environmental management training

an ILO/UNEP Programme
in support of Managers
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1 GENERAL ENVIRONMENTAL MANAGEMENT

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GENERAL ENVIRONMENTAL MANAGEMENT

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 1
GENERAL ENVIRONMENTAL MANAGEMENT

A training manual 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.

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 1 - GENERAL ENVIRONMENTAL 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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GENERAL ENVIRONMENTAL MANAGEMENT

Unit G.1 Environment and Enterprise Objectives

International Labour Office Geneva

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Unit G1: Environment and enterprise objectives

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

INTRODUCTION

The learning objectives of this unit are as follows:

1. To use the language and concepts of environmental management.

2. To relate the goals of the business enterprise to the environment.

3. To provide alternative definitions of environmental management and its importance.

4. To motivate further study.

In small groups (SGs) add additional objectives as appropriate:

STUDY/LECTURE: ENVIRONMENT AND ENTERPRISE OBJECTIVES

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. WHAT IS ENVIRONMENT?

(a) The environment may be defined as the total of all social, technological, biological, physical, and chemical elements which compose the surroundings of man.

(b) It is the physical environment that provides the resources necessary for man's survival. All enterprises work within the environment and react to it. The environment provides the resources for life and production (food, energy, air, water, materials, land); it also provides the "sink" or disposal destination for waste products (see Exhibit 1).

2. BASIC GOALS OF BUSINESS ENTERPRISES

(a) An enterprise's goals are limited by resources, social constraints and legislation.

(b) By examining the basic goals of most enterprises we will see the necessity for management to maintain environmental awareness. An enterprise's basic goals are:

* survival - long-term viability, financial viability, conservation of resources;

* profitability - financial viability to aid survival;

* growth - the ability of the enterprise to meet the changing needs and desires of the community;

* social responsibility - to promote harmony with the community and government.

3. ENVIRONMENTAL MANAGEMENT AND ENTERPRISE GOALS

(a) Enterprise management uses the resources of the biosphere (physical environment) to produce goods and services through the application of technology.

(b) The environment determines the enterprise's strategies on the use of resources (see Exhibit 2).

(c) A manager's environmental awareness helps enterprises to attain the:

* survival goal through closer co-operation with governments and society to seek out areas of common interest, conservation of needed material resources, prevention of nuisances;

* profitability goals through more efficient, less wasteful resource conserving technology;

* growth goal through more efficient, safer, healthier and durable products.

4. COMMUNITY RELATIONS

(a) Many managerial decisions result in environmental impacts. If environmental problems occur they are early warning signals of economic and community relations problems ahead.

(b) Communities and governments will not tolerate a situation that continues to jeopardise the health or quality of life of the community members.

(c) Values and tolerance levels within the community and government change according to circumstances and time, usually toward a greater demand for quality.

5. DECISION MAKING

(a) Environmental management decisions may be curative or preventive. General management must weigh the effects and costs of both approaches.

(b) Decisions for preventive actions often cost less than curative ones.

For example: In spite of advice to the contrary from environmental authorities, a vegetable canning plant was set up next to a small stream where there were important fish spawning grounds. Now the manufacturer will have to spend far more on additional effluent treatment than would have been the case had he moved to a more suitable site initially.

(c) Unforeseen costs and delays result from decision-maker's unawareness of the environmental impact and/or failure to assess them.

6. ENVIRONMENTAL MANAGEMENT OF THE ENTERPRISE

(a) To provide for an enterprise's long-term survival, its managers must exercise good environmental management (see exhibit 3).

(b) A working definition of environmental management is:

* a system or integrated approach to management which takes into account the benefits and costs to owners, workers and society as a whole;

* an "open system" (one which reacts to the total environment) view of the enterprise;

* the practice of using physical resources efficiently and reducing waste.

(c) Environmental management provides for participatory planning as a way of preventing problems. Through participatory planning the enterprise gains new insights into market trends.

7. SURVIVAL FACTORS OF AN ENTERPRISE

(a) An enterprise may pursue its goals only with the permission - in a variety of forms - of the government and the community.

(b) Enterprises have the right to operate only in conformity with governmental regulations, even if enforcement is slack. Effective enforcement of the law is not always assured; in future, tougher enforcement is likely.

(c) Survival depends on recognition of long-term, as well as short-term goals.

(d) It is important for an enterprise to:

* forecast what could happen to the total environment;

* analyse the possible qualitative and quantitative effects of preventive and curative antipollution measures in the long run.

EXHIBIT 1

SOME ENVIRONMENTAL INTERACTIONS (SCHEMATIC)

