30
6.	Minicases	SG	20
7.	Quiz	IND	15
8.	Feedback form	IND	15
	Total minutes		240

Includes coffee break - 10 minutes

Note:
MG = Main Group
IND = Individual
SG = Small Group
CSG = Combined small Group

1. OBJECTIVES

(a) To improve project feasibility studies by including an environmental element; to evaluate the benefits and limitations of Environmental Impact Assessment (EIA) as a project planning tool.

(b) To determine whether the necessary environmental data has been collated to manage a project effectively, and to generate viable alternatives.

(c) To consider both project cost/benefit analysis and social cost/benefit analysis, when making project decisions.

(d) To develop and use appropriate criteria in decisions about technology and personnel, for the operational phase of a project.

(e) To motivate further study in the future.

In SG add additional objectives as appropriate:

(f)

(g)

Note: This package builds upon the training modules, G.1 through G.5, of the Environmental Management Series which may be helpful to learners who have no previous experience in the field.

This material is designed in a special format to stimulate group study and interaction. It is not a text book and is not suitable for individual study until after the unit has been completed.

---

1. ENVIRONMENTAL IMPACT ASSESSMENT (EIA): WHAT IS IT?

(a) The main functions of EIA are to:

* identify the project or activity and the environment in which it will be implemented;

* predict the impact of each activity on the different components of the environment (Exhibit 2);

* evaluate (quantify and qualify) the significance of these impacts and develop alternatives;

* communicate these impacts to decision-makers and affected communities and generate alternative courses of action;

and thus provide the basis for project monitoring and evaluation.

(b) EIA methodology (Exhibit 3) enables both the enterprise and public decision-makers to make appropriate choices.

(c) EIA analysis should forecast both short-term and long-term effects of projects, and should clarify the implications and trade-offs of different project designs and implementation methods.

2. PROJECT FEASIBILITY: WHY EIA IS IMPORTANT TO YOU

(a) Feasibility studies determine whether a project can be carried out with the available resources to achieve its planned objectives.

(b) The basic questions raised by feasibility studies are:

* Is the project economically feasible?

* Are the important inputs (raw materials, energy, labour, etc.) available and if so, at what cost?

* What technology is appropriate?

* Does the project or its product have positive or negative impacts on the economy, the environment and the labour market? Have all possibilities been considered including the "worst case" scenario.

(c) In 1985, socio-political forces in developing countries show increasing concern for effects of large development projects on the total environment. Thus the project manager now has special environmental responsibilities (Exhibit 1).

(d) To be initially approved and successfully implemented, a project's feasibility study must <u>now</u> provide for the <u>new</u> dimension of environmental management which helps the project and enterprise managers defend their projects in terms of:

* conservative and efficient use of limited natural resources;

* pollution control of air, water and land;

* impact on community life styles.

3. BENEFITS OF THE EIA PROCESS

(a) The EIA process is an excellent planning tool, if sufficient data is collected and properly analysed and presented. An EIA can:

* predict the likely effects of alternative project activities on nearby natural and socio-economic systems;

* help affected parties assess the significance of these effects and estimate their value;

* list problems that require action;

* show the implications of, or compromises between, measures designed to manage or resolve expected problems.

(b) Thus, EIA is a systematic framework and process for generating the necessary information for decison-makers to choose the most suitable and environmentally sound development options.

4. HOW EFFECTIVE IS THE EIA PROCESS?

(a) Unfortunately, EIA is sometimes carried out badly. As a result, information vital to decision making may be lacking in quality or quantity. A poor EIA is sometimes worse than none at all, because it may mislead project staff.

(b) The quality of EIA implementation depends to a large extent on who is responsible for it, the choice of consultants to carry it out and the information and time available.

(c) A community's political system influences the way in which an EIA is carried out, since it may alter the distribution of benefits and costs of public and private investments. However, EIA can examine the values and interests of the different environmental "actors" and provide some of the information needed to resolve conflicts.

(d) The dominant criteria for a new project (production, social, financial etc.) strongly affect the way project development is conducted, and may largely dictate how effectively environmental information and values are incorporated into project planning and design.

Example: If maximum output capacity is the dominant criterion environmental considerations will be considered more lightly.

5. COST-BENEFIT ANALYSIS

(a) In addition to the EIA the technique of cost-benefit analysis (CBA) is used extensively for project feasibility studies:

* CBA examines project profitability for its investors;

* CBA compares the project with other projects competing for the same funding.

(b) Though not a substitute for an EIA, a CBA will distinguish:

* project cost benefit (restricted to direct costs and benefits ignoring the social and economic costs of environmental damage);

* social cost benefit (includes all direct and indirect costs of environmental damage).

6. TECHNOLOGY CHOICE

(a) Using EIA and CBA, project managers and planners can define the technology appropriate to the project and its environment.

(b) Project planners and managers can use three criteria to determine whether a proposed technology is appropriate:

* does it further general developmental goals, including:

  - growth of production and employment through effective use of local resources,
  - improvement of skills,
  - reduction of inequalities in income distribution?

* is it adapted to the availability of local resources: land, water, energy, geographical location, climate and other natural resources? In particular, are local resources adequate for the long-term maintenance of new equipment acquired from overseas?

* does it make good use of:

  - size of market,
  - foreign exchange availability,
  - existing infrastructure and manpower skills,
  - social and cultural structure of the population and its potential for adaptation?

(c) Consideration should be given to introducing less capital-intensive and sophisticated technologies when planning a project. Nevertheless, some environmental dangers can be expected. Consider these factors even when aid agencies donate "free" technology which may require expensive long-term maintenance costs with foreign exchange implications.

(d) Technology choice depends on a complex network of decisions made at various levels (government, enterprise, etc.). However, it is the planner and manager who start this decision-making process.

(e) Technology transfer direct from industrialised countries may be beneficial and can often solve a specific problem rapidly and economically. Technology designed primarily to save labour may be detrimental to social welfare and employment. The chosen technology must be adapted to local conditions.

Example: It would be an advantage for a drought-afflicted country to import efficient well-drilling equipment and train and employ local personnel to do the work.

7. PROJECT STAFFING

(a) A project manager should hesitate to introduce non-local project personnel into communities with a fragile culture.

Example: A foreign construction crew near an isolated Arctic community caused problems that affected the youth of the community which eventually destroyed the community.

(b) Early in project planning, the project manager should assess the environmental training needs of the project personnel. He should ensure that the EIA analysis and project cost-benefit studies are available for training purposes.

(c) The project manager must assign clear responsibility (at all levels) for the project's environmental aspects by setting up a clear organisational structure related to key environmental factors.

(d) It may be necessary, especially in a large or complex project, to assign responsibility for environmental training and monitoring to a full-time environmental manager.

8. PREPARING FOR THE PROJECT OPERATIONS

(a) Environmental considerations should be integrated into the various stages of project design (most important), project planning and project implementation particularly with regard to:

* recruiting and training personnel;

* setting up an effective operating and maintenance system;

Example: Accidents such as those at Three Mile Island, Bhopal and the Mexican refinery were probably due to careless operating and maintenance, poor supervision and operator training.

* ascertaining the availability of necessary supplies, equipment and transport.

(b) It is essential to use the EIA in project design to monitor and possibly reformulate portions of the project. The initial objectives and inputs of the project can thus be re-examined in the light of anticipated impacts and constraints; flexibility at the project design stage is crucial.

(c) EIA and CBA techniques are useful for identifying the significance of potentially critical problems; they are also useful for generating viable alternatives to project design.

THE RESPONSIBLE PROJECT MANAGER

(1) Recognises the need to collect environmental data continuously before and during the project.

(2) Knows that base-line data includes background pollution, prevailing climatology, hydrology, resources, traffic flows, economy, population, labour, etc.

(3) Acts to control and reduce social and physical environmental impacts.

(4) Delegates project environmental responsibilities to a qualified staff member who reports directly to him.

(5) In building the project data bank, reviews and assesses currently available information and collates it with the EIA to produce background reports, reviews and inventories.

(6) Reviews, assesses and identifies potential conflicts, constraints, that require further study and identifies solutions to immediate problems.

(7) Knows the critical areas of environmental concern.

(8) Develops a workable environmental monitoring process based on experience and judgement; thus by review and identification, he establishes the benchmarks for the ongoing supervision of the project.

(9) Uses continuous collection and interpretation of environmental data, during project construction and operation to aid future project operational planning.

PREDICTION OF ENVIRONMENTAL IMPACTS FOR A POWER STATION

ACTIVITY COMPONENT	Fuel combustion				Cooling	Power lines
SOURCE	Emissions of CO_2, SO_2, NO_x				Discharge of cooling water	Physical intrusion in landscape
FIRST-ORDER EFFECTS	Increase in ambient concentrations and deposition of contaminants				Effect on receiving water temperature	Effect on visual environment
HIGHER-ORDER EFFECTS	Effects of CO_2 on global climate	Effects of NO_x on ozone levels	Effects of NO_x and SO_2 on human health and plants	Effects on water resources		
		Acidification of lake water				
			Effects on aquatic plants and animals			

BASIC EIA METHODOLOGY

A: Identification

1. Define development objectives and key constraints on implementation.

2. Identify options for achieving development objectives.

3. Identify key linkages of proposed development with natural resources, socio-economic systems and other development activities.

4. Determine need for environmental assessment on the basis of evident implications for natural system productivity and environmental quality and the extent of conventional project planning review of external and long-term consequences.

5. Define scope (the terms of reference of the analysis) of the assessment, if needed, so that analysis and presentation of results focuses on the prominent and potentially harmful problems. This process involves consulting the agencies, interested parties and affected groups, and defining the physical and analytical scope of the assessment.

6. Assemble baseline data for natural and socio-economic systems, potentially conflicting development activities and key resource implications.

7. Analyse the proposed development activity to identify resource demands and outputs and the effects on natural system productivity and environmental quality.

B: Prediction

8. Predict the magnitude and severity of effects of proposed development activity.

C: Evaluation

9. Assess the significance, distribution and permanence of predicted effects from the vantage point of surrounding populations, other development activities dependent on shared natural systems and long-term productivity.

10. Establish real resource costs and benefits associated with assessment and incorporate these values into the overall economic evaluation of the development.

D: Communication

11. Determine how to present the results of the assessment, indicating trade-offs, key factors, sources of data, levels of confidence and from whose vantage point conclusions are made.

12. Propose realistic cost-effective measures for mitigating (reducing) and managing the environmental effects in consultation with project design and management factors.

13. Establish mechanisms for monitoring and controlling environmental problems during the life of the project in co-operation with the implementation agency and other responsible bodies.

CASE - MATA OIL REFINERY

Questions on the case

1. Study the case carefully and determine the key facts and issues.

2. Review and complete the limited EIA questionnaire (Exhibit 6) using the data in the case.

3. Evaluate the adequacy of this limited EIA questionnaire.

4. What key environmental concerns have been missed?

5. Decide and justify what action should be taken by the management.

CASE - MATA OIL REFINERY

1. OVERVIEW

In 1984, following technical and economic feasibility studies, the Government decided, to construct a 6 million tonne per year oil refinery near Mata.

At the time of the decision, the Government had no legal or procedural EIA requirement and the refinery was located at Mata because of its central location and the availability of both rail and highway transport. After the decision, but before construction began, the government established a National Committee on Environmental Planning and Co-ordination and began to incorporate EIA in its development plans. Because international and national groups had expressed grave concern about possible damage to the historical monuments at Agri and adverse impacts on the nearby Bird Sanctuary, the Government appointed an expert committee to conduct an EIA on the refinery and implementation phase of the project.

The study team evaluated alternative design and operation scenarios to determine which had the least environmental impact. It found that the refinery would affect several environmental factors of an aesthetic and socio-economic nature and that certain effects would be positive. For example, the refinery would bring new jobs and income into the area, which would improve the quality of public services through higher tax revenue, etc.

2. BASIC ASPECTS

The National Oil Corporation (NOC) Ltd. will build an oil refinery on 200 acres in a small valley. The valley is in a river basin and the refinery site is in an approved industrial zone, two miles from the city of Mata (population 5,000), and 25 miles from a national mosque.

There are eight industries in Mata, many of them related to the railways (e.g. iron foundries), extensive agriculture especially rice and wheat, and good grazing land within 10-15 miles of the site.

The river flows through the Bird Sanctuary. The source of food, irrigation water and drinking water, the river is also a spawning ground for fish. Air and water quality are good.

The enterprise plans to house most of the construction personnel in Mata. No displacement of the local community will be necessary. The number of employees during construction will average 400, and post-construction operations will employ 150 people.

The theoretical environmental context of the Mata Refinery is shown in Exhibit 4. Waste water discharged by the refinery (600 million m^3 daily) would be conveyed by an open channel to the river. Water pollutants emitted would include BOD, oil, grease, phenols and ammonia. These pollutants can kill fish and smell bad.

No controlled incineration is envisaged; solid waste will be buried in land fills.

Other types of pollution include noise and thermal pollution. In the construction phase, the environmental impacts will include noise, dust and destruction of the landscape. When the refinery is operational, air pollutants will include sulphur dioxide and particulates.

3. TIME FRAME

The EIA for the Mata Oil Refinery deals with three separate time phases. The first phase, pre-construction, starts when the project is officially announced and lasts until construction starts. The second phase, construction, lasts until the project becomes operational. In the final - the operational phase - impacts for the next 20 years (the expected life of the refinery) will be considered.

4. EIA METHOD

The EIA system selected is a checklist/questionnaire which provides basic information and identifies the data that will be needed. A scoring system is developed, which includes social impacts.

The first step in establishing the check-lists and questionnaires is to develop a list of environmental impact factors (Exhibit 5).

Next, an environment impact assessment questionnaire is developed (Exhibit 6). This information is used to rate the design or operational alternatives being considered.

5. SUPPLEMENTAL ENVIRONMENTAL DATA

In order to deal with the main concerns - damage to the monuments and the bird sanctuary - the government and the National Oil Company both conducted meteorological, air quality, and water quality studies in the Mata area during a period of 15 months.

Studies were also made of the actual status of the monuments and the potential impact on the stonework of increased sulphur dioxide levels. The potential impact of air pollutant emissions on the bird sanctuary were conducted by experts and the results incorporated into the EIA. Some of these results are tabulated in the questionnaire.