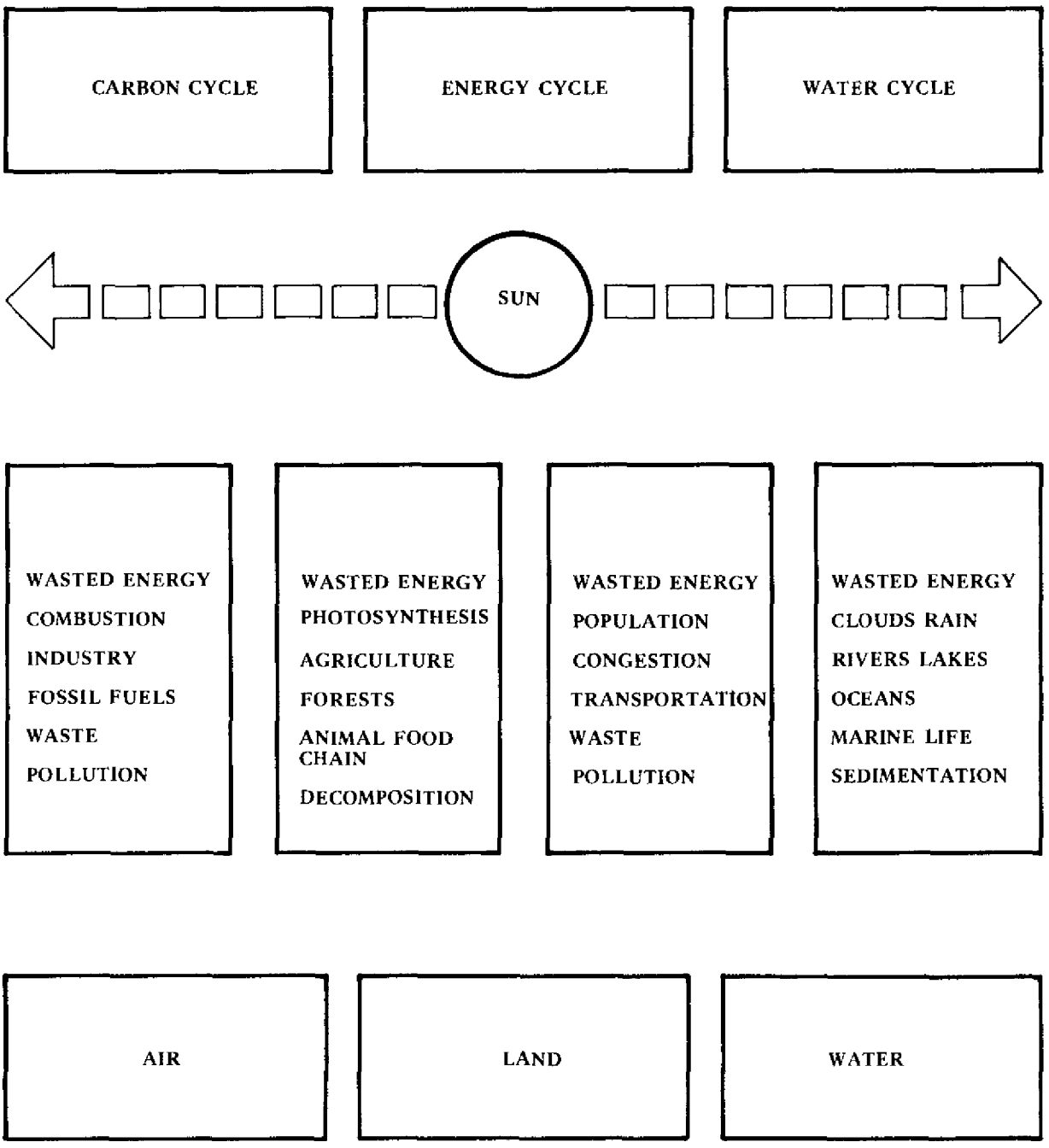

EXHIBIT 2

THE ENTERPRISE IN ITS ENVIRONMENT

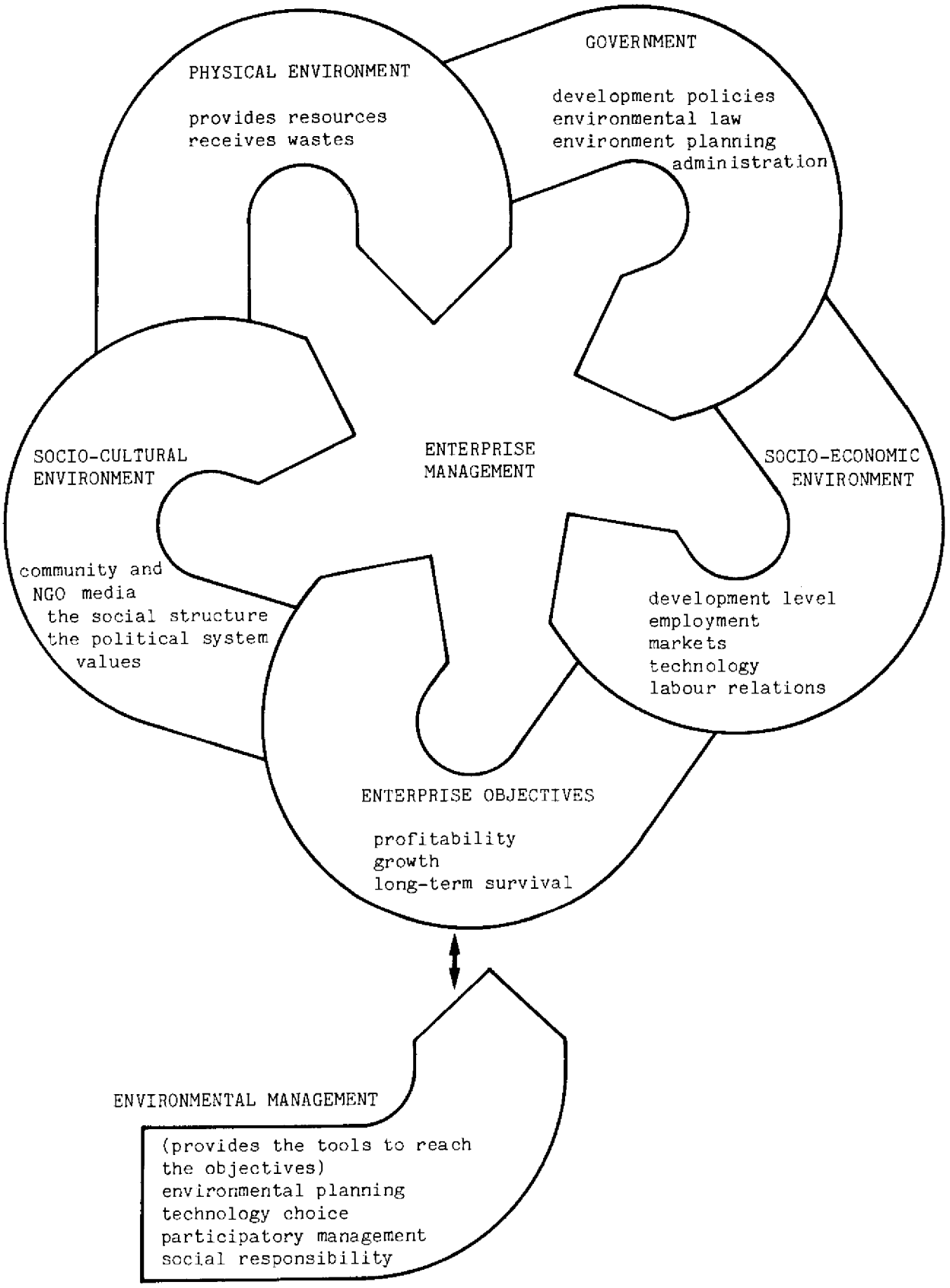

EXHIBIT 3

PRINCIPAL PROJECT PLANNING ELEMENTS

PLANNING SYSTEM / PLANNING STAGE	FEASIBILITY	PROJECT STRATEGY	
ECONOMIC EVALUATION	● Benefits ● Risk	● Continue Appraisal with View to Changing Project Specifications if Necessary	
PROJECT DEFINITION	● System Specs ● Base Technology ● $ Estimate ● Project Schedule	● Outline Design ● Configuration Definition ● Budget by Major Areas ● Milestone Schedule ● Detailed "Planning" Schedule	
FINANCE	● Potential Sources	● Principal Sources ● Major Payments Schedule	
ENVIRONMENT	● Initial Impact Assessment	● Definition of Environmental Impact Statement ● National and Local Government Support Assessed ● Local Population Attitude Assessed ● Supplier Situation Assessed	
ORGANIZATION AND SYSTEMS	● Initial Project Outline	● Overall Concepts for: - Contractors Strategies - Design fabrication, Construction - Labour and Materials Sources ● Principal Responsibilities Determined ● Major Information Systems Identified ● Key Personnel Identified	
INFRASTRUCTURE AND SUPPORT	● Assessment Extent of Support Required	● Preliminary Plans for; - Labour Relations - Camps - Logistics	

DESIGN	PRODUCTION	TURN-OVER AND START-UP
● Impact on other Business Functions Assessed ● Adjustments Made as Necessary		● Assess Project Cost For Product Pricing Purpose
● Further Development of Outline Design, Schedule and Budget	● Detailed Contract Specs and Drawings ● Overall Schedule Requirements ● Detailed Budget / Contract Bids	● Operating Manuals ● Training ● Primary Materials Preparation ● Hand-over Schedules ● Test Schedules ● Move
● Detailed Sources ● More Detailed Cash Requirements	● Detailed Payments Schedule by Creditors and Currency	● Annual Financial Operating Ran
● Schedule of Approvals Required ● Government or Community Support Groups Identified	● Permit Expediting System ● Expediting Schedules ● Public Relations	● Marketing ● Personnel ● Inventory Ranning ● Safety Procedures ● Outstanding Legal Issues
● Contract Negotiating Ran ● Some Major Contracts Signed ● Union Discussions ● Possibly Some Long Lead Materials Ordered ● Responsibilities Matrix ● Manpower Plan ● Systems Design Schedule	● Contract Terms and Conditions ● Owner Organization Detailed ● Detailed Staffing Plans	● Operations Organization Development and Start-up ● Project Organization Phase-out ● Wind-down of project personnel
● Further Definition of: -Labour Relations - Camps - Administration - Transport, Logistics and Warehousing ● Support Organization Outlined ● Permits Requested Outlined	● Detailed Definition of: - Labour Relations - Camps - Transport, Logistics, etc ● Construction Schedules/ Contracts for Camps, Power, Transport,etc ● Service Contracts Identified ● Support Organization Defined	● Wind-down and sell-off of project camps, etc ● Ran for housing, transport, physical and social welfare of operating personnel

CASE - ASIAN QUARRY COMPANY

Questions on the case

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

2. Identify the alternative actions available to John regarding the profit and growth of the enterprise; evaluate the advantages and disadvantages of each alternative.

3. Define the criteria for John to settle the problem.

4. Decide and justify what John should do now and in the future.

CASE - THE ASIAN QUARRY COMPANY

Since 1978, the Asian Quarry Company has supplied stone to Luwatana, 40km away. The quarry hired and trained 15 men from a small, largely agricultural, community to work as machine operators and truck drivers.

The expatriate contractor, John Roy (a self-made man), was plagued with complaints by farmers about the amount of dust from the quarry. In addition, many people complained that the quarry trucks sped along the narrow country roads between the quarry and the town endangering school children and other pedestrians.

Dynamite blasts punctuated the air twice daily. Occasionally, the blasts would loosen small bits of the local temple ceiling which would fall onto the reclining Buddha.

Over the last few years, John had installed devices to muffle the noise and experimented with methods to limit the dust. In spite of this, the farmers and other people in the community continued to complain.

Finally, last month, a lawsuit was filed on behalf of the community to stop quarry operations. The business will go bankrupt if John loses the lawsuit because he still has his loans to pay.

MINICASES

1. AGGREGATE SAND

Offshore sand and rock are dredged near the estuary of the Kuwai River to produce aggregate for concrete used in the construction of an urea plant on the river 10 km inland. Trucks carry the gravel on a road that runs parallel to the Kuwai river.

What precautions must be taken to prevent the possible impact of dredging and road construction on the environment and the livelihood of local farmers and fishermen?