6. ALTERNATIVES FOR DESIGN AND OPERATION

Since the location was fixed, the study team only assessed process and design changes. Among the alternatives considered were:

* selecting and proportioning feedstock (raw materials) to reduce emissions of SO_2;

* using of low sulphur fuel oil and sulphur-free gases for refinery furnaces instead of using feedstock or unstripped product *to reduce SO_2);

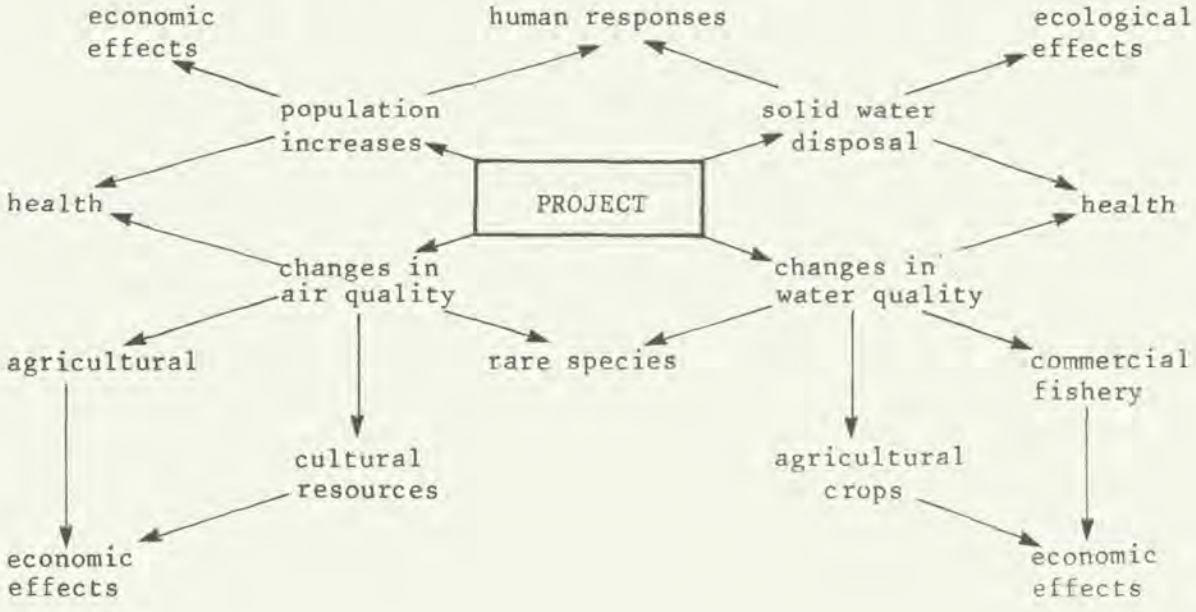
* increasing stack heights on furnaces and boilers to improve mixing and dispersion (to reduce concentration of gas emissions);

* utilising treated waste water for irrigation of nearby areas to reduce impact on the river.

EXHIBIT 4

THEORETICAL CONTEXT OF THE MATA REFINERY EIA

The usual orientation in EIA is to determine how a project development will affect various environmental factors as shown simplistically in this exhibit.



CHECK LIST OF ENVIRONMENTAL IMPACT FACTORS
(Industrial Development)

1. Liquid waste
2. Solid waste
3. Air pollutant
4. Noise and vibration
5. Odour and colour-producing agents
6. Displacement of human habitation
7. Construction activities
8. Operational activities
9. Movement of people
10. Displacement of existing economic activities (e.g. agriculture, fishing, small-scale industry, etc.)
11. Transportation
12. Accidents and hazards (within and outside work environment)
13. Earthwork and landscape modification, site clearance
14. Cost changes
15. Utilities - water resources, energy consumption, etc.

Note: The EIA is used to:

1. describe the project and its environment;
2. predict the impacts of the activity on the environment;
3. evaluate (quantify and qualify) the impacts;
4. communicate the impacts and suggest alternatives.

EXHIBIT 6

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

(For review in SG; items marked "....." to be completed)

	Question	Answer
1.	Name of factory/project/institution:	.....
2.	Address:	National Oil Co. Ltd., Mata
3.	Site of the plant/project:	Mata
4.	Area of land acquired or to be acquired:	.....
5.	Area to be built up or developed:	180 acres
6.	Present use of land at site: agriculture/forest/grazing/ human settlements/fallow/any other use:	Agriculture and grazing
7.	Present population in site area:	5,000
	Human activity in and nearby site:	City of Mata
8.	Nature of topography near the site: Plain/valley/hilly/undulating:	Valley with gentle hills
9.	Site characteristics: River basin/coastal/ estuarine/ landlocked/marshy/ sandy/rocky/ water logged:	River basin
10.	Is the site within municipal or metropolitan area? If not, how far from:	No. Two miles from Mata
11.	Is the site within the approved industrial zone?	Yes
	If so, how far from the nearest town or human settlements:	.....

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

Question		Answer
12.	State the following features within 15 miles of the site:	
*	Human settlements:	Mata
*	Agriculture land acreage and crops grown:	Extensive - rice and wheat
*	Grazing land:	Yes
*	Forest/sanctuary/natural park/ recreation centres:	Bird Sanctuary
*	Stream/rivers: Usage:	..... Fishery, irrigation, water supply
*	Ponds/lake/dam:	N/A
*	Fisheries/spawning ground:	Yes, in the river
*	Hills/mountains:	Gentle hills
*	Industries: Specify:	Light and heavy industries in Mata including railroad yards
*	Archaeological/historical importance:	....
*	Recreation areas, tourist importance, etc.	....

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

Question	Answer
* Any other items, say, institutions, religious places, etc.:	N/A
* Present state of environment:	High quality air and good water quality. High natural levels of suspended particulate.
13. Climate	
* Climate conditions - hot humid, warm humid, semi arid, dry, etc.:	Warm humid
* Temperature ^{o}C:	Range 10-40, average 30^{o}C
* Prevailing winds/direction speed (state also calm condition)	To the south/south-east Unknown
* Rainfall: Total: maximum intensity:	Unknown Unknown
* Sunshine: Percentage clear days:	80%
* Any other:	N/A
14. Settlement	
* Total number of persons proposed to be displaced:	None
* Total number of persons to be employed: (a) during construction: (b) during operation:	 400 (monthly average) .....
* Any township/housing existing or proposed for employees:	Yes
If so, give details:	....

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

Question	Answer
* Utilities to be provided in townships and industry (state separately)	
Total water supply:	From the river by industry (600 million m^3 daily)
Treatment of sewage:	By industry
Disposal of refuse/solid waste:	By industry
Surface water/rainwater drainage:	Into the river by industry
* Any other information:	.....

15. Water requirements

* Source of water:	River
* What type of treatment given:	Filtration, disinfection
* Adequacy of water at source - maximum capacity:	800 million m^3
* Quality characteristics of raw and treated water:	Unknown

16. Waste water produced

* Quantity per day	
Process:	100 million m^3
Cooling:	470 million m^3
Sanitary:	30 million m^3
Others:	N/A
* Probable pollutants present:	BOD, oil and grease, phenols, and ammonia

EXHIBIT 6 (continued)

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

Question	Answer
17. Points of disposal of waste products	
* - Method of conveyance and disposal of waste water (details of outfall, disposal points like receiving waters, land, etc.)	....
- Mention the usage of the disposal area and near environs, possible effects on receiving waters, land, etc.	....
* Method of disposal of solid waste/industrial sludge:	
- Land, burning, dumping in sea, lagoons, marshes, etc.	Land fill
- If on land, do you envisage any leaching or toxic compounds through soil into ground water, river, etc.?	No, clay liner used first
- If open burning is used, where is it done?	N/A
- Is controlled burning by incinerators practised?	No
- Give details like location, chimney heights, quantity burnt, etc.	N/A
* Dispersal of air pollutants. Will the air emissions possibly affect the nearby airport, vegetation, human settlement, etc.?	Yes

EXHIBIT 6 (continued)

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

Question	Answer
Name the pollutant released:	Sulphur dioxide, (SO_2) particulates
Any odour-producing substances that are released:	Mercaptans
18. Types of pollution (other than conventional)	
A. Operational phase	
* Noise:	Yes
- What are the sources:	....
- Noise level: within factory: just outside:	Maximum, range unknown
- Is it possible to stop the high noise level operations during the night?	No
- State measures to mitigate noise level within and outside factory.	Mufflers and noise-reducing enclosures will be installed.
* Odour:	Yes
- What are the processes and possible chemicals that can cause odour and aesthetic nuisance?	Burning SO_2
Within factory environment:	SO_2 and mercaptans
Outside factory environment:	SO_2 and mercaptans
- Possible measures for control/ mitigation:	Afterburners to oxidise odour-producing compounds

EXHIBIT 6 (continued)

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

Question	Answer
18 A. cont'd.	
* Thermal pollution:	Yes
- Any high temperature discharges of water to disposal points:	.....
- Give details and measures of control:	Cooling water discharged to cooling pond for reuse. Overflow from cooling pond is treated then released to river at only about 5°C over background.
* Radio-active pollution:	N/A
- Nature, type and sources:	N/A
* Any specific toxic chemicals used as routine for chemical analysis in the laboratory or pilot plant or in industrial process:	Yes
Give details:	N/A
Are they discharged along with waste water?	.....
B. Construction phase - list environmental impacts and solutions:	Possible noise, dust emissions, heavy-duty vehicle movements, aesthetics, temporary camps for human habitation, etc. Temporary high levels of dust and noise during daylight hours. Site will be watered for dust control.

EXHIBIT 6 (continued)

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

Question	Answer
19. Factory environment	
* No. of toilets and urinals provided:	Two toilets and one urinal per 30 men.
* No. of drinking water cisterns: and adequacy:	.....
Provision of shower baths:	Yes
* Provision of rest rooms for workers:	Yes
* Safety and fire-fighting requirements:	As required
* Canteen and eating facilities:	Cafeteria provided
* Handling of hazardous materials: What precautions and practices followed for workers:	Requires use of special clothing, gloves, etc.
* Dustiness inside the units:	N/A
What are the measures to control:	N/A
* Ventilation facilities within units (give details):	N/A
20. Management of environment pollution control	
* Details of organisational set up, personnel, laboratory facilities, operation and maintenance set up:	.....
* Is the industry/institution doing monitoring of emissions? If so, give details:	Yes, upstream and down-stream water sampling, four air-monitoring stations.

EXHIBIT 6 (continued)

ENVIRONMENTAL IMPACT IDENTIFICATION QUESTIONNAIRE

Question	Answer
19. Factory environment (cont.d)	
* Expenditure on environmental control management including pollution control facilities:	N/A
Brief observations on environmental impact:	Refinery is close to bird sanctuary and historical monuments so air pollution control is particularly important.

Note: The information in this table is presented for illustrative purposes only and does not represent the in-depth information used for the original Mata EIA study.

MINICASES

1. TOBACCO ROAD

A large multinational company wishes to expand its tobacco-growing capacity in the semi-arid region of Burkina Faso. The Ministry of Agriculture examines the proposal and realises that although benefits would include additional foreign exchange and a better balance of trade, the burning of up to two hectares of wood will be required in the curing process of one ton of tobacco.

What can the Ministry require the multinational company to do to prevent the countryside from being denuded and eroded and still reap the benefits of foreign exchange and an improved trade balance?

2. ISLAND FAIR

A well-known tourist club proposes to build a 16-storey hotel on the main beach of a South Pacific island kingdom. At present there are no large buildings on the island. The hotel would be ideally situated for foreign guests to admire the island's mountain range and the outlying islands. The new airport on the opposite side of the island is suitable for the estimated tourist traffic. Automobiles play only a small part in the life of the island.

What directives should the government give the Club regarding tourist transport and accommodation design?

3. COMPASS COURSE

A multimillion dollar project is to be set up to build a highway through a densely populated area. A number of local institutions will be affected. The Ministry of Human Settlements has approved the retention of five of these: the rest will have to be demolished.

You are chairman of the committee deciding upon which five community institutions are to be saved. Rank them in order of community importance, discuss in SG which five you will finally retain based on consensus.

1. A public market that provides income to the town and 300 market vendors.

2. A public elementary and secondary school.

3. A textile industry that provides jobs to 3000 workers.

4. A 100-year-old Narra tree.

5. A five-star hotel which attracts tourists and generates millions of pesos each year.

6. A well-known state university which the President attended.

7. A newly built hospital which is the pet project of the mayor's wife.

LAST ASSIGNMENT - ACTION PLANNING

INSTRUCTIONS - INDIVIDUAL WORK

(a) Assemble in SG now.

(b) Turn to your Standard Course Diary and find the section "Guidelines for Action Items".

(c) Complete your action planning now.

Unit PM1: Project development

CASE GUIDE

(Not retained by participants)

CONTENTS

ANSWERS TO THE CASE: MATA OIL REFINERY

1. STORY OF THE CASE

The Government sanctioned the construction of the Mata Oil Refinery. Under the management of the National Oil Corporation the refinery will bring new jobs and income into the Mata region.

At the time of the project's design, no EIA was required by law. However, just before construction started, the Government instituted EIA as a legal prerequisite to national development projects.

Industry and agriculture play an important economic role at Mata. The river has good fishing and is a source of food, irrigation and community water.

Waste water from the refining process will be deposited in the river. Major pollutants include BOD, oil, phenols and ammonia.

Air pollutants include particulate matter and sulphur dioxide (SO_2). There will be no controlled burning of solid wastes which will be dumped into land fills.

About 400 construction employees will be housed in Mata. Refinery operations will be carried out by 150 men.

2. EOA QUESTIONNAIRE ANSWERS

Question No.	Answer
1.	Mata Oil Refinery
2.	200 acres

Question No.	Answer
11.	2 miles
12. (v)	Yes, one main river. Fishery, irrigation, water supply.
12. (x)	Al Noor Mosque and other monuments at Agri (25 miles away).
12. (xi)	Al Noor Mosque and Bird Sanctuary.
14. (i) (b)	150.
14. (ii)	Yes, existing space in Mata to accommodate most workers.
17. (i) (a)	Open channel to the river.
17. (i) (b)	Drinking, irrigation, fishery - could cause taste and odour problems or kill fish and damage crops. Risk to human health.
18. (A) (i) (a)	Compressors, engines, generators.
18. (A) (iii) (a)	No.
18. (A) (iii) (b)	Cooling water discharged to cooling pond for reuse. Overflow from cooling pond is treated then released to river at only about 5^{o} over background.
18. (A) (v)	Yes.
19. (ii)	N/A.

Question No.	Answer
19. (iii)1	Yes.
20. (i)	N/A.

3. ADEQUACY OF EIA QUESTIONNAIRE

The major features of EIA are not stressed in the environmental questionnaire. The questionnaire does not specify the resource inputs; it fails to estimate the resulting environmental changes; it fails to describe the project adequately; it fails to evaluate the impacts.

Through its failure in the above points, the questionnaire is of little value when estimating the project's major impacts on the bio-physical and socio-economic environments.

4. KEY ENVIRONMENTAL CONCERNS

One of the main concerns for the people of Mata is the influx of construction workers their families, and then later the operational personnel and their families. These additional people could overload the schools, water supply and sanitation systems. Thus, large amounts of public funds would have to be spent to expand these systems. A reduction in the quality of life is likely.

Considering the huge amount of water processed, little emphasis is placed on the alternatives to water pollution. The effects on fishing, tourism and agriculture were not evaluated.

The effects of SO_2 on people and the monuments are not described sufficiently in the questionnaire. There will also be the added nuisances of noise and smell which also constitute a form of pollution. The effect of the increased road and rail traffic is not even considered.

5. DECISION AND JUSTIFICATION

Decision:

(a) Assuming that the project will be implemented, several process and design changes should be made and incorporated into the implementation phase of the refinery based on the EIA and the completed tables in order to minimise the environmental impacts:

* furnace and boiler stack height must be increased;

* the feedstock could be altered and only sulphur-free fuel oil and gas used in the production units. At Agri this would result in only a marginal increase of sulphur oxides, such as SO_2 (judged not to be harmful to the monuments) given the already high level coming from local iron smelters;

* the pond for the treated effluent has to be enlarged in order to provide more retention time to protect the river during low flow periods.

(b) the monitoring programme should be continued and expanded so that any significant increases in air or water pollution caused by the refinery could be quickly identified and corrective action taken to protect the environment.

(c) However, the ideal solution would be to perform the EIA properly, review the site decision and justify the need for this refinery. Further study could also be carried out on alternative technologies.

Justification:

The environmental impacts cannot really be minimised until they have adequately been identified and evaluated. Therefore a new and more effective EIA should be completed to provide base-line data for project monitoring and control.

6. LEARNING POINTS

(a) The value of the EIA must not be impaired by setting time and resource constraints which are too stringent.

(b) The EIA usually leads to improved environmental management even when implemented late; this may, however, result in higher cost or lost production time.

(c) The project manager should select the "worst case" scenario from several EIAs and direct work from that basis.

(d) The project manager must assess the inevitable environmental changes which may result before the implementation of any project.

(e) Expatriate, construction and operational personnel will impact on the infrastructure of the project site/region. This must be considered as an environmental impact.

(f) If given low priority, governments will overlook environmental concerns and concentrate on factors promoting national economic development.

(g) Like a stone thrown into the water, a project has a ripple effect (see the diagram in the case study). It has secondary effects and interrelationships which may not be evident immediately.

Note: The information in the EIA questionnaire is presented for illustrative purposes only and does not present the full information required for an in-depth study of the project.

ANSWERS TO THE MINICASES

1. TOBACCO ROAD

(a) The Ministry must hold the company responsible for reforestation of the area where trees are cut for tobacco curing purposes.

(b) The Ministry could also require the company to switch from wood burning to solar units (a more developed technology) to cure the tobacco. Other processes and technologies could also be considered.

2. ISLAND FAIR

(a) The Government should allow the club to use only coaches or existing public transport to ferry the tourists between airport and club, and for tourist excursions to the mountains.

(b) The hotel should be redesigned to blend with local housing; tourist accommodation should be acceptable to the local community.

3. **COMPASS COURSE**

(a) The textile industry which provides jobs for 3,000 workers.

(b) The state university which the President attended.

(c) The hospital which is the project of the wife of the mayor.

(d) The public market that provides income to the town and 300 market vendors.

(e) The five-star hotel which generates millions of pesos of income annually.

Note: This is only one answer; the chairman should consult a broad sample of community views before deciding what is appropriate.

QUIZ

Choose the most correct answer

1. Studies to determine whether a project can be carried out with available resources to achieve planned objectives are:

   (a) EIA studies
   (b) project design studies
   (c) feasibility studies
   (d) project development studies

2. During the project development phase, the project manager should do all of the following, except:

   (a) plan recruitment and training of operational personnel
   (b) project the needs of management and maintenance
   (c) hire an environmental control manager
   (d) check the availability of supplies, materials, etc.

3. "The project design stage is usually too early to design an environmental management training programme for the construction stage!" This statement is:

   (a) true, because personnel have not yet been recruited
   (b) generally false
   (c) true for oil refinery construction
   (d) generally true

4. A technology is generally appropriate when it furthers development goals, including the growth of _____ and output through the effective use of _____ resources:

   (a) national earnings, donor
   (b) natural food, natural fertiliser
   (c) manpower, traditional
   (d) production and employment, local

5. EIA aids environmental management even when implemented later, but this:

   (a) is a failure of project design
   (b) delays project implementation
   (c) may lead to higher costs and lost production time
   (d) does not matter

6. Project cost-benefit analyses are:

(a) a part of the feasibility studies
(b) more appropriate when scientifically prepared
(c) only relevant if they are full social CBA studies
(d) too costly unless the proposed project is very large

7. Project planning includes forecasts of all of the following, except:

(a) project feasibility in relation to the marketplace
(b) plan for an initial EIA
(c) "milestones" against which progress can be measured
(d) delays due to interactions between the project and its environment

8. Environmental awareness in the planning stage helps project managers:

(a) to complete the project on schedule
(b) mainly in the social cost benefit analysis
(c) only later in the implementation stage
(d) to complete the project on schedule and within the budget

9. A poor EIA is probably:

(a) better than none
(b) useful for project planning
(c) worse than none
(d) no harm to the environment

10. The main objectives of an EIA (Environment Impact Assessment) are to:

(a) describe, predict, prevent and save
(b) leave the environment as completely unchanged as possible
(c) communicate, predict and describe
(d) describe, predict, evaluate and communicate

11. The important factors in a feasibility study for a project include:

(a) market, price and inputs/resources
(b) inputs/resources, economy, environment and project management
(c) market, prices, inputs/resources, economy, and environment
(d) none of the above are true

12. EIA of a project is used for all of the following, except:

(a) to get government approval
(b) to determine local levels of workers salaries and benefits
(c) to develop alternative solutions
(d) to assist in the feasibility assessment of a project

13. To determine whether a project will achieve its objectives in its paricular environment, the project manager uses:

(a) social cost-benefit analysis
(b) feasibility studies
(c) project cost-benefit analysis
(d) astrology

14. To ensure environmental flexibility in a project design:

(a) hire an EIA expert
(b) select the "worst case" scenario
(c) make formal plans with 2 or 3 alternatives
(d) have a team of three managers put in charge of the project

15. Direct transfer of developed capital intensive technology:

(a) is seldom advisable for a developing country
(b) usually causes more maintenance problems than economic benefits
(c) may be beneficial if adapted to local conditions
(d) would not usually be permitted by aid donors

16. Environmental training needs for the project personnel are assessed and set by the:

(a) project manager
(b) National Government Department responsible for the environment
(c) Ministry of sport and culture
(d) UN Environmental Program

17. The resources available to a company to carry out a project include:

(a) financial, human, natural and governmental
(b) air, water, minerals and land
(c) financial, human, organisational and natural
(d) natural resources and fossil fuels

18. In planning new development projects, local concerns get high priority from government agencies, provided they are:

(a) not too expensive
(b) consistent with national political priorities
(c) consistent with environmental prioritiies
(d) religious

19. The scope of EIA is usually constrained by all of the following, except:

(a) political pressure
(b) type of project
(c) resource limitations
(d) time

20. The document which is least used in assessing a project is the:

(a) feasibility study
(b) EIA
(c) cost-benefit study
(d) national 5-year development plan

acbdc cbdbd cbcbc acbdd

Note: One of these answers may be wrong. Which one?

notes

environmental management training
an ILO/UNEP Programme in support of Managers and Management Institutions

2

PROJECT MANAGEMENT AND THE ENVIRONMENT

Unit PM.2 Project Implementation

International Labour Office Geneva

environmental management training
an ILO/UNEP Programme in support of Managers and Management Institutions

Unit PM2: Project implementation

WORKPACK

(Retained by participants)

Contents

1. OBJECTIVES

(a) To develop new knowledge, skills and attitudes about environmental management in development projects.

(b) To recognise the types of management information (about the environment) needed during project implementation.

(c) To control environmental impacts during project implementation in managing manpower, materials, sub-contractors and community relations.

(d) To improve the ability of project staff to interact with community groups affected by project activities.

(e) To motivate further study.

In SG add additional objectives as appropriate:

(f)

(g)

Note: This package builds upon the training modules, G.1 through G.5, of the Environmental Management Series which may be helpful to learners who have no previous experience in the field.

This material is designed in a special format to stimulate group study and interaction. It is not a text book and is not suitable for individual study until after the unit has been completed.

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1. ENVIRONMENTAL MANAGEMENT IN PROJECT IMPLEMENTATION

(a) The environment is complex and changing, and it is impossible to predict all project impacts precisely due to continuous interaction between the project and the environment.

(b) During project implementation, the project manager must try to anticipate possible future environmental problems in order to prevent or minimise their effects. This requires awareness of and sensitivity to political, social, economic and physical forces.

(c) A checklist of environmental management tasks must be included in the project schedule. This checklist is based upon the EIA and the environmental activity/impact matrix which is supplemented with data collected during monitoring.

(d) The project manager practices environmental management by:

* providing overall direction for the project;

* setting performance standards and providing guidance to achieve them;

* co-ordinating activities which involve various teams or groups;

* ensuring a timely flow of information and decisions;

* setting reporting/alarm parameters;

* initiating stabilising action when adverse trends appear;

* taking direct action to correct abnormal situations.

(e) Environmental management, therefore, includes the management of: manpower, materials, sub-contractors and community relations.

(f) The successful implementation of a project which affects the environment requires flexibility and continual feasibility studies to generate alternatives (including indigenous technology).

2. ENVIRONMENTAL DATA COLLECTION

(a) Responsibility for environmental data collection and interpretation may be delegated to a special project staff member, reporting directly to the project manager.

(b) A continuous environmental data collection system should be established by the project manager to provide base-line and current data on background pollution, climatology, hydrology, natural resources, traffic flows, economy, population, labour, etc.

(c) The project environmental data bank is created using the base-line data from the EIA, the environmental activity/impact matrix and other background reports, reviews and inventories.

(d) The data bank must be updated continually with the findings of the monitoring/data collection system.

(e) Regular environmental reviews should be undertaken to assess and identify potential trouble spots and to seek solutions to problems which arise. Areas of concern on a typical construction project are listed in
Exhibit 1.

3. MANAGEMENT OF MANPOWER

(a) Manpower planning and recruitment are sensitive issues. Training needs must be assessed in advance and training capacity expanded to ensure that skilled manpower will be available when needed.

(b) Project staff must be made environmentally aware with the aid of training programmes and campaigns that highlight sensitive areas and key problems. Environmental training is essential for all project supervisory staff; such training is more effective when associated with a positive and negative reward system (e.g. certificates, salary increases, disciplinary action, publicity, public relations, etc., related to environmental impacts).

(c) The manpower effects of a project must be monitored and controlled by project planners and managers. Continuous feedback is necessary to adapt the project to changing needs.

(d) When housing and services are in short supply, the local community may resent the influx of expatriate project workers and their families. The higher income earned by skilled workers and the resulting increased demand for goods may disrupt the economy to the detriment of the local population.

4. MANAGEMENT OF MATERIALS

(a) Efficient use of materials has four advantages:

* reduced cost
* reduced wastage
* reduced pollution
* more efficient use of resources.

(b) The quality of materials used on the project may lead to environmental impacts. Environmental quality standards must be set and clearly stated when ordering from suppliers.

(c) An inspection plan must be drawn up to indicate where, how and by whom, incoming materials and equipment are to be inspected for sub-standard or inconsistent quality.

(d) Quality control should be preventive (i.e. before use), otherwise faults can get "built-in" and then become very difficult and expensive to rectify later.

5. ENVIRONMENTAL MANAGEMENT OF CONTRACTORS

(a) Contractors must be monitored regarding their impacts on the environment; under pressure of cost and time the contractors may allow negative environmental impacts to occur in order to achieve certain project objectives; therefore the environmental manager must be able to control how contractors achieve project targets.

(b) Apart from financial considerations, other important aspects in selecting a contractor are:

* "Will he stay in business?"

* "Will he fulfil his contractual obligations in terms of quality, performance, delivery and environmental compliance?"

* "Will he take remedial action if the project runs into difficulties?"

(c) Project implementation must be flexible since the end-user's or legal requirements can change (e.g. to ensure safety or environmental protection).

(d) The contractor may want to make changes to take advantage of trade-offs between cost and time; this must be resisted if the change increases environmental impacts.

(e) Every modification has an effect on project costs, performance or timing. The later a change is made, the greater is its impact on the project; therefore ensure that the planning is carried out with great care and consider various scenarios.

(f) Strict and formal procedures are required to assess the environmental impacts of any proposed changes in the budget, schedule or performance:

* The project manager may formally amend the specifications and cost. However, if he does not have the authority to do this, he refers the proposal for the change (with an analysis of its impact) and his recommendations to the appropriate party.

* If a customer or community is involved, the appropriate authority will normally be the customer or the community.

* If the change affects the legal construction permit, the authorisation of the licensing and environmental authorities must be secured before implementing the change.

6. MANAGEMENT OF COMMUNITY RELATIONS

(a) Community relations must be planned, managed and controlled; it is usually more cost effective to prevent conflicts with the community than to resolve conflicts after they arise.

(b) The relationship between the project and the "actors" in its environment is illustrated in Exhibit 2. Such "actors" include: environmental agencies, external contractors, sub-contractors, internal departments, clients, special interest groups and the community at large.

(c) The channels of communication between these different "actors" are illustrated in Exhibit 3. The "information exchange belt" in the project environment provide information flows directly, without the intervention of authority as a filter.

(d) Management of community relations follows logically from the "information exchange belt". The local community should be involved in the design, planning and implementation stages of the project to:

* agree on common objectives and to plan jointly within the existing legal framework;

* exchange information at all stages of the project. For this the media should be involved and the implementation process should be fully explained.

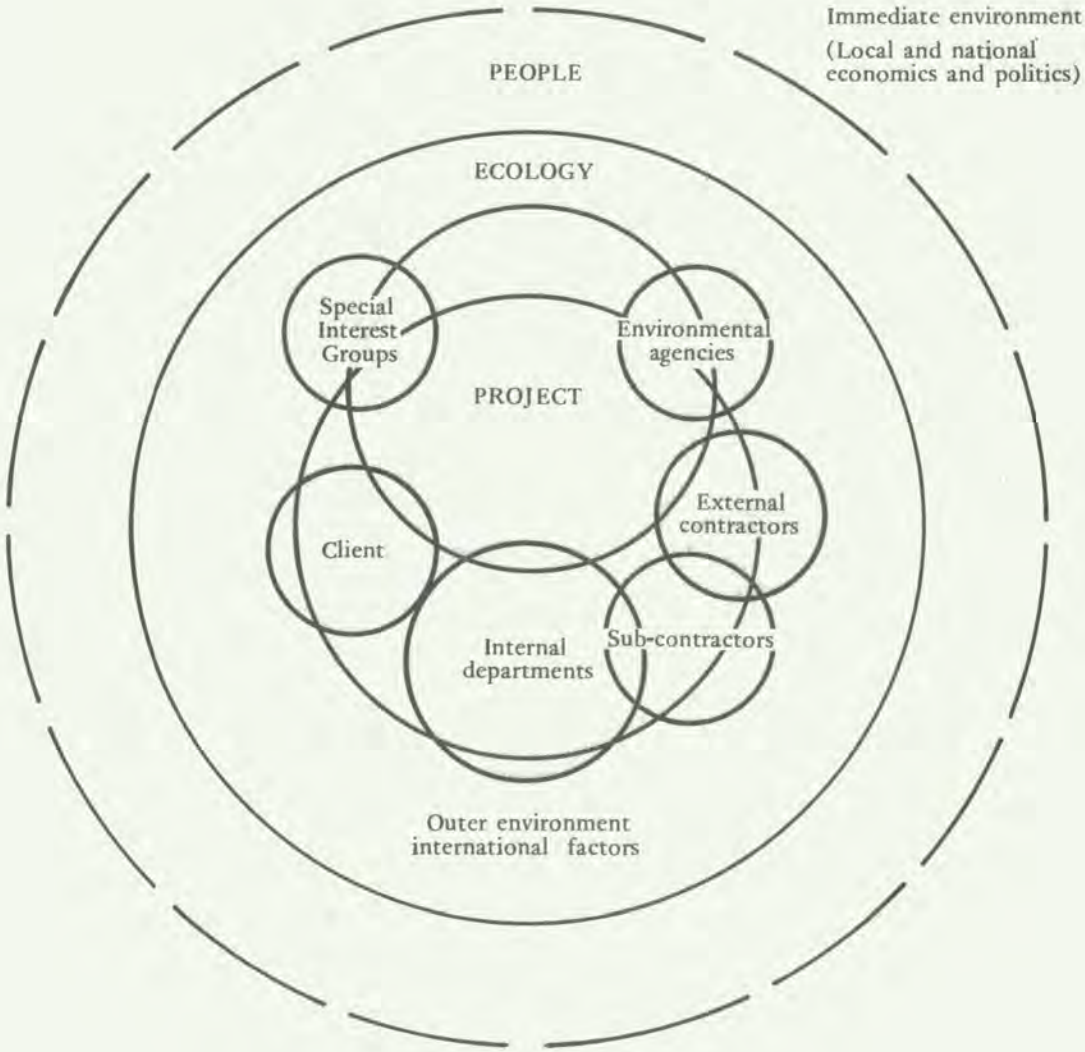
(e) To achieve project objectives whilst satisfying community needs is not necessarily easy. A suggested technique for doing so is illustrated in Exhibit 4.