2. PALM BEACH

A palm oil plant, built on the banks of a river flowing into the sea, provides regular and greater income to the villagers of Winnebago. Winnebago's main source of income is based on shrimp harvesting. The designers of the plant planned for effluent waters to be dumped without treatment into the river. The oils in the effluent are light and will stay on the river and sea surfaces.

From the point of view of a production manager what segments of the environment will be affected by the waste oils?

3. KAWANI FOUNDRY

Kawani plans to build a small foundry 100 kms from the city of Colombo to produce small quantities of iron/steel for the local knife industry. To practice preventive environmental management and minimize the negative impacts on the environment (to obtain a permit to build the plant) he asks you to identify the possible environmental impacts now.

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
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MANAGERS AND MANAGEMENT INSTITUTIONS

Unit G1: Environment and enterprise objectives

CASE GUIDE

(NOT RETAINED BY PARTICIPANTS)

CONTENTS

ANSWERS TO THE CASE - ASIAN QUARRY COMPANY

1. STORY OF THE CASE

Since 1978, a foreign owned and managed company has supplied the limestone for the city's construction, 40 km away. The quarry employs 15 local men from the agricultural community.

Dust raised by the quarry and its trucks, the high speeds of the trucks on the narrow roads, the dynamite blasts and the resulting cracked temple ceiling are the villagers' chief complaints of the quarry operation.

In spite of John Roy's efforts to resolve the problems through technology, the villagers file a lawsuit. John is threatened with bankruptcy due to penalties usually imposed by the court and the unpaid bills for the dust abatement devices and other capital purchases.

2. ALTERNATIVES AND EFFECTS

(see exhibit 4).

3. CRITERIA FOR A SETTLEMENT OF THE DISPUTE

(a) Long-term survival, and not a "quick fix".

(b) Cost of settlement must balance with profit goals.

(c) Satisfy the community and government.

(d) Comply with legal requirements.

(e) Protect the environment in the future and for the future.

4. DECISION AND JUSTIFICATION

(a) Decision:

* obtain a delay in the legal process;

* establish community relations;

* seek technological alternatives for short and long-term solutions;

* provide community services;

* look for alternative sites;

* gradually move operations.

(b) Justification:

* time is needed to deal with the short-term problems but, in the long term, change the site because the community will be displeased by the constant damage to the statue of Buddha. It will eventually force John to shut down the operation because of the high cost of the retrofitting and the stiff court penalties.

5. LEARNING POINTS

(a) Preventive environmental management is essential for the survival of enterprises.

(b) Business enterprises must assume the social responsibility to consider the total environment (physical, biological, social) to SURVIVE, PROFIT and GROW.

(c) It is often possible to turn the adversary process (by which competing lawyers maximise their total fees) into a negotiation process whereby the enterprise and the community maximise total long-term benefits through participation.

(d) Curative (retrofitting) methods and devices are usually more expensive than preventive methods and devices.

(e) Environmentally conscious enterprises choose a development strategy that is appropriate for the social/physical environment.

(f) Enterprises need to establish a community relations mechanism at the outset to avoid damage claims and penalties.

(g) Assess potential environmental impacts at the planning stage and design plans to eliminate or mitigate them before they become problems.

(h) Even if the situation has been allowed to deteriorate, it is not too late to try to start a participatory process; there are cost-effective technical solutions to almost every problem.

(i) Alternative solutions to a problem can be related to: time, place, technology and people.

EXHIBIT 4

ALTERNATIVES AND EFFECTS

Alternative	Advantages	Disadvantages
(a) Sell equipment	Cash available for	Low resale value; other investments going out of business with business, with possible legal penalty
(b) Pay penalty	Short-term deferral of problems; gain time	Cost; further penalty doubtful long-term survival
(c) Retrofit equipment and reduce production	Improve equipment; placate community	Probable work stoppage or lower production because of retrofitting process or inexpertise with new methods
(d) Bankruptcy/ receivership	No more community problems	Loss of income for John, community loses income
(e) Establish or improve community and communication between enterprise and community	Helps monitor community reactions to enterprise; initiatives tend towards assurance of company's continued place in the community	Establishing a community relations programme is a preventive measure usually taken prior to a project or production
(f) Suggest out of court settlement and continue operations in the long term	Probably a lower cost to enterprise in regard to possible penalty	Community will not be satisfied in the long term, conflict will arise in the short term
(g) Use trucks, equipment and men for efforts to improve the community environment (e.g back-hauling materials from city to farms or grading roads	Educate workers on the benefits of environmental awareness, improved efficiency of men and equipment benefiting enterprise and community to farms or grading	+Added work for man-power and machines; no direct profit

ANSWERS TO THE MINICASES

1. AGGREGATE SAND

(a) From a preventive viewpoint considerable care must be taken in assessing the dredging operation; if it affects the fishermen's income, there will be damage claims and protests.

(b) If the environmental impact assessment agrees to the plant location and the dredging operation, considerable care must be taken to avoid disturbing fish concentrations and the nutrient flow.

(c) Truck traffic must not exceed acceptable noise, speed and dust limits.

2. PALM BEACH

(a) Shrimp are sea floor dwellers. Suspended solids sink to the sea bottom while the oily film remains on the surface and reduces light. This kills the shrimp or at least stunts their growth.

(b) Additional income for some members of the community will not make up to the rest for the oil in the river water and the effect of effluent on the fish and shrimp. This will result in a reduction of the fishermen's income.

3. KAWANI FOUNDRY

Negative environmental impacts on:

(a) Air - toxic fumes which may affect the local community and even the city, depending on size of foundry; gases include nitrous oxides and sulphurous oxides.

(b) Water - may be affected by plant effluents, which are usually toxic, when the water table is high.

(c) Ground - slag heaps may accumulate.

(d) Socio-economic factors - employment entailing health hazards and other negative effects - unless control measures are taken.

QUIZ

Choose the most correct answer

1. Good environmental management is needed to achieve:

   (a) profit
   (b) growth
   (c) development goals
   (d) survival

2. A working definition of environmental management includes:

   (a) managing an ecosystem
   (b) economic recession
   (c) a systems or integrated approach to management
   (d) baseline data gathering

3. Without social responsibility the company will:

   (a) increase profits
   (b) conflict with government and the public
   (c) develop cost-effective monitoring systems
   (d) become immoral

4. An enterprise's environmental problems are usually signals of:

   (a) unavoidable constraints
   (b) good strategic planning
   (c) future economic problems
   (d) well-managed production

5. A company's survival in the community requires all the following, <u>except</u>:

   (a) provide employment for the majority of the community
   (b) be financially sound
   (c) be environmentally aware
   (d) provide good employment and working conditions

6. A company's environmental awareness:

(a) helps to alienate investors
(b) is incompatible with profit making
(c) helps attain profit goals
(d) leads to conflict

7. A company's growth is dependent on:

(a) use of indigenous resources
(b) efficient operations
(c) the availability of foreign exchange
(d) vitamins and minerals

8. Management must weigh project decisions:

(a) in an unstructured fashion, to encourage creativity
(b) from a preventive perspective
(c) superficially, changing only when the project matures
(d) to make sure they reduce costs

9 Many projects will fail:

(a) because of their resource conserving nature
(b) due to close monitoring by governments
(c) due to programmes for improved performance
(d) because of their impact on the physical environment

10. All the following are suitable working definitions for environmental management, except:

(a) to provide a community view of the corporation
(b) to exercise corporate responsibility
(c) to satisfy local employment requirements
(d) to exercise participatory planning

11. Without the government's approval an enterprise:

(a) has the right to operate
(b) cannot implement environmental management
(c) usually has no right to operate
(d) will get the community's permission to operate

12. To turn the adversary process (judicial system) into a negotiation process between the enterprise and the community is:

(a) always possible
(b) usually possible
(c) depends mostly on the enterprise
(d) never possible

13. Establishing a good community relations programme:

(a) is vital towards the end of a project
(b) normally involves making extraordinary and expensive promises to the community
(c) is normally a legal requirement
(d) is preferable at the beginning of the project

14. In water, heavy effluents sink and:

(a) inhibit growth of the fish
(b) are usually good food for fish
(c) prevent erosion
(d) drown

15. From a community's view the aesthetic effects of a project are:

(a) never important when they are part of the project
(b) always important in the design stage
(c) rarely considered unless politics is involved
(d) usually important in every situation

16. Government or local laws on environmental issues:

(a) never change
(b) change with time and prevailing values
(c) should be discreetly ignored
(d) do not usually put constraints on a project

17. Survival of an enterprise is normally:

(a) totally dependent upon environmental management
(b) dependent on measures taken after feasibility/environmental studies
(c) must consider that environmental laws can change
(d) depends on recognition of long-term and short-term goals

18. Environmental management must _____ the _____ and _____ effects of both preventive and curative measures before a decision is taken:

(a) measure, noise, pollution
(b) measure, cost, harmful
(c) forecast, qualitative, quantitative
(d) change, pollution, abatement

19. Participatory planning:

(a) includes stockholders and government representatives
(b) usually is not cost effective
(c) allows the community to participate in the project
(d) is an invitation to trouble

20. Environmental management uses participatory planning to:

(a) solve human problems and prevent other problems
(b) encourage investment and solve human problems
(c) prevent problems and gain insight into market trends
(d) gain insight into market trends and encourage investment

dcbca cbbdc abdad bdccc

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

notes

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GENERAL ENVIRONMENTAL MANAGEMENT

Unit G.2 Scope and Structure of the Environment

International Labour Office Geneva

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

Unit G2: Scope and structure of the environment

WORKPACK

(Retained by participants)

Contents

INTRODUCTION

The learning objectives of this unit are as follows:

1. To define the environment in terms of the functions and constraints of its resources.

2. To relate economics to the environment and its limited resources.

3. To identify the causes of environmental conflict and the potential for negotiation with the different "actors" (interest groups).

4. To include environmental concerns into the management decision-making process.

5. To motivate further study.

In SG add additional objectives as appropriate:

STUDY/LECTURE - SCOPE AND AWARENESS OF
THE ENVIRONMENT

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 RESOURCES

(a) The physical environment provides all the resources necessary for life including raw materials, energy, water, air, land and living resources (plants, fish, animals), etc.

(b) Most environmental resources are in the biosphere life zone of the earth, a 6 km thick layer on the surface of the earth, which includes the atmosphere.

(c) The economic view is that the natural environment is an asset or capital commodity that directly and indirectly provides man with economic benefits.

(d) Throughout history, societies have ensured their continued existence by adapting to the changing natural environment. Some societies have achieved adjustment through including in their development planning natural resource management, land-use planning, pollution control and conservation measures.

Example: The two thousand-year-old rice terraces on mountains in the Philippines clearly show awareness of the need to adapt to the environment.

(e) Growing world population and environmental exploitation impose an ever-increasing strain on natural resources. Resource supplies are not unlimited. Therefore protection measures must seek to conserve resources and also be cost-effective.

Example: In Bali, flocks of ducks fertilise the rice fields and eat insects harmful to the rice. When a government programme strongly encouraged oil-based fertilisers the rice crop declined because the insects attacked the plants (and the ducks were poisoned by the artificial fertilisers). Soon Balinese farmers returned to the older more reliable duck-to-rice-field farming.

(f) Total world resources are never fully known. Each year new technology and new information systems provide new data on resources.

Example: Known world oil reserves increase every year as new fields are discovered despite growing oil consumption by industrialised countries.