(f) There are 20 basic rules for community action and they are applicable at the design and implementation stages (Exhibit 5).

ENVIRONMENTAL CONTROLS DURING CONSTRUCTION PROJECT

(a) Physical aspects	Includes: land use, visual aspect of the project (e.g. replanting trees, restoring excavations, etc.); protecting surrounding residential areas from noise and visual impairment (e.g. by installing fencing, plantings, etc.); protecting streams, lakes and underground water, air quality, forests and other ecological systems; and conserving energy, raw materials and recycling or disposing of solid wastes.
(b) Socio-economic aspects	Includes: project impacts on the economy of a region, such as a rapidly increased demand for labour (in excess of supply) disrupting traditional (e.g. agricultural) production and leading to economic recession in the area after construction has been completed.
(c) Community involvement	Includes: dealing with community leaders, different ethnic groups, people with different income levels, or organisational affiliations, to inform them of the plans and provide a channel to communicate grievances or apprehensions. Possibly involving them in decisions affecting community welfare, hiring practices, etc.
(d) Historical and archeological aspects	Includes: preserving historical and archeological sites of an irreplaceable nature which may be affected by the construction activity. Consulting with competent technical authorities (department of antiquities, university, etc.).

THE PROJECT IN ITS ENVIRONMENT



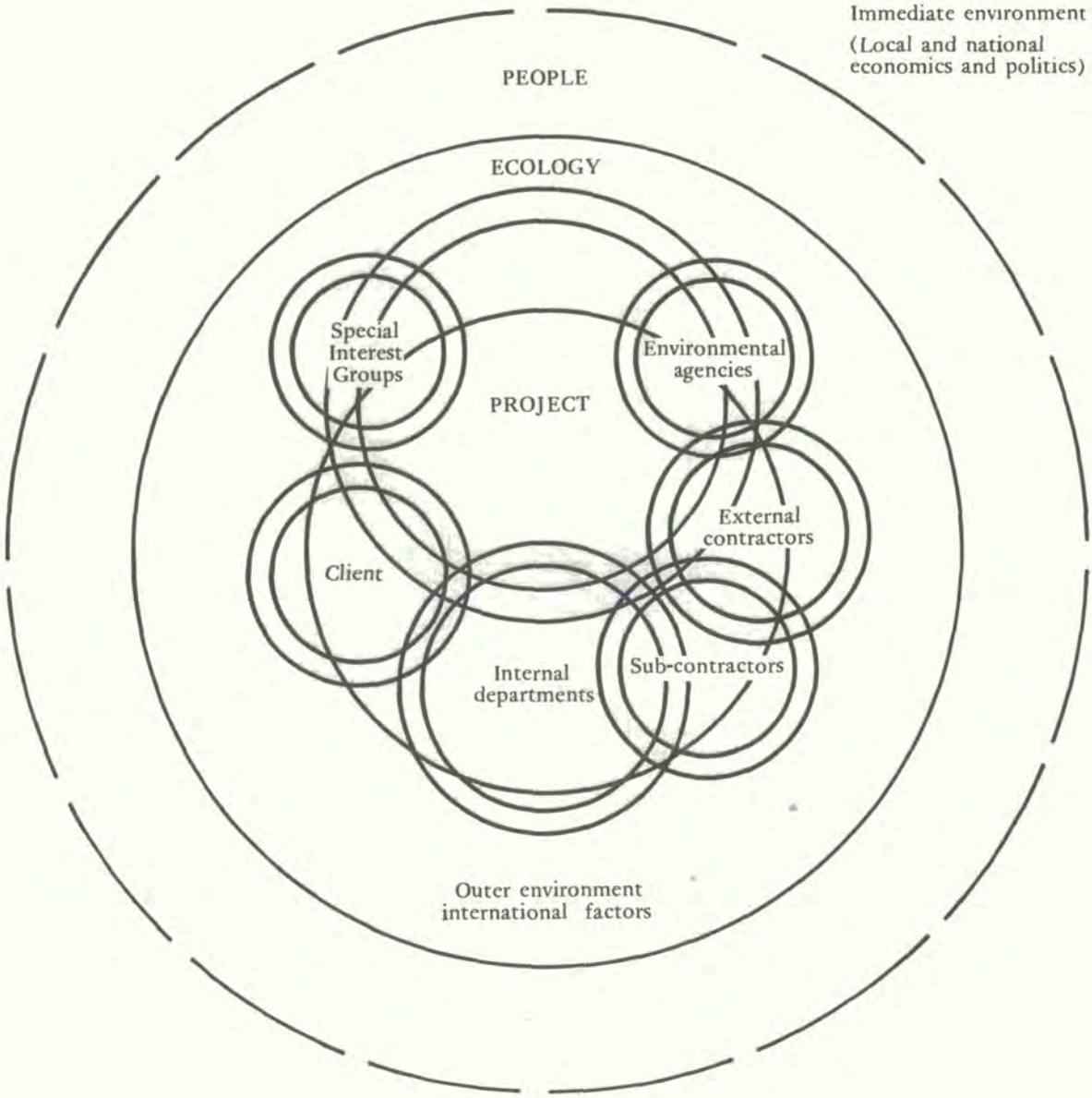
Note:

(a) The "outer environment", represented by the solid-line circle represents the international economic and political environment (international trade, treaty obligations, environmental and ecological regulations, etc.) within which the project exists.

(b) Surrounding this is a dotted circle, labelled "people", as a reminder that people are everywhere - within the project and in its broader environment.

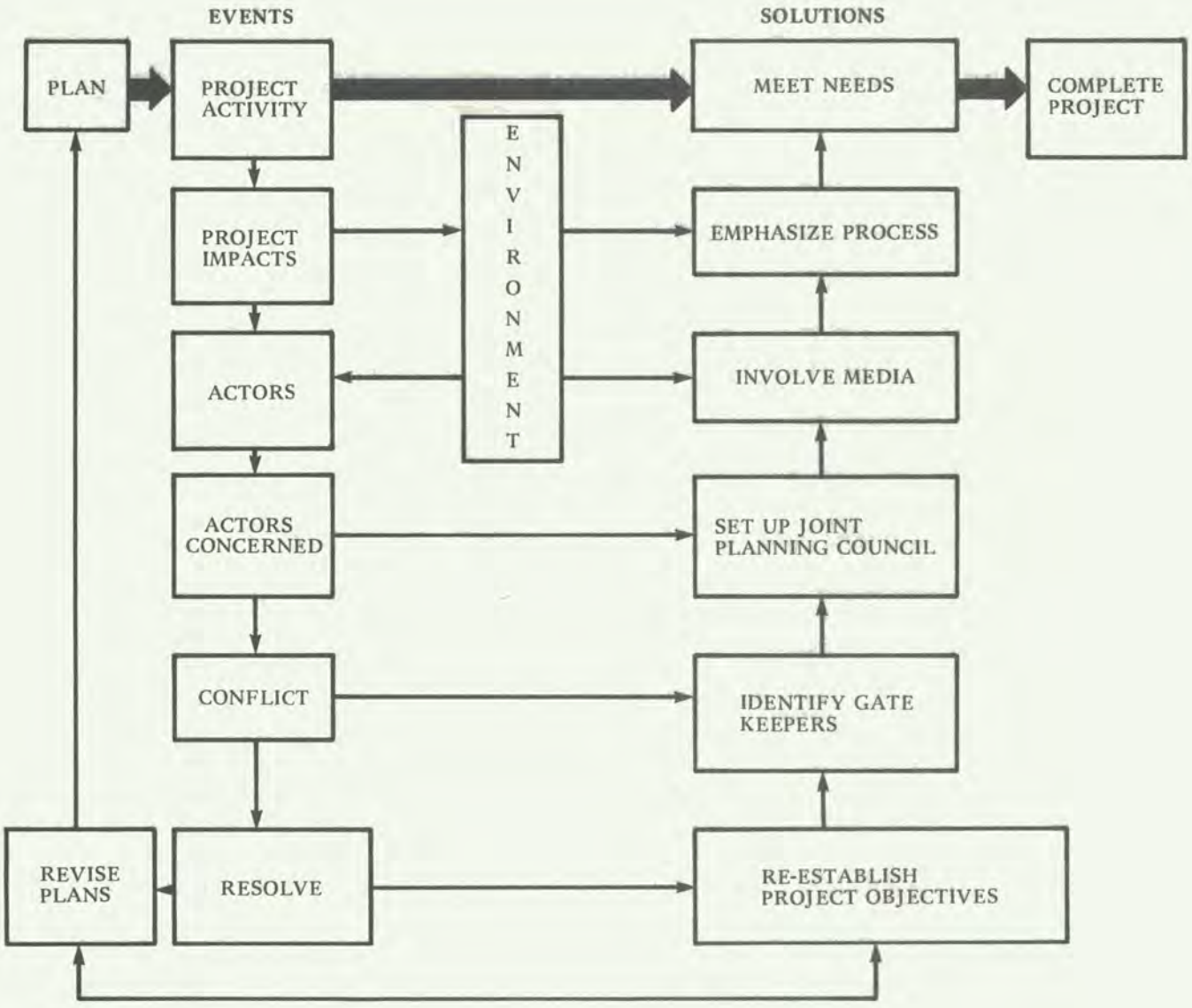
(c) It should be noted that no more than two of the inner circles have a common overlap. This represents the control interface, across which instructions and information reports flow.

INFORMATION EXCHANGE BELTS IN THE PROJECT ENVIRONMENT



Here the demarcations are less distinct and information can flow directly across belts without the intervention of authority as a filter.

TECHNIQUE FOR ACHIEVING PROJECT OBJECTIVES WHILST SATISFYING COMMUNITY



As project activity is affected by "project impacts", "actors", "actors concerned" etc. a solution can be obtained by following the arrows towards the solutions column and then following the instructions leading towards meeting needs and "complete project".

* ANALYSE the scene
* UNDERSTAND the underlying issues
* ESTABLISH your objectives
* CONTACT a broad cross-section including workers
* IDENTIFY the opinion-makers or decision-makers
* SET UP a joint planning mechanism
* HOLD meetings on neutral ground
* LISTEN rather than speak
* DON'T accept offices, e.g. Chairman or Secretary
* ALLOW an acclimatisation period
* BE OPEN, frank and sincere
* KEEP a low, but level profile
* OFFER guarantees; ACCEPT commitment
* REMEMBER that "process" is as important as "substance"
* KEEP the media involved; ISSUE news sheets
* HELP other decision-makers maintain their constituents' trust
* DON'T understate the problems
* DON'T underestimate the other participants' technical knowledge
* BE positive
* EXPLORE every way of doing what the others want

CASE - ONSDAG IRRIGATION PROJECT

Questions on the case

1. Study the case carefully and determine the key facts and issues.

2. What are the findings from the environmental manager's monitoring activities?

3. Develop alternative action plans for the manager to resolve the problems and improve client/enterprise relations.

4. Decide and justify the action to be taken.

CASE - ONSDAG IRRIGATION PROJECT

1. OVERVIEW: RIO CHOCO 1984

The goals of the Onsdag Irrigation Project, like other large-scale irrigation schemes managed by a parastatal organisation, are both economic and social. If successful in Rio Choco, the project would eventually generate scarce foreign exchange through the production and sale of cash crops. At the household level it would increase income and lessen farmers' risk of crop failures.

The Onsdag Irrigation Project is to supply irrigation water from the Ubargi River to a nearly level black clay plain 90 km away. A dam, complete with a pumping station at one end of the canal, will regulate the Ubargi waters through the main canal as it supplies a 5,700 km network of smaller irrigation canals.

The canalisation is designed to operate on a night storage system. The drainage systems collect surface run-off from fields and minor drains into the main collector drains. Drains run parallel and adjacent to the main irrigation canal to protect it from run-off from higher land to the east. Drainage canals empty into the uncultivated lands adjacent to the project and do not transfer run-off waters to adjacent seasonal stream channels.

The project aim is to irrigate cotton and groundnut crops. Resident labour in the project's newly-designed villages constitutes approximately 50 per cent of the total workforce needed. These workers, along with about 60,000 seasonal labourers (during the harvest season), hand-pick the crops. The canal water is used by the workers and their families for daily household needs (since their homes do not have water supplied) and to supplement the one standpipe in each village centre. People were moved to the new villages just before the first planting. Designers did not consult the villagers on village design, water supply, or waste disposal. Cattle, camels and goats always come to the standpipes and canals to drink.

2. THE ENVIRONMENTAL IMPACT ASSESSMENT

The Onsdag Irrigation Project was subjected to environmental assessment by the donors during the design stage and during implementation. The EIA helped identify three major problems:

(a) Creation of vector habitat for water-borne diseases (malaria, schistosomiasis etc.).

(b) Health aspects of alflatoxin (a fungus-related toxic substance) on groundnuts.

(c) Disruption of game migratory routes to and from the Linder National Park. The potential impacts on the Linder Park were reviewed by the Game Department and technical experts from the United Nations Development Programme (UNDP).

These concerns were examined by the Government before signing the project agreements, which required the Government to develop a programme (accceptable to the donors) to control and treat schistosomiasis and malaria in the project area.

3. PROJECT STATUS AND DEVELOPMENTS

The project's main irrigation channel and 30 per cent of the smaller channels have just been completed. The newly-irrigated area is yielding a bumper crop of groundnuts and cotton. The good harvest is due to 11 aerial applications of crop protection chemicals. This combats the whitefly which leaves a sticky substance on the cotton lint, deteriorating its quality and sales value. Tractor-applied herbicides were used to control weeds, while areas to be mechanically harvested were treated twice with aerially-applied defoliants (which do not harm the crops). Horticultural plots are treated manually with insecticides and fungicides by resident labourers.

On a regular monitoring trip, E.L. Gordo, the project's environmental manager, noticed that in the fields nearest to the construction site, the crops were dry and of a different colour from those further away. Water tests in the smaller canals showed unusually high amounts of insecticide, herbicide and fungicide residues. Gordo reported his findings to the project manager, Sidney Carton.

Even prior to Gordo's report, Carton was worried. The project was eight months behind schedule due to dam design changes, and the client was anxious to earn foreign exchange. Furthermore, recent studies showed that the same project, using indigenous rain-fed irrigation techniques and natural fertilisers, would have cost US$40 per hectare per annum (but with 50 per cent less productivity) instead of the US$760 of the present project.

1. PULP AND PAPER PROJECT

In Turkey, a new pulp and paper plant is being constructed on a river two miles from the seashore - a possible future tourist area. The Government intervened to balance the industrial and tourist development by setting zoning laws to limit the industrial area development, and rerouting heavy truck traffic to avoid the Mediterranean shore. The project's environmental manager, after one of his weekly monitoring trips, reported that the pipeline for the plant's effluents which discharges into the sea, would not be effective in dispersing the pollutants due to wave movements at certain hours of the day.

What are the options for the project manager?

2. BELO ROBB

Ten floors of a 40-storey office building in South America have been completed. A report reaching project headquarters indicates that in recent studies, inhaled asbestos was identified as the cause of respiratory diseases including asbestosis (a form of pneumoconiosis), and two types of malignant lung tumours. Asbestos is used in this building to fire-proof the steel grid structure.

What are the project manager's alternatives in considering the effects on the construction workers and future occupants?

3. KAWANEE DEVELOPMENT AGENCY

The Kawanee Agency is financing the construction of a 120 MWatt, hydro-electric dam in Sri Lanka. During construction, Jake Caleb (the project manager) received disturbing news about how expatriate personnel (mostly men) were upsetting local inhabitants and their culture. Vice related incidents were increasing within and around the dam site, and surrounding communities were very upset. This was affecting the work and atmosphere at the site, especially between expatriate personnel and the local workforce. Action?

LAST ASSIGNMENT - ACTION PLANNING

INSTRUCTIONS - INDIVIDUAL WORK

(a) Assemble in SG now.

(b) Turn to your Standard Course Diary and find the section "Guidelines for Action Items".

(c) Complete your action planning now.

E N V I R O N M E N T A L M A N A G E M E N T T R A I N I N G
AN ILO/UNEP PROGRAMME IN SUPPORT OF
MANAGERS AND MANAGEMENT INSTITUTIONS

Unit PM2: Project implementation

CASE GUIDE

(Not retained by participants)

CONTENTS

ANSWERS TO THE CASE - ONSDAG IRRIGATION PROJECT

1. STORY OF THE CASE

The Onsdag project is designed to supply water from the Ubargi River to a level black clay plain which is suitable for growing cotton and groundnuts. The project is designed to generate income for 120,000 resident and seasonal workers. Other project objectives are to increase national foreign exchange reserves and improve the general quality of local life.

With the dam, pumping station and main canal completed, all that remains to be built is 4,000 km of small canals. Planting and harvesting in the irrigated areas has yielded bumper crops of cotton and groundnuts. The large harvest is due, mainly, to frequent applications of fungicides, herbicides and insecticides.

During monitoring, the environmental manager observed poor colour and growth in the newly irrigated fields nearest the worksite. Testing the water, he found very high concentrations of the chemicals used to protect the crops. The environmental manager reported his findings to the project manager.

The project is eight months behind schedule and the recent client report shows that the development costs of this project are 19 times greater than if the project had used indigenous means.

2. FINDINGS FROM ENVIRONMENTAL MONITORING

(a) The water is contaminated with high concentrations of chemicals. This puts the crops as well as the labour force, their families and livestock at risk (since household water is drawn from the canals).

(b) The environmental manager's findings could be the final reason for the client to discontinue the project (note that the technology used in this project costs much more than indigenous technology although it does achieve higher productivity).

3. ALTERNATIVES - ACTION PLANS

(a) The project manager, in collaboration with the enterprise planners and headquarters, should initiate studies on country-feasible, cost-efficient means to protect and fertilise the crops.

(b) The contractor should install more standpipes in each village to reduce or eliminate the necessity for residents to use canal water (which would become contaminated) for household needs.

(c) Collector drains that protect the main canal from run-off should be used to channel fresh water into ponds for fishing and animal watering needs.

(d) Stop the project and introduce indigenous technology.

4. DECISION AND JUSTIFICATION

(a) Decision:

* The project manager should implement alternatives (a), (b) and (c) listed above.

* The environmental manager should have further technical feasibility studies performed, including EIA, to seek alternatives to chemical protection and fertilizing of crops.

(b) Justification:

* By showing the client that his interests are also important, the contractor may salvage his goodwill and obtain more work in the country or the region.

* Presenting a feasible plan to the client that would lower costs of crop fertilizing and protection, may prevent him from terminating the project and resorting to indigenous methods.

* The provision of additional standpipes would entice people away from the canals for their household water needs and should be part of any remedial plan.

* Channelling the collected drain water is more hygienic, and would prevent the canal banks and standpipe areas from being deteriorated by the animals.

* It is probably not justified to change the technology at this late stage since the indigenous technology has low productivity.

5. LEARNING POINTS

(a) Data collected during EIA should be reliable and comprehensive for subsequent project environmental monitoring.

(b) Provided it is timely, project monitoring carried out regularly may reduce the risk of a project shutdown.

(c) Project feasibility studies should generate alternatives which include local (indigenous) as well as donor technology and resources.

(d) Aid recipient countries should request an independent environmental impact assessment of proposed projects to filter out incompatible technology or methods.

(e) A recipient country need not always accept the "aid" of a donor country, since it can lead to high costs and relatively uneconomic technology compared with indigenous alternatives.

(f) To avoid alienating it, the local community should be involved in decision-making before plans are implemented. This can prevent expensive corrective measures later.

(g) The project manager must be flexible to manage the continuously changing aspects of the project's environment.

ANSWERS TO THE MINICASES

1. PULP AND PAPER PROJECT

(a) The project manager should re-examine the oceanographic studies and the pipeline outfall. If the findings of the environmental manager's monitoring contradict the original studies and design, then the project manager should recommend additional studies to determine an improved pipeline design.

(b) The pollutants can be discharged into the sea during periods when the wave movements are right. At all other times, effluents should be stored in a reservoir/tank for later discharge.

(c) A change in the location, depth and length of the pipeline could provide adequate dilution of the pollutants. The project manager may find that this is a cost beneficial solution and modify the pipeline.

2. BELO ROBB

(a) Elimination of the asbestos hazard. Do not use any fire proofing, but the building will become a fire hazard (no final solution!).

(b) If asbestos is already being used, then the workforce could be equipped with air masks, but the future users of the building will be at risk (no final solution!).

(c) The logical strategy is to stop work and consult the designers on alternative materials for fireproofing to prevent higher costs that would result from curative action or legal penalties later on.

3. KAWANEE DEVELOPMENT AGENCY

Jake Caleb should verify that the reported incidents are actually occurring on the site and then take steps to prevent any future problems.

(a) Entry into the camp and to the dam site should be restricted to staff only (e.g. I.D. cards, etc.). This would prevent any unpleasantness on camp.

(b) Advise expatriate staff against being involved in any such incidents as they may be putting themselves at risk.

(c) Organise public relations trips for the local inhabitants to visit the site and show them how they will benefit from the dam.

(d) If necessary, send expatriates to the capital or other large cities during the week-ends.

QUIZ

Choose the most correct answer

1. "The project manager is responsible for environmental management". This statement is:

   (a) false, if there is an environmental manager on the project
   (b) true, if he was also responsible for project design
   (c) true
   (d) false, if there is an effective project/community relations activity

2. The EIA for a project is

   (a) a critical source for the project scheduling checklist
   (b) legally required in all countries
   (c) best evaluated at the end of the project
   (d) more important in project implementation than design

3. The key factor for effective project environmental monitoring is usually:

   (a) data to monitor manpower movements
   (b) a continuous and timely data collection system
   (c) an activity/input environmental matrix
   (d) community relations

4. Critical areas of concern for an environmental manager on a construction project includes all of the following, except:

   (a) social and physical environment
   (b) historical, archeological and economic concerns
   (c) community involvement
   (d) labour contracts

5. Effective environmental training programmes:

   (a) require an effective reward system
   (b) are necessary for all workers and project staff
   (c) can be avoided by efficient manpower recruitment procedures
   (d) rarely help the project management to achieve targets

6. A pulp project discharges waste products into the sea. These were returned by tidal movements and the community reacted against the project. The environmental manager should:

(a) re-examine the problem to determine causes and significance
(b) set up a community action team
(c) change the discharge pipeline's depth and length
(d) discharge pollutants only at night

7. The environmental impacts of the influx of workers and their families from other regions to the project site/region:

(a) may have negative impacts on the local community
(b) usually increase local birthrates
(c) are usually solved by separating the new workers and their families from the local community
(d) are rarely controllable

8. Due to continuous interaction between the project and the environment it is usually:

(a) possible to predict impacts
(b) possible to control impacts
(c) impossible for the project manager to monitor the environment
(d) impossible to predict all project impacts precisely

9. An environmental management checklist:

(a) is finalised in the design phase
(b) is used only if EIA has been performed
(c) requires continuous updating during the project operation
(d) is used by management to react to emergency situations

10. Project environmental monitoring during implementation <u>mostly</u> requires:

(a) some contact with the community to determine unacceptable environmental impacts
(b) comparing project progress against target
(c) updating the environmental data bank
(d) regular review of environmental impacts

11. In a donor financed project the "free" technology:

(a) is usually beneficial because it is free
(b) ensures state-of-the-art technology
(c) may not be economic in terms of social costs
(d) usually has fewer environmental impacts than indigenous technology

12. Successful implementation of a project with severe environmental impacts mainly requires:

(a) persistence to get project plans through
(b) technology to control pollution
(c) continuous feasibility studies to generate alternatives
(d) control of suppliers and contractors for compliance with quality standards

13. The criteria for choosing a good contractor for a project should be:

(a) the achievement of project target completion dates
(b) the protection of the local environment from damage
(c) the achievement of targets with minimal environmental impacts
(d) financial reliability

14. A sub-contractor is faced with an asbestos hazard. He should:

(a) eliminate fire-proofing materials
(b) equip workforce with air masks
(c) consult designers for alternative fire-proofing materials
(d) consult lawyers for protection against legal penalties

15. Project management involvement with the community includes all, except:

(a) analysis of the local/regional scene
(b) understanding the underlying issues
(c) keeping a high community profile
(d) the preventive approach to conflict

16. For a project manager to interact with the community, he:

(a) should be open, frank and sincere
(b) should join community organisations and accept offices
(c) should keep a high profile
(d) must provide benefits to the community

17. Project materials are checked in order to:

(a) employ extra local labour and use local materials
(b) prevent faults being built-in, which cost more in the long run
(c) avoid production delays due to unsuitable materials
(d) eliminate all materials that have long-term environmental impacts

18. The key advantage of environmental management of project materials is:

(a) reduced cost and improved community relations
(b) reduced waste and pollution
(c) improved protection of natural resources
(d) reduced pollution, waste and cost

19. The process for satisfying community needs, includes all of the following, except:

(a) involving the media
(b) identifing gate-keepers
(c) establishing the community objectives
(d) setting up a joint planning council

20. Selecting or recruiting manpower from outside the local labour force is a sensitive issue:

(a) for projects lasting more than one year
(b) for expatriate staff
(c) only in developing countries
(d) requiring care in selecting workers with lifestyles compatible with the host community

cabda aadcd ccccc abdcd

Note: One of these answers may be wrong. Which one?

notes

environmental management training
an ILO/UNEP Programme in support of Managers and Management Institutions

2

PROJECT MANAGEMENT AND THE ENVIRONMENT

Unit PM.3 Project Monitoring and Environmental Evaluation

International Labour Office Geneva

environmental management training
an ILO/UNEP Programme in support of Managers and Management Institutions

Unit PM3: Project monitoring and environmental evaluation

WORKPACK

(Retained by participants)

Contents

1. OBJECTIVES

(a) To develop new knowledge, skills and attitudes about environmental management in development projects.

(b) To assess the need for a environmental monitoring system

(c) To plan for a positive project environmental evaluation.

(d) To reinforce flexibility and environmental sensitivity as key project management skills in the 1980s

(e) To motivate further study.

In SG add additional objectives as appropriate:

(f)

(g)

Note: This package builds upon the training modules, G.1 through G.5, of the Environmental Management Series which may be helpful to learners who have no previous experience in the field.

STUDY/LECTURE: PROJECT MONITORING
AND ENVIRONMENTAL EVALUATION

This material is designed in a special format to stimulate group study and interaction. It is not a text book and is not suitable for individual study until after the unit has been completed.

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1. PROJECT ENVIRONMENTAL MONITORING

(a) The EIA is a planning tool which identifies potential environmental impacts and generates terms of reference to monitor them at all project stages: design, planning, construction, implementation and, finally, full production.

(b) It is not possible to predict precisely all environmental impacts. Although the EIA and other technical studies are used as a basis for designing a monitoring system, the overall system must be flexible to adapt to new project priorities.

(c) Monitoring during project construction alerts management to new environmental problems during implementation.

(d) Similarly, monitoring the extent and nature of environmental impacts in project implementation provides useful new data on environmental concerns for the full production stage.

2. GUIDELINES FOR MONITORING

(a) Management must provide adequate resources for a project environmental monitoring system. Such a monitoring system needs defined objectives, a technical programme and a management structure geared to critical environmental concerns. Otherwise, environmental monitoring may take place in an atmosphere of conflict and confusion.

(b) The key questions to answer when setting up the monitoring system are:

* what environmental concerns are significant;

* who administers the monitoring programme;

* how will results be interpreted and reported;

* how will decisions be made.

(c) From an activity/impact matrix (Exhibit 1) a monitoring checklist may be developed (Exhibit 2).

(d) In periodic monitoring reports, the monitoring system documents environmental impacts and remedial actions taken.

3. PROJECT ENVIRONMENTAL EVALUATION

(a) Monitoring and evaluating are basically complementary as indicated in Exhibit 3.

(b) Evaluation covers short and long-term objectives; it draws conclusions from the project experience, analyses successes and failures, suggests improvements in ongoing activities and provides guidance in planning new ones.

(c) Environmental management aspects of a project identified in the EIA, will feature in the project evaluation. For example:

* environmental deficiencies noted by the end of construction should be recorded on the final inspection check-list (sometimes referred to as the "punch list");

* items on this "punch list" must be completed, rectified or modified as directed by the project manager, the client or the agency in charge before the full production phase of the project.

4. GUIDELINES FOR EVALUATION

(a) Environmental evaluation information is obtained from project monitoring records, interviews with key personnel, and the final project report.

(b) The final report:

* summarises progress reports;

* highlights deviations from the original design and schedules;

* states the reasons for these deviations, and records any corrective action taken;

* documents special circumstances or situations which have arisen during the progress of the work;

* includes final drawings with annotations of changes made to the original plans;

* specifies environmental issues encountered and methods used to lessen impacts and evaluates such actions.

(c) Evaluating a project from an environmental management viewpoint is part of general project evaluation and is outlined in a special reading for later study (see bibliography) which may be used as a framework for future environmental evaluations.

5. TRANSITION FROM PROJECT IMPLEMENTATION TO FULL PRODUCTION

(a) Project environmental evaluation is a critical management function after construction and implementation and before full production; it determines whether the project has achieved its operational goals and environmental standards.