2. COMMON RESOURCES: "FREE GOODS"

(a) In economics certain key environmental resources were once classified as "free goods" because they were available in abundance (e.g. water, air, land). They were used as common property for which no ownership rights were identifiable. These common property resources provide multiple services and functions.

Example: As an environmental component or resource, water is used for drinking, irrigation, fishing, recreation, cooling, transportation, as well as for aesthetic and cultural purposes.

(b) However, such "free goods" are now recognised to be limited. Environmental managers aim at the long-term management of natural resources and control of social and economic development processes which have environmental impacts.

Example: Most timber companies have become aware of the growing scarcity of their raw material. Now, timber farming, reforestation and improved cutting practices are all part of the industry's internal environmental management.

(c) Limits to common property are embodied in environmental standards, which can be voluntary or mandatory as enacted in environmental law (e.g. air quality laws, water management laws, etc.). These laws establish the responsibilities of government environmental protection agencies, the liabilities of the polluters and the means of enforcement.

Example: Most industrialised countries have legislation covering allowable air, water and land pollution standards by chemical manufacturing companies. Such standards relate to science and/or health and negotiations concerning acceptable levels are essentially political. These negotiations involve government, enterprises, and environmental pressure groups.

3. CLASSIFICATION OF RESOURCES

(a) Resources which the environment provides may be:

* Tangible: Air flows, water, minerals, fuels, food, materials.

* Intangible: Nutrient cycling, climate regulation, the removal, dispersion, storage and degradation of residuals or wastes.

* Aesthetic: Scenic, recreational and other pleasing features.

(b) Resources may also be either "renewable" or "non-renewable". Thus:

* renewable resources renew themselves within a short time if properly managed (e.g. air, water and land);

* "non-renewable" resources once used are lost (e.g. minerals and oils).

(c) Pollution is a special case where the environment and its resources are misused. Sound environmental management calls for much more than pollution prevention: it means long-term resource use and the maintenance of environmental quality.

4. INTERNAL VERSUS EXTERNAL STRUCTURES

(a) Environmental functions are the vital link between the internal structure (management/worker) of the enterprise and the external, physical and social structure outside the enterprise. Thus:

* an enterprise which ignores the impacts it is making on the environment is headed for environmental conflict;

* as resource scarcity and/or goal incompatibility increase, so does the potential for conflict.

(b) Since prevention is usually much less costly than cure for the system as a whole (enterprise, community and the natural environment), the internal emphasis should be placed on ways to:

* avoid environmental degradation, and

* forecast, avoid, or remove conflict issues.

Example: Tree replanting is usually organised by responsible pulp mill managers to ensure the long-term supply of raw materials. However, this replanting can change the habitat for the animals and birds. Enterprises tend to plant the most productive species and thereby reduce the genetic variety of trees which ensures the long-term survival of the forest.

5. ENVIRONMENTAL CONFLICT

(a) Conflict results from the use of resources and functions by one party at the expense of other parties.

(b) Conflict situations result from overuse or abuse of environmental resources and functions.

(c) Conflict between the enterprise and the community or government may result from incompatible values and goals or the scarcity of resources. Preconditions for environmental conflict are summarised in Exhibit 1.

(d) Successful environmental management internalises environmental concern through measures taken at the decision-making stage.

(e) Recognition of environmental issues and the "actors" and their influence on economic, social and political factors is the first stage towards resolving conflicts.

(f) A matrix showing the relation between the environmental resources at stake and the "actors" concerned, may help to clarify the situation (Exhibit 2).

(g) Once an enterprise has identified the resources and "actors" in an environmental conflict it can begin to tailor its objectives to environmental conditions:

* an appraisal must be carried out to discover whether resources are compatible with enterprise needs;

* then make an adaptation of enterprise goals (strategic fit) to the community's needs.

(h) The "opportunity cost" of delay in manufacturing operations may be significant; thus, the avoidance of conflicts by management may save time and be highly cost effective.

Example: Although a palm oil plant contributed to the region's prosperity, the plant's effluents harmed the shrimp harvest with the result that the shrimp fishermen's association forced the plant to install expensive pollution abatement controls and to reimburse the fishermen for lost income. If this had been considered at the planning stage, a new site could have been chosen which would have saved the enterprise time and money.

6. IMPACT OF ENVIRONMENTAL MANAGEMENT DECISIONS

(a) The enterprise and the community are part of one system; therefore decisions must be taken with and not on behalf of the community.

(b) Good environmental management looks at the potential consequences of actions before their implementation to assess their impact on the total system. In this way decisions reached are balanced solutions for the enterprise as well as the community.

(c) Sound environmental management is cost effective since it:

* achieves higher productivity through a more efficient use of energy and raw materials;

* increases workforce motivation (most of the workforce comes from the affected community);

* achieves enterprise goals of survival, growth and profitability, with limited community conflict.

(d) Environmental management is a series of compromises using limited resources to achieve multiple goals.

Example: In 1954, a community that relied on logging welcomed a pulp mill because the logging business had declined. The community accepted air and water pollution as the price to be paid for employment. The years passed and incomes rose and by 1984 the community felt the need for better quality environment as well as jobs. The mill's management agreed but was concerned that the cost of reducing pollution would involve raising prices to uncompetitive levels.