(b) The evaluation indicates goal conflicts between the project, now in production, and its environment. The enterprise and the government use project evaluation to create a system to operate during the full production phase, which will:

* establish environmental standards and indicators;

* correct performance deficiencies;

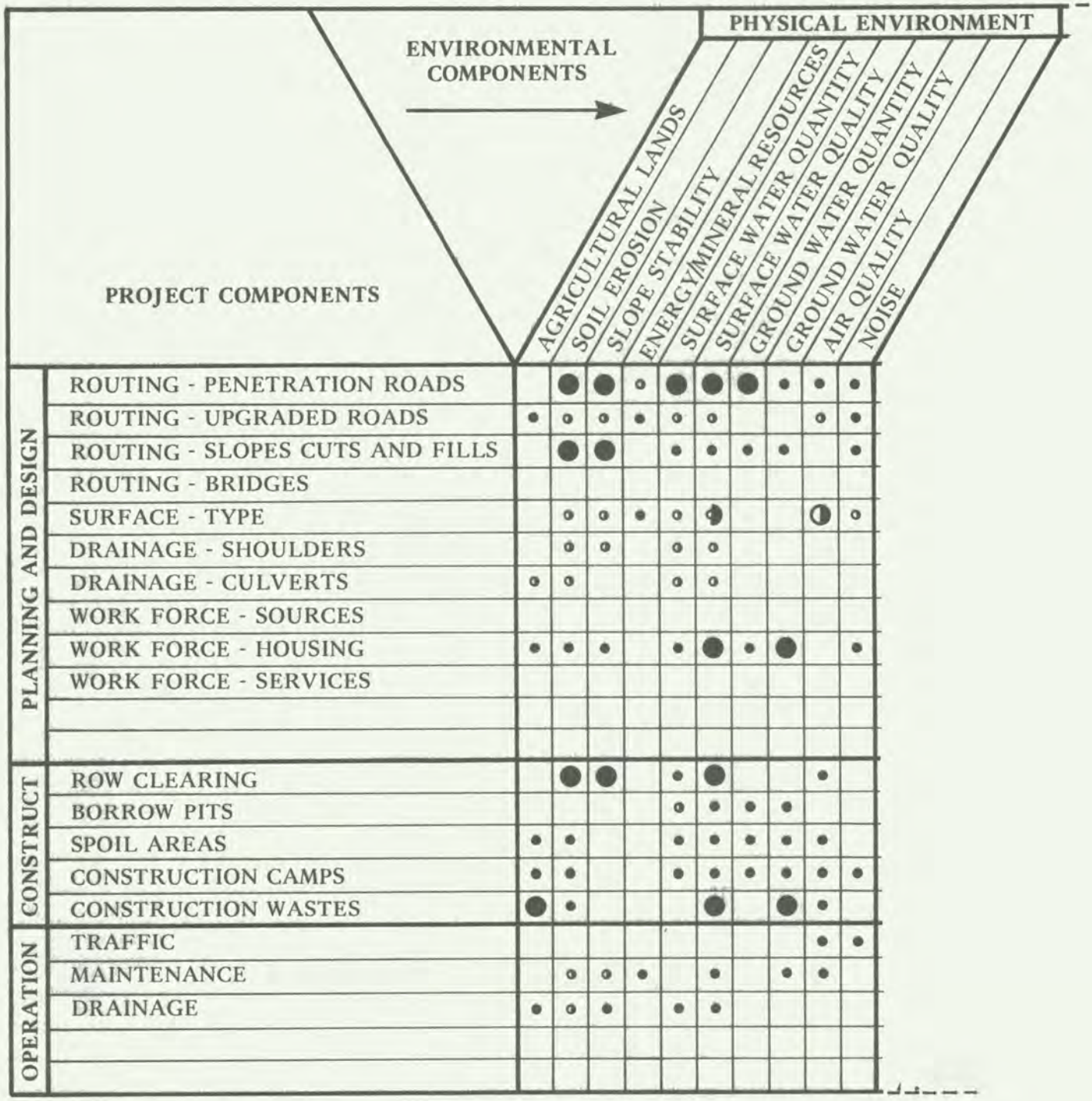
* provide monitoring resources (e.g. equipment, manpower, training);

* institute a follow-up and accountability system for changes.

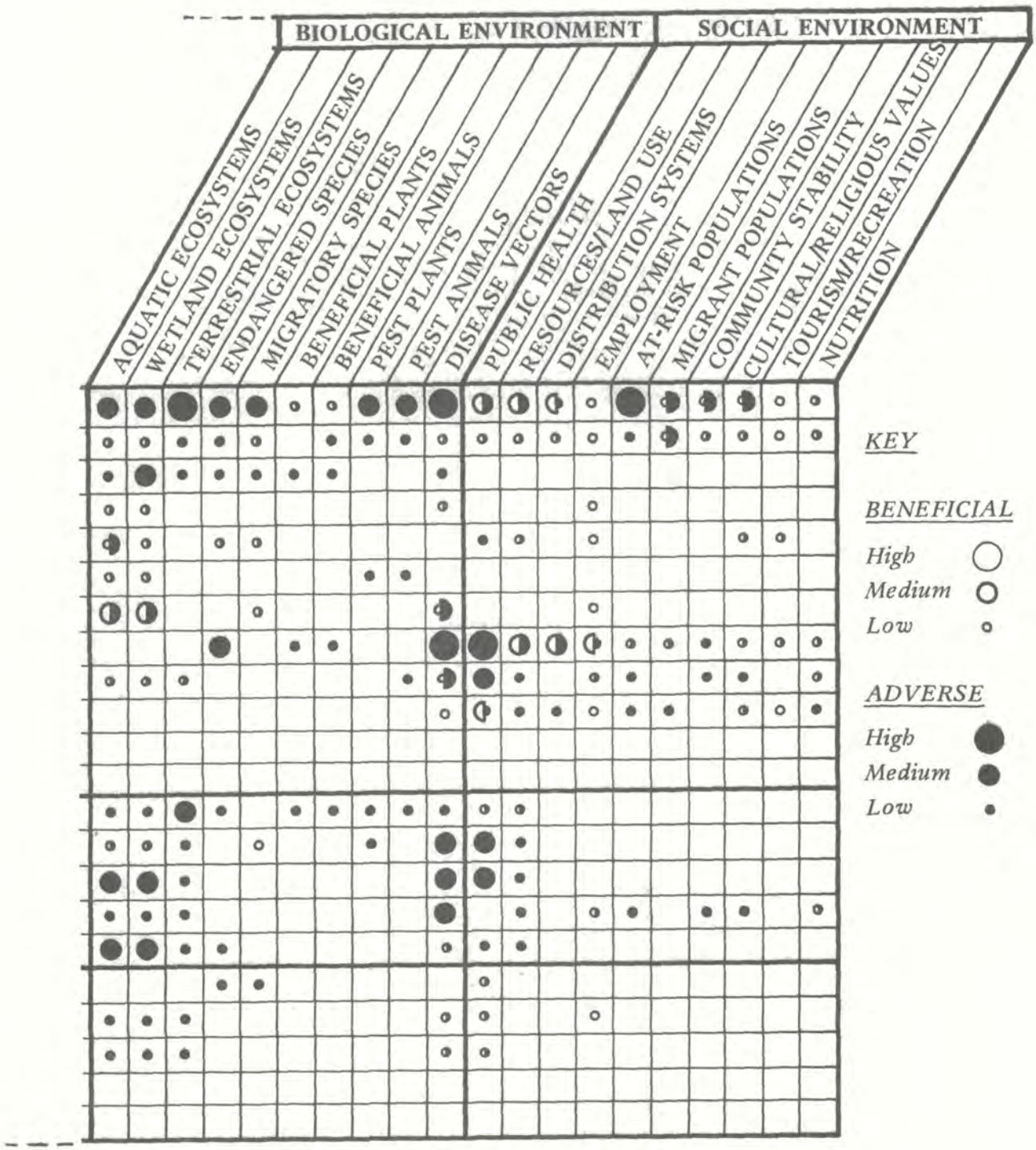
ACTIVITY/IMPACT MATRIX

Indicating the relative severity of potential environmental impacts

A RURAL ROADS PROJECT



Borberry,J. Status and applications of Environmental Impact Assessment for development, Conservation for Development Centre Gland, Switzerland, 1984



SOURCE HARZA ENGINEERING, 1980

PROJECT MONITORING CHECK-LIST - AN EXAMPLE

(To be used as a guide in assessing the environmental impact of each major project decison)

A. PROJECT TYPE (road, industry, etc.): _____

B. PROJECT PHASE (planning/design, etc.): _____

C. PROJECT COMPONENT (routing, site location, etc.): _____

D. PROJECT DECISION POTENTIAL IMPACTS:

1. Agricultural lands

(a) Are there cultivable lands in the project area?	Yes___	No___	N/A__
(b) Did project decision result in more or improved cultivable land?	Yes___	No___	N/A__
(c) Did project decision result in less or damaged cultivable land?	Yes___	No___	N/A__

Impact on agricultural land .....

2. Soil erosion

(a) Did project decision help to prevent soil loss or erosion?	Yes___	No___	N/A__
(b) Will project decision directly cause or worsen soil loss or erosion?	Yes___	No___	N/A__
(c) Could project decision indirectly lead to practices that could cause soil loss or erosion?	Yes___	No___	N/A__
(d) Is it necessary to consult a soils scientist?	Yes___	No___	N/A__

Impact on soil erosion .....

3. Slope stability

(a) Does project decision involve actual modification of slopes?	Yes___	No___	N/A__
(b) Will project decision affect stability of slopes indirectly?	Yes___	No___	N/A__
(c) Will project decision result in other conditions that could affect slope stability?	Yes___	No___	N/A__
(d) Could project decision cause people, livestock or property to be located where existing unstable slopes could be a hazard?	Yes___	No___	N/A__
(e) Is it necessary to consult a geotechnical engineer?	Yes___	No___	N/A__

Impact on slope stability .....

4. Energy-mineral resources

(a) Do energy-mineral resources exist in project area?	Yes___	No___	N/A__
(b) Will project decision help to develop, now or in the future, important energy-mineral resources?	Yes___	No___	N/A__
(c) Will project decision cause significant consumption of additional energy-mineral resources such as engine fuels?	Yes___	No___	N/A__
(d) Could project decision prevent or impede future development of essential energy-mineral resources?	Yes___	No___	N/A__
(e) Is it necessary to consult with a minerals agency or mining engineer?	Yes___	No___	N/A__

Impact on energy/mineral resources .....

5. Surface water quantity

(a) Do surface water resources exist in project area?	Yes___	No___	N/A__
(b) Is information available on present and future demands on water resources as a result of the project?	Yes___	No___	N/A__
(c) Will project decision help to increase or preserve available surface water supplies by such things as improved drainage/run-off conditions?	Yes___	No___	N/A__
(d) Will project decision increase demand or cause loss of available surface water either directly or indirectly?	Yes___	No___	N/A__
(e) Is it necessary to consult a hydrologist?	Yes___	No___	N/A__

Impact on surface water quantity .....

6. Surface water quality

(a) Is information available on present water quality?	Yes___	No___	N/A__
(b) Will project decision lead to additional natural or man-made discharges into surface waters?	Yes___	No___	N/A__
(c) Will project decision help to improve or project surface water quality?	Yes___	No___	N/A__
(d) Could project decision cause deterioration of surface water quality either directly or indirectly?	Yes___	No___	N/A__
(e) Is it necessary to consult a water quality engineer or agency?	Yes___	No___	N/A__

Impact on surface water quality .....

PROJECT MONITORING AND EVALUATION

1. Monitoring	2. Evaluation
(a) keeps track of daily activities on a continuous basis	(a) periodically examines project effect/impact (long-range view)
(b) accepts policies, rules	(b) questions policies, procedures & rules
(c) controls production of outputs	(c) examines progress towards objective achievement and questions appropriateness/ adequacy of objectives
(d) focuses on transformation of inputs to outputs	(d) focuses on transformation of outputs to objectives
(e) concentrates on planned project elements	(e) assesses planned elements and looks for unplanned change, searches for causes, challenges assumptions
(f) reports on implementation progress	(f) checks on progress and seeks to identify lessons learned

CASE - DEL POWER AND LIGHT

Questions on the case

1. Study the case carefully and determine the key facts and issues.

2. How could Mr. Singh have prevented some of the environmental management problems?

3. Outline some possible solutions to issues highlighted in the case.

4. Decide and justify Mr. Singh's priorities for immediate action.

CASE - DEL POWER AND LIGHT

In 1983 the Del Power and Light Company planned to build a coal-fired station near the city centre. Mohan Singh was appointed project manager, and assumed duty in August of that year after the first manager was discharged due to his unsuccessful attempts to deal with project/community problems.

Building supplies for this project (which was to take approximately two years) were supplied by truck and open rail cars directly to the site, passing through the city. These links were to be used later, to supply the power station when in operation with coal and other materials.

The local community complains about disturbances caused by the construction work, but Mr. Singh is determined to ensure that the project is completed on schedule. The list of complaints is long and includes:

* dust from cement and other supplies carried on trucks;
* noise of trains, trucks and construction equipment thoughout the day;
* danger to pedestrians on roads and near site;
* property damage due to train and truck vibrations;
* dumping of waste on common land.

Furthermore, people living near the river complain that the water for domestic consumption, previously available, is no longer clean enough.

Mr. Singh has to complete the project on time, but he risks community backlash on the power plant once it is commissioned. Following an inspection, he has found out that he may be fined by the government and discharged by his company for polluting the river.

MINICASES

1. SOUTHERN CROSS

In the cold semi-antarctic weather, metal takes on different characteristics from those prevailing in normal conditions. On the Bobozoan Oil pipeline project, pipe sections laid end to end are welded then placed in a trench or hoisted on to legs where the soil is frozen too hard to dig. Migratory herds pass under the raised pipeline. What are the major items to monitor during construction of this project and for the next pipeline project?

2. CITY TREES

During the construction of a sprawling office building and apartment complex in the city, the project manager had nearly all the trees cut down and gave no thought to re-planting trees on the site once the project was completed. The client demanded that it be done. Why? What do trees provide for the environment?

3. KENWORTH LOGGING CO.

In order to open the jungle for timber cutting, the project manager ordered a road to be made up a steep hill during the dry season. The soil, basically stable in the dry season, will be unsuitable for the road during the rainy season. If the road is washed away, the erosion of the topsoil will accelerate, but if he does not build this road he will not be able to transport the logs away from the site. What are his alternatives?

CHECKLIST FOR GENERAL PROJECT EVALUATION

(with special attention to environmental issues)

1. EVALUATING A PROJECT

(a) Evaluation should be a constructive interaction between interested parties, a collaborative effort rather than a judicial review. Only if those involved in the evaluation understand the proper approach to the exercise from the outset can the time and effort devoted to the process yield the desired benefits.

(b) Evaluation can take many forms depending on its specific purpose and objective and whether it is carried out by outside consultants, donor representatives, in-house personnel, project staff or a combination of any of these.

(c) The value of the exercise will normally be enhanced by involving a number of persons connected with the project and providing various viewpoints, experiences and skills. Broad representation will usually result in a more comprehensive review of project status, promote a better understanding of the project and facilitate the implementaton of decisions taken.

(d) Normally the evaluation process can be divided into three phases:

* Preparation of environmental evaluation worksheet

* Conduct of evaluation

* Preparation of report and recommendations.

2. PREPARATION OF EVALUATION WORKSHEET

(a) Project objective

* What is the project objective.

* What attainment indicators of the objectives were identified in the design.

* State whether the project is having, or likely to have, the desired impact on the target group (intended beneficiaries).

(b) Immediate environment management (EM) objectives

* What are the immediate EM objectives.

* What indicators confirm achievement of the EM objectives.

* For each indicator, what data have been collected? What facts have been observed which tend to confirm that the immediate objective is being or has been achieved.

* What major assumptions were identified as necessary for the achievement of the EM objectives.

* For each assumption, show whether it has materialised, remains valid or is no longer valid.

(c) Outputs

* List planned outputs.

* For each output, identify portion scheduled or intended for completion during period covered by report.

* For all outputs, list the type of impact and the present status of the project environment.

* What major EM assumptions were identified as necessary for the achievement of the immediate objectives.

* For each assumption, show whether it has materialised, remains valid or is no longer valid.

* What action was taken to mitigate or resolve the conflicts (if any) between the output production and the project environment.

(d) Activities

* List scheduled major activities.

* For each activity, identify portion scheduled or intended for completion during the period covered by this report.

* For all activities, list the type of impact and the present status of the project environment as a result of the individual activities.

* What major assumptions were identified as necessary for the commencement of each activity.

* For each assumption, show whether it has materialised, remains valid or is no longer valid.

* What action was taken to mitigate or resolve the conflicts (if any) between the activity and the project environment.

(e) Inputs

* List planned inputs.

* For each planned input, identify portion scheduled or intended for provision during the period covered by this report.

* For inputs, show those provided to date and their impacts on the project environment.

* What major EM assumptions were identified as necessary for undertaking the activities.

* For each assumption, show whether it has materialised, remains valid or is no longer valid.

* What action was taken to mitigate or resolve the conflicts (if any) between the activity and the project environment.

3. CONTENT OF EVALUATION

(a) The evaluation worksheet should be submitted to the members of the evaluation team as early as possible. The group should first agree on whether the worksheet reflects the design, the established objectives, indicators and assumptions, and performance to date.

(b) The evaluation team can then compare results with projections by applying seven distinct but inter-related analytical tests:

* Effectiveness

  - Has the project made the anticipated progress towards the realisation of environmental management.
  - On the basis of data collected for each indicator, is it likely that the immediate EM objective will be achieved.
  - Does the evidence suggest that a meaningful contribution to project objectives will be made and have the desired impact on target groups.
  - Have objectives been achieved; is there a reasonable hope that projections will be met; if not, are objectives still attainable.

* Efficiency

  - Are EM costs in line with results and the project cost schedule.

* Relevance

  - Is project EM relevant to its overall objectives.
  - Political, economic or other factors arising during the project's initial implementation period can make it necessary to change. Are the project's EM objectives still pertinent.

* Continued validity of project design

  - Have planned inputs, activities and outputs and EM brought about project's objectives.
  - Does project design still correspond to the EIA.

* Unanticipated effects

  - Have there been any significant unexpected environmental effects, whether beneficial or detrimental.
  - Is there any evidence of unanticipated effects which should be considered in planning future projects?

Note: Despite the best efforts of planners, projects often have unexpected results, especially in the uncertain socio-economic and physical environments in which public and private enterprises operate. The process of periodic evaluation provides an opportunity for identifying major unexpected factors and, in the case of continuing projects, considering appropriate action to maximise (or minimise) these effects.

* Identification of alternatives

  - Could EM have dealt with the problem in a more effective or efficient way.
  - Based on experience, what approach would have been more successful or less costly.

Note: This information will be especially valuable when follow-up activities or similar problems elsewhere are being considered.

* Causality

  - What factors have affected the project's EM performance.
  - Did these factors impact the project outcome. Describe the impacts.

(c) The review will have considered a great many factors which have contributed to or retarded project progress. They must be identified for short and long-range benefits (feedback and future projects).

(d) Marking these factors may prove difficult since the participants in the review are likely to have different perspectives.

(e) Factors affecting one project are not likely to recur. However, if data shows that the same EM problems crop up in a wide range of projects, then future planning can take these into account.

4. PREPARATION OF EM REPORT AND RECOMMENDATIONS

(a) This final and most important phase of the evaluation exercise consists of:

* overall conclusions;

* revising the project design;

* deciding on action to be taken or recommendations made;

* identifying lessons learned from terminating or completing a project.

(b) Overall conclusions (all projects)

On the basis of project progress analysis provide a concise narrative EM evaluation statement.

(c) Project revisions (continuing projects only)

Using project progress analysis, identify any changes to be added to the project design. Revised objectives, indicators, outputs, etc. will be the basis of any subsequent evaluation exercise.

(d) Decisions/recommendations (continuing projects)

Most decisions or recommendations will be the direct result of the tests undertaken under step 2 above. Even the causality test - intended primarily for long-range purposes - may serve to identify actions to be taken. For example, any factor rated important which is also rated negative presumably requires management's urgent attention.

While the evaluation report is expected to record the action/decisions taken or proposed, it is not designed to serve as a means of requesting or initiating such action. If any actions either need to be undertaken or authorised by parties not directly involved in the review (enterprise headquarters, government agencies, funding agencies not participating in the evaluation, etc.), normal operating procedures and regular channels of communication should be followed.

(e) Lessons learned (terminating and completed projects)

On project completion, project management and the evaluation team have the opportunity to identify the lessons learned which could apply to other projects and to make recommendations on the timing of a follow-up evaluation.

This sort of information is important in any event, but imperative if there is any possibility of another project along similar lines being undertaken at a later date, by which time the original staff members may no longer be available.

(f) Distribution of the EM

Timely distribution should follow the guide-lines in the project document evaluation report.

LAST ASSIGNMENT - ACTION PLANNING

INSTRUCTIONS - INDIVIDUAL WORK

(a) Assemble in SG now.

(b) Turn to your Standard Course Diary and find the section "Guidelines for Action Items".

(c) Complete your action planning now.

E N V I R O N M E N T A L M A N A G E M E N T T R A I N I N G
AN ILO/UNEP PROGRAMME IN SUPPORT OF
MANAGERS AND MANAGEMENT INSTITUTIONS

Unit PM3: Project monitoring and environmental evaluation

CASE GUIDE

(NOT RETAINED BY PARTICIPANTS)

CONTENTS

ANSWER TO THE CASE: DEL POWER AND LIGHT

1. STORY OF THE CASE

Del Power and Light are building a coal-fired power station in the middle of Del city. Mr. Singh, the project manager, is very keen to keep the project on schedule, but he has recently received many complaints from the local community on how the project has negatively affected their lives. He also risks a heavy fine for water pollution and possible discharge by his company.

2. PREVENTING ENVIRONMENTAL PROBLEMS

(a) Use EIA to describe, predict, evaluate and communicate environmental impacts, so that such impacts may be prevented.

(b) Set up a Project/Community committee to monitor the effects of the project on the local community.

(c) Set up an effective system for monitoring environmental pollution of the air, water, land etc.

(d) Investigate complaints before they become major issues; if impacts are significant, take immediate action before the cost of corrective action or penalities increases.

3. POSSIBLE SOLUTIONS

(a) Dust: ensure materials are packed, and/or transported in covered trucks on rail cars. Spray water to reduce dust in the air.

(b) Noise: ensure that supplies come in at regular times during the day so that disturbance is minimised.

(c) Danger to pedestrians: brief and train all drivers to be more conscious of pedestrians; mark out safe paths for pedestrians near the site.

(d) Dumping: determine (with the committee) either an acceptable site for landfill or have the wastes trucked out.

(e) Water: wastes dumped into the water should be monitored for oils and chemicals which could be collected and disposed of more thoughtfully.

(f) Overall: use a monitoring system to forecast and prevent adverse environmental impacts before they become significant.

4. PRIORITIES FOR MR. SINGH

(a) Decision - Contact community representatives and the government department responsible for the environment (the one likely to fine him) and gain time to act; discuss the issues fully.

Justification - This helps Mr. Singh to reduce environmental impacts, improve relations, helps avoid fines and (perhaps) avoid being discharged.

(b) Decision - Set up an environmental monitoring system in collaboration with the community.

Justification - This collaboration helps to convince the community that monitoring will be effective.

(c) Decision - Take steps immediately to correct the dust problem, the pedestrian problem and the water problem.

Justification - By attacking the easier problems with quick solutions, demonstrate reliability and gain trust.

(d) Decision - Start negotiations to reach agreement with the community and the government department on the other issues e.g. noise, dumping and disposal of collected oils and chemicals.

Justification - These are more difficult problems where total irradication is probably impossible or too costly; the level of correction required will have to be agreed on.

5. LEARNING POINTS

(a) In a project environmental impact crisis, management must gain time to negotiate.

(b) As a priority, deal with low-cost environmental impact areas when quick results establish credibility with the community and the government.

(c) Set up community/enterprise committees during the project design and planning stage to help avoid negative community reactions.

(d) Monitor environmental conditions before and after a project is commissioned to receive early warning if something is going wrong.

(e) Establish environmental controls which are practicable, reasonable and cost effective; complete 100 per cent environmental control could force termination of the project.

(f) Curative costs (e.g. fines) which penalise an enterprise for lack of environmental responsibility, may be acceptable in the short term to achieve initial project objectives, however long-term effects may be disastrous for the project.

(g) Public and private enterprises should not overlook environmental impacts even if environmental concerns are given a low priority.

(h) EIA is vital for project planning and implementation to prevent significant environmental impacts.

(i) Give project environmental impacts serious consideration so that adequate safeguards will not be ignored (e.g. in this case damage due to vibration and safety of pedestrians).

(j) Maintain flexibility in the system so that the project can be adapted as new priorities emerge.

ANSWERS TO THE MINICASES

1. SOUTHERN CROSS

(a) Major items to monitor are the migratory routes, any special crossings of the animal herds, which vary from the routes used prior to the project. The other items to monitor are pipeline sections stability in the trench or on the legs and welds between pipe sections to prevent metal failure.

(b) The next project could place the pipeline in water.

2. CITY TREES

The client should have specified in the contract that the construction company would replace the trees that were cut down. Strong environmental reasons for this demand are that trees:

(a) filter particulates from the air;

(b) conserve energy and improve comfort by shading buildings and parking lots;

(c) protect buildings by providing windbreaks and muffling sound;

(d) stop erosion by holding soil and breaking the impact of heavy rainfall;

(e) generate more oxygen;

(f) encourage bird life;

(g) are beautiful.

3. **KENWORTH LOGGING CO.**

The project manager's alternatives are:

(a) Build the road cheaply and monitor its effect on the environment and the environment's effect on the road, so as to repair when necessary.

(b) Use cost-benefit analysis (of traffic and environment) and build the best road possible with the funds available.

(c) Find alternative means of transport. Helicopter, oxen or elephant are possible choices, if available.

QUIZ

Choose the most correct answer

1. An effective system of project environmental monitoring will usually:

   (a) prevent all major environmental problems
   (b) require highly specialized staff
   (c) evaluate the project
   (d) document problems and the remedial action

2. "With a good Environmental Impact Assessment it is usually possible to predict all major environmental problems accurately and to anticipate the appropriate methods to deal with them". This statement is:

   (a) generally true
   (b) true for EIA by experts
   (c) generally false
   (d) false, due to technological change

3. The vital question to answer when setting up an environmental monitoring programme is:

   (a) who administers the programme
   (b) how are results to be analysed
   (c) how are decisions made
   (d) does it have adequate resources and management structure

4. An environmental monitoring programme is developed in the ..... stage of the project.

   (a) implementation
   (b) planning
   (c) design
   (d) political upheaval

5. The best way to monitor a project's daily progress and its environmental impacts, is to link the monitoring check-list with the:

   (a) EIA
   (b) activity/impact matrix
   (c) final inspection list
   (d) project's punch list

6. Environmental monitoring and evaluation are:

(a) basically the same process
(b) rarely used beyond the planning and design phase
(c) different, but complementary
(d) only used after the planning and design phase

7. An increase in the number of trees in a city usually does all, except:

(a) improve the quality of water
(b) conserve energy
(c) protect buildings
(d) improve the air quality and the morale of the dogs

8. Environmental impacts highlighted in the project evaluation are:

(a) due to poor environmental monitoring
(b) not relevant in the final inspection
(c) integrated into the "punch" list
(d) mistakes by the project manager

9. Project environmental monitoring requires all, except:

(a) management structure
(b) adequate resources
(c) objectives and a technical programme
(d) legal pollution standards

10. An environmental evaluation:

(a) considers mainly the implementation phase
(b) considers inputs, outputs and environmental affects
(c) is valid only for short-term objectives
(d) rarely occurs

11. A project post-implementation environmental evaluation is mainly concerned with:

(a) resource conservation
(b) pollution
(c) project success
(d) project goal conflicts

12. For an environmental evaluation of a project, all are necessary, except:

(a) question policies and procedures
(b) examine progress towards a variety of objective achievements
(c) focus on transformation of inputs to outputs
(d) focus on transformation of outputs to objectives

13. From the following select a component of the final environmental evaluation report:

(a) summarises the progress reports
(b) establishes performance goals
(c) includes all environmental aspects considered
(d) institutes a follow-up system for project changes

14. The most important phase of environmental evaluation consists of:

(a) stating overall conclusions
(b) revising the project design (when necessary)
(c) setting acceptable pollution standards
(d) identifying the lessons learned from terminated or completed projects

15. Environmental evaluation should be a constructive judgment that is a ..... effort rather than a ..... review:

(a) consultancy, judicial
(b) management, collaborative
(c) collaborative, judicial
(d) objective, subjective

16. When project monitoring indicates an environmental crisis, then the priority for the project manager is usually to:

(a) gain time to negotiate
(b) form a community committee
(c) stop production and pollution immediately
(d) attack simple pollution issues first

17. The evaluation worksheets are submitted to the evaluation team members:

(a) after the results have been compared and accepted
(b) to be filled in after the evaluation review
(c) to document overtime claims
(d) before the evaluation review

18. The environmental evaluation of a project requires all except:

(a) examination of project effects/impacts
(b) assessment of planned elements or looking for unplanned change
(c) checking on progress and seeking to identify lessons learned
(d) setting environmental standards

19. The monitoring of an environmental project requires all except:

(a) acceptance of policies and rules
(b) reporting on implementation progress
(c) keeping trace of daily activities on continuous basis
(d) questioning policies and procedures

20. In the environmental monitoring process, the project manager will generally:

(a) keep trace of major activities on an hourly basis
(b) look at production inputs
(c) keep in touch with the Ministry of Health on a regular basis
(d) concentrate on the major planned project elements

d c d c b c a c d b d c a d c a d b d d

Note: One of these answers may be wrong. Which one?

notes

environmental management training
an ILO/UNEP Programme in support of Managers and Management Institutions

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PROJECT MANAGEMENT AND THE ENVIRONMENT

Appendix

International Labour Office Geneva

APPENDIX A

DETAILED DESCRIPTION OF ENVIRONMENTAL MANAGEMENT PROGRAMME MATERIALS

BOOK 1: GENERAL ENVIRONMENTAL MANAGEMENT (5 UNITS) - intended for managers, supervisors and students from public or private enterprises or development projects of a general nature which may have some impact on the physical or social environment. The typical learner will have some work experience but little previous training in environmental management.

G.1 Environment and Enterprise Objectives

- Relates the basic goals of the enterprise to environmental management.
- Examines the tools and goals of environmental management and its importance.
- Introduces the concepts and language (glossary) of environmental management.

G.2 Scope and Structure of the Environment

- Examines the economic and ecological views of environment.
- Illustrates the services and functions of environment.
- Analyses different types of environmental conflict.

G.3 Interaction: Nature, Society and the Enterprise

- Examines the roles of individuals and groups in a country.
- Relates the natural environment to the socio-economic environment.
- Illustrates the role of the enterprise in the total environment.

G.4 Environmental Impact Assessment (EIA)

- Demonstrates the four steps to activate EIA.
- Uses a basic matrix to perform simple environmental assessment.
- Analyses EIA and its functions.