EXHIBIT 1

PRECONDITIONS FOR ENVIRONMENTAL CONFLICT

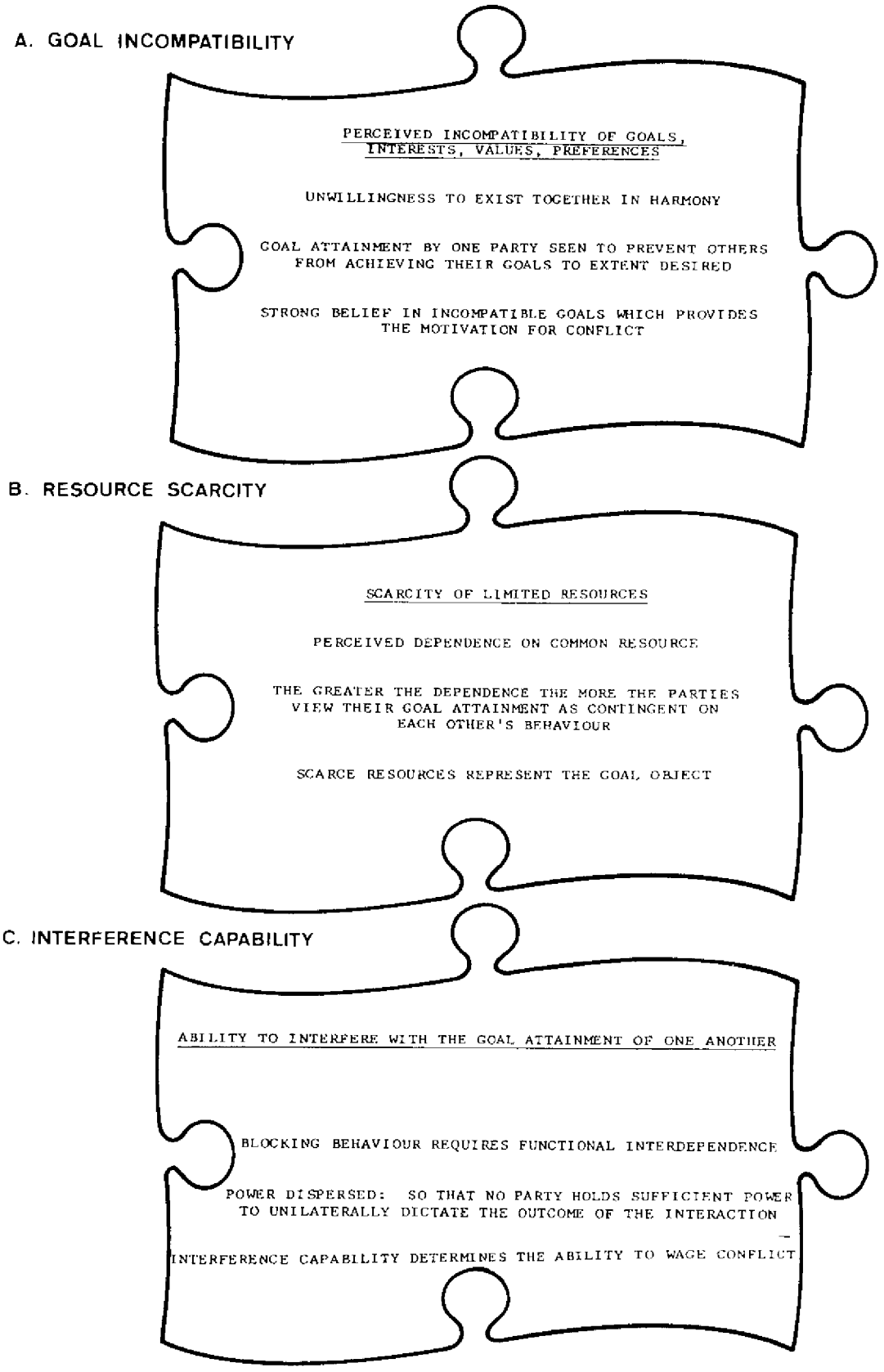

EXHIBIT 2

Matrix relating environmental resources and actors concerned

CULTURAL WATER	TRANSPORTATION WATER	RECREATION WATER	INDUSTRIAL WATER	FISHING WATER	IRRIGATION WATER	COOLING WATER	RAW MATERIAL	DRINKING WATER		RESOURCE FUNCTION / ACTOR
■								■		CITIZEN
								■		DOCTORS
					■			■		FARMERS
								■		HEALTH AUTHORITIES
				■						COMMERCIAL FISHERMEN
				■						FISHING CLUBS
				■	■		■			FOOD INDUSTRY
			■			■	■			INDUSTRY
		■		■				■		HOLIDAY INDUSTRY
	■									TRANSPORT INDUSTRY
■										CULTURAL ASSOCIATION
■	■	■	■	■	■	■	■	■		POLITICIANS
■	■	■	■	■	■	■	■	■		PRESS
			■			■				INDUSTRIAL ASSOCIATION
	■		■			■	■	■		PROFESSIONALS

CASE: ZEPPO CITY PULP MILL

Questions on the case

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

2. Identify the key problems to be resolved.

3. Develop various alternatives to resolve the problems and outline their effects on the enterprise.

4. Can the pulp mill proposals be accepted?

5. Decide and justify what the pulp mill should do.

Note: In CSG participants may be assigned specific roles.

CASE: ZEPPO CITY PULP MILL (ZCP)

Zeppo City Pulp Mill (ZCP) had plans to establish a new mill integrated with large logging concessions on 50 hectares to the northeast of Zeppo City. The pulp mill would have a daily capacity of 500 metric tons of unbleached pulp and would use local trees. Mill production would be sold to domestic markets to cut imports of long-fibre pulp.

It planned to export part of the production and thus contribute to the country's foreign exchange earnings. Supporters of the project acknowledged that certain waste materials would be discharged into the river and air.

The mill would be constructed on a turn-key basis by a foreign contractor who would supply all the necessary machinery and technical know-how until the start up of the plant and its final turnover to the owners in three years' time.

The points of view expressed at a meeting between the ZCP representative and various community leaders at the Zeppo City Forum are summarised in points 1 to 6 below.