G.5 Pollution Prevention Pays

- Discusses the benefits of preventive versus retro fitting measures.
- Opens enterprise awareness to new technologies enabling the enterprise to be more profitable and less polluting.
- Demonstrates the results of pollution prevention programs, and how selling company know-how and waste products may open new markets and profit centres.

BOOK 2 - PROJECT MANAGEMENT AND THE ENVIRONMENT (3 UNITS) - for project managers, supervisors and students involved in development projects which may have some impact on the physical or social environment. The typical learner will have three to five years practical experience; some environmental management experience is desirable.

PM.1 Project Development

- Develops knowledge, skills and attitudes regarding project design and the environment.
- Uses EIA (Environmental Impact Assessment) in project design Involves the learner in assessment and planning for environmental impacts.

PM.2 Project Implementation

- Deals with a variety of environmental impacts during implementation.
- Involves the learner in solving challenges of the project.

PM.3 Project Monitoring and Environmental Evaluation

- Demonstrates how proper monitoring effects overall project evaluation.
- Analyses the environmental impact and evaluation process that follow projects.

BOOK 3 - PRODUCTION MANAGEMENT AND THE ENVIRONMENT (4 UNITS) - for production managers, supervisors and students from public and private enterprises involved in production activities which may have some impact on the physical or social environment. The typical learner will have three to five years practical experience; some environmental management experience is desirable.

PDM.1 Production Management and Environment

- Analyses the key responsibilities of the production manager and in relation to the environment.
- Develops the organisational structure for efficient and effective environmental management.

PDM.2 Product Design

- Demonstrates how environmental management begins with an EIA of proposed new products as an influence on product design.
- Analyses alternatives for product design and their short-term and
  long-term influences on environmental issues.

PDM.3 Technology Choice

- Relates technology choice to the short and long-term effects on the
  environment.
  Focuses on technology choice as related to environmental as well as
  technical and financial criteria.

PDM.4 Waste Management and Design of Production Systems

- Assesses environmental impacts of production systems.
- Analyses practical production system problems and their complex effect on environment.

BOOK 4 - ENVIRONMENTAL MANAGEMENT GAME - for policy makers, project managers, environmental planners, enterprise managers, community based workers, trainers, members of a community, etc.; to develop awareness and understanding of the need to give equal importance to the political, social, cultural, physical, economic, techological environments at every phase of project or production activities.

This is a four to six-hour simulation exercise with conflicting interest groups seeking goals of profit, growth and survival, in the face of difficult environmental impact conditions. Materials include a manual for participants and a separate trainers' guide.

BOOK 5 - SUPPORTING ENVIRONMENTAL MANAGEMENT TRAINING MATERIALS - including: Instruction for the organiser, Standard course diary, Diagnostic instrument, Technical note on FLP methodology, etc.

Instructions for the organiser

Detailed explanation for the trainer and technical specialist who uses FLP materials; demonstrates how FLP materials may be used in a variety of ways from direct teaching to total group participation. Provides technical specifications for designing FLP materials and adapting them to local conditions. Step-by-step instructions on how to use each unit (20 pages).

Standard course diary

Manual for each trainee including; description of FLP, registration form, learner feed-back form, action planning routine, etc.

Diagnostic instrument

Alternative choice quiz of 80 questions on the whole training materials which may be used before or after training activities.

Technical note on FLP methodology

Detailed explanation of FLP technology, application and availability from the ILO in both environmental management and other areas of management training.

Note: Manual: Introduction to environmental management (published separately) by Professor Michael Royston, recognised international expert and consultant to the ILO/UNEP project in the field. This should be available in late 1985 or early 1986 and will include chapters on environmental management and training, environmental issues for industrialised and developing countries, the managerial response, profiles of the responsive organisation in terms of policies, efforts and organisational structure, projects, products and production, the environmental dimensions of management such as production, management, project management, marketing, personnel, finance, corporate planning, R & D, engineering and design, top management, and, finally, an action plan for managers.

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PROJECT MANAGEMENT AND THE ENVIRONMENT

Basic glossary

International Labour Office Geneva

BASIC GLOSSARY

ACID RAIN
Rain polluted by sulphur and nitrogen-based acids from combustion processes which damages lakes and forests.

ADD-ON
Practice of "adding-on" a pollution control plant at the end of a dirty process.

AEROBIC BACTERIA
Micro-organisms which live only in the presence of free oxygen.

AIR POLLUTION
This can be divided into particulate and gaseous pollutants. Particulate pollutants consist mainly of dust and smoke. Gaseous pollutants are caused by the burning of fuels (wood, oil, coal) and consist mostly of sulphur oxides, nitrogen oxides, carbon monoxide etc., and also from industrial processes.

AIR POLLUTION INDEX
An index based on the concentration of sulphur dioxide (SO2), carbon monoxide (CO), dust particles, and hydrocarbons.

ALLOCATION OF RESOURCES
Division of scarce resources between various users to attain optimum benefits for all.

ANTI-KNOCK ADDITIVES
Substances that give evenness of fuel combustion in internal combustion engines. Contain mainly organic lead compounds (tetra-ethyl lead).

ATMOSPHERE
The mass of air surrounding the Earth, consisting of several concentric layers such as the troposphere, stratosphere, mesosphere and ionoshpere.

BACKGROUND REPORTS
Report on pre-project pollution levels.

BIOCHEMICAL OXYGEN DEMAND (B.O.D.)

The amount of oxygen that is needed for biochemical oxidation of organic pollutants in water.

BIODEGRADABLE

Substances that can be decomposed through biological processes.

BIOMASS

All material of vegetable and animal origin produced through biological processes.

BIO-PHYSICAL

That part of the environment of encompassing living species and their physical surroundings.

BIOSPHERE

That part of the Earth's surface, including the ocean, the atmosphere which supports life.

B.O.D.

See Biochemical Oxygen Demand.

CATALYST

Substance which produces a chemical reaction in other bodies without undergoing change itself.

CONVECTION

Transportation of heat by the movement of hot gases or liquids.

COST-BENEFIT ANALYSIS

Analysis of total quantifiable costs and benefits of a project to society as a whole.

CYANIDE

Toxic compound of two radicals each consisting of one atom of nitrogen and one of carbon.

DDT

Synthetic insecticide from the chlorinated hydrocarbons group used mainly for agricultural purposes and for malaria control. It resists biodegration, and therefore can be harmful to the biosphere if used without due precaution.

DECIBEL
A unit of intensity of sound.

DENITRIFYING BACTERIA
Bacteria which break up nitrogen compounds.

DE-SALINATION
Process to remove salt from sea water.

DESERTIFICATION
Transformation of productive land into desert.

DETRIMENTAL
Damaging, harmful.

DEVELOPMENTAL GOALS
The intention of raising the total level of human well-being.

DIRECT TECHNOLOGY TRANSFER
Conveying knowledge directly from an existing user in one part of the world to a potential user in another part.

ECOLOGY
The study of relationships between living organisms and their environment.

ECO-SYSTEM
A collection of living organisms, their necessary resources and their habitat, and their interaction in a self-contained and sustainable manner.

ECOSYSTEMS
Organisation of relationships of living organisms within a given natural environment.

ENERGY RESOURCES
Sources of fuel (both renewable and non-renewable).

ENVIRONMENTAL IMPACT ASSESSMENT(EIA)
The assessment, before the decision to implement a project, of the impact the project would have on the environment if it were to be implemented.

ENVIRONMENTAL MANAGMENT

Management of activities within tolerable constraints imposed by the environment itself, and with full consideration of ecological factors; management of the enterprise to achieve survival, profitability, growth and social responsibility; essentially preventive rather than retro-fitting.

ENVIRONMENTAL PLANNING

Planning for the use of environmental resources on a sustainable basis.

ENVIRONMENTAL RESOURCES

Resources of land, water, air, flora and fauna.

EROSION

The loss of soil by winds and water.

EUTROPHICATION

Accelerated aging of lakes through build up of organic residues caused by over fertilization.

EXTERNALITY

The cost or benefits occurring to parties other than the supplier and the purchaser of an economic transaction.

FEASIBILITY

Economic and technical viability of a project.

FEEDSTOCK

Raw material for chemical synthesis.

FERTILIZER

Organic or inorganic compounds used to make the land more productive.

FOOD CHAIN

See Metabolic Chain.

FOSSIL FUEL

A source of non-renewable energy such as oil, gas and coal resulting from the "fossilization" of biomass.

FUEL CELL

A device for producing electrity directly from the chemical reaction between hydrogen and oxygen.

GATEKEEPER

A member of a community who channels information and opinions.

GEOTHERMAL ENERGY

Energy derive(from hot zones beneath the earth's surface or in geologically active areas.

GASEOUS ATMOSPHERIC POLLUTION

Pollution from the burning of fossil fuels, industrial emissions etc. It can cause intoxication, bronchitis, asthma, emphysema and other respiratory illnesses.

GREENHOUSE EFFECT

Heating of the atmosphere due to the trapped solar energy as a result of a rise in the carbon dioxide concentration of the atmosphere.

GREEN REVOLUTION

Increases in food outputs from high-yielding varieties of seeds which require a combination of irrigation, fertilizers and pesticides.

HERBICIDES

Chemicals used to kill plants.

HUMAN SETTLEMENTS

Cities, towns and villages.

HYDROCARBONS

Chemical compounds composed of hydrogen and carbon; the largest source of hydrocarbons is oil.

HYDROSPHERE

The water portion of the earth's surface as distinguished from the solid part (lithosphere) and the gaseous layer (atmosphere).

IMPLEMENTATION

The realization - construction and setting in operation of a project.

INDUSTRIAL WASTE
Solid residues from industrial processes.

INFRASTRUCTURE
The physical basis of social services.

INORGANIC COMPOUNDS
Substances that do not contain carbon as their principal element.

INSECTICIDES
Chemical agents that destroy insects.

INTEGRATED CONTROL
Ecological pest management with the combined use of all possible means.

IONIZING RADIATION
Radiations emitted by radio-active substances or apparatus, with sufficient energy to produce ionization directly on their passage through a substance. Can destroy living cells.

LAND USE
Allocation of sectors of land that are restricted from certain activities. Thus certain areas would be reserved for industries while other areas would be reserved for habitation.

LITHOSPHERE
The solid part of the earth's surface.

LOW-SULPHUR FUEL
Fossil fuels from which sulphur has been removed.

MALARIA
Parasitic mosquito borne disease.

MANURE
Animal excreta after aerobic fermentation, used as fertilizer.

MAXIMUM PERMISSIBLE DOSE
The dose of a toxic agent that a person may receive over a specific time without appreciable bodily injury.

MEGALOPOLIS
Very large metropolitan urbanized zone.

METABOLIC CHAIN (also Food Chain)
The sequence of consumption of lower organisms by higher organisms.

METEOROLOGY
The science of the atmosphere and its phenomena.

METHANE
A colourless, odourless, inflammable gaseous hydrocarbon, chief component of natural gas.

MICROGRAMME
One millionth part of a gramme.

MINERAL RESOURCES
Mineral deposits of an area that are potentially recoverable.

MITIGATE
Reduce severity (of impacts) by modifying a project or its location.

NATURAL GAS
A combustible, gaseous mixture of hydrocarbons found in association with crude oil or in separate deposits.

NATURAL SYSTEMS
Stable interacting collection of non-man-made physical and or biological entities.

NITRITE
A salt or ester of nitric acid.

NITROGEN OXIDES
Laughing gas.

NITROUS OXIDE
Oxide of nitrogen used as a propellant.

NUTRIENT
Substances which provide nourishment for plants.

ORGANIC SUBSTANCE
Substances based on molecules having a carbon skeleton, usually originating from biomass.

OUTFALL
Point of discharge of waste water.

OUTPUT
Production.

OZONE
Gas containing three molecules of oxygen, a powerful oxidant. An ozone layer above the earth absorbs dangerous ultra violet radiation. In the lower atmosphere, it is involved in producing photochemical smog.

PARASTATAL
An institution or body which takes on some of the roles of civil government or political authority; an agency through which the state works indirectly.

PARTICULATES
Fine solid particles which remain suspended in gases, particularly air.

PERSISTENT INSECTICIDES
Non-degradable insecticides, such as DDT.

PHOTOCHEMICAL SMOG
Chemical pollutants in the atmosphere resulting from chemical reactions involving hydrocarbons and oxidants in the presence of sunlight.

PHYSICAL PLANNING
Land use and infrastructure planning emphasising the need for providing a balanced economic development and conserving resources.

PNEUMOCONIOSIS
Debilitating or fatal lung disease caused by the inhalation of mineral dust.

POLLUTANT
Substances that damage the quality of the environment.

PRODUCTIVITY
A measure of the physical output resulting from the use of human or natural resources.

RAW SEWAGE
Untreated municipal waste waters containing human excreta, etc.

RECYCLING
The recovery and reuse of materials from scrap or other waste materials.

RESOURCE-INTENSIVE
Activity (usually human) requiring large input of natural resources.

RETRO-FITTING
Environmental management of the enterprise which fails to prevent environmental damage; must expend resources later for corrective measures.

RESOURCE INVENTORIES
Exhaustive listing of resources.

SCHISTOSOMIASIS
Disease caused by parasitic fluke transmitted by a water snail.

SECONDARY SEWAGE TREATMENT
Process whereby sewage, after being screened, is subjected to aerobic treatment methods to dissolve organic pollutants.

SEMI-ARID REGION
Region with very low rainfall.

SMOG
Air pollution consisting of smoke and fog.

SOCIAL COSTS
The quantitative and qualitative burden imposed on society by a given activity.

SOCIO-ECONOMIC
Income and social position considered as a single factor to measure a family or an individual's status in a community.

SULPHUR DIOXIDE

Air pollutant arises from the combustion of sulphur in fuels. Above certain concentrations it is a respiratory irritant; during airborn transportation it can convert into an acid precipitated as "acid rain", damages crops, forests, lakes and structures.

SYNERGISTIC

Co-operative action of various forces such that the total effect is greater than the sum of the two or more effects if the action was taken independently.

TERTIARY SEWAGE TREATMENT

Third stage of sewage treatment, where chemical compounds are removed.

TETRAETHYL LEAD

A highly toxic lead compound that, when added in small proportions to gasoline, increases the fuel anti-knock quality.

THERMAL INVERSION

Entrapment of cold air and pollutants below a stable layer of warm air.

THERMAL POLLUTION

Heating of water bodies caused by the discharge of warm water from industrial cooling systems.

TONNE

One thousand kilogrammes.

VECTOR HABITAT

The place where an organism, which transmits a disease, normally lives.

VULNERABILITY OF ECOSYSTEMS

Fragility of the ecosystem to mismanagement.

ZONING REGULATIONS

Regulations designed to control land use for specific activities (industrial, residential, nature reserves etc.).

environmental management training

Economic development and technological progress can be compatible with reasonable protection of the environment. New environmental management techniques are in use around the world, helping enterprises to meet their objectives of profit, growth and survival, while protecting the environment.

A series of training materials in environmental management has been developed to support environmental management training in enterprises, training centres and institutes, universities, business schools, projects, etc. The series was produced and tested by the Management Development Branch of the International Labour Office for the United Nations Environment Programme (UNEP) in collaboration with several management institutions. The project team was co-ordinated and the materials edited by Dr. R.G.A. Boland of the ILO.