1. ZCP REPRESENTATIVE - SALIM AHMED

Our company will make a large investment in this region, which will include new first-class roads, reliable water and electricity supplies, and more classrooms for your children.

There will be great employment opportunities for around 1000 workers from the construction phase to the operational phase. Your children who are graduating will not have to leave you and your town because job opportunities will exist right here. They will not have to go and look for jobs in far away places like Penang or Fairbanks.

Think also of the support business that will be created because of this plant. Those of you who are entrepreneurs can have your own businesses right here. Tax money paid by this firm to your municipality will be spent for your own and your children's welfare.

To calm your fears about the environmental impacts of the project, our plans minimise expected pollutants as much as is technologically feasible. Water and air pollution control devices are so thorough that the discharge into the air and your river will be much lower than at many other similar plants.

We plan to keep track of pollution by hiring full-time environmental control experts. You can help us here by calling attention to any pollution from our mill.

2. PRESIDENT OF THE FISHERMEN'S ASSOCIATION

The project will alter the immediate environment and affect the rivers and streams and Zeppo Gulf itself. Hundreds of fishermen will be deprived of their livelihood since the fish and other marine life will be affected. Even if the project generates job opportunities for many of the people, I am sure that there will be hundreds of fishermen who cannot be employed since all they know is how to fish, which they have done for generations.

3. ENVIRONMENTAL PLANNER (EMPLOYED BY THE ZEPPO CITY COUNCIL)

The benefits of the project from its employment generation and savings in foreign exchange will be extensive. There will also be considerable improvement in the economic life of the community.

However, the negative impacts of the project must also be assessed. Certain waste materials will be discharged into the river as well as into the atmosphere. Liquid wastes will be in the form of solvents and some suspended solids. Sawdust, sulphur dioxide (SO_2) and hydrogen sulfide (H_2S), and soot from the boiler will be emitted into the atmosphere.

For these pollutants, elaborate control measures are being provided by the owners, but the river will be altered both chemically and physically. At present, the river is classified as a class A river, i.e. the river is a source of drinking water. When the plant is in operation, however, the river will be classified as a class C river, i.e. the water will no longer be fit for human consumption. Furthermore, when the river is at its lowest level just before the rains, there will be a strong smell.

The project's impact on the lifestyle of the people in the community must also be assessed. The people in the community are mostly fishermen and small landowners who till their own land, raise animals and market their produce. They are self-sufficient because of the crops they grow on the land and the river which they fish. There will always be resistance to the mill from these people, since their economic and cultural equilibrium will be upset.

4. PRESIDENT OF THE ZEPPO LOGGERS' AND PLYWOOD MANUFACTURERS' ASSOCIATION

The tremendous capacity of the proposed mill will require a natural resource which is already scarce. Our plywood plants are already importing wood from Indonesia to preserve our forest resources. Reforestation cannot keep up with the rate of depletion by our loggers and plywood manufacturers. We suggest, therefore, that the pulp mill move to another area to avoid further depletion of our forest resources otherwise, deforestation will lead to the closure of some of our plants and regional unemployment for over 5000 employees.

5. **PRESIDENT OF THE BANANA GROWERS' ASSOCIATION**

We do not see that the planned pulp mill will have any effect on our industry. The banana plant is working well and should not be affected by the minimal pollution claimed by ZCP. However, our labourers will be attracted to work in the factory which will most probably pay higher wages than we do. While we do not want to stand in the way of our workers' progress, we would have the expensive task of hiring and training replacements for those who leave.

6. **PRESIDENT OF THE LOCAL WORLD WILDLIFE FOUNDATION**

Generally speaking, the integrated pulp mill project will be beneficial to the community. Better school facilities and a better infrastructure can be constructed using revenue from increased taxes. This will improve standards of living for everybody. However, the World Wildlife Foundation would like an expert opinion on the harmful effects of the pollution on the river and the extent of deforestation.

The overall plan is strongly supported by the national government but ZCP, with the impending environmental conflict, was uncertain how to proceed.

MINICASES

1. BHUTAN'S DILEMMA

The number of tourists is increasing in this hilly country. The Government plans to build many hotels, but this development requires the Government to move native residents to higher outlying areas. Since wood is the energy source for all native cooking and heating, the people must cut trees and shrubs which are scarce at higher altitudes.

Forecast the project's short and long-term impacts on the environment.

2. MINING AND MONSOONS

The Joyid Copper Smelter is located in a tropical valley in Shaba close to an open-pit copper mine. This mining operation dumps tailings (refuse or inferior ore) near the largest lake in the valley. The fish in this shallow lake are the main source of protein for the valley people.

Discuss the likely effects on the environment of the monsoon's heavy run-off.

3. THE CLEAN CAR

To reduce pollution from exhaust gas emission, the Environment Protection Agency reduced the emission standard for motor cars to 20 per cent of present permissible limits and gave the car manufacturing industry three years to produce engines conforming to the new standard.

The industry had two alternatives:

(a) To install a catalytic after-burner in the exhaust system, which raises the cost and requires lead-free fuel (lead is added to fuel to improve its performance). Lead-free fuel is more expensive, not always available and less energy conserving.

(b) To develop engines that would produce less exhaust gases per kilometre without an after-burner. However, such engines would be smaller and less powerful, reducing the size and performance of the car. Customers traditionally prefer big, powerful cars.

Discuss alternatives and recommend a new strategy.

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.

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Unit G2: Scope and structure of the environment

CASE GUIDE

(NOT RETAINED BY PARTICIPANTS)

CONTENTS

ANSWERS TO THE CASE: ZEPPO CITY PULP MILL

1. STORY OF THE CASE

An enterprise plans to build a pulp mill in an agricultural and fishing community. Significant investment by the enterprise in the local community's infrastructure is ZCP's key argument to convince the local community that the pulp mill will benefit the community despite some river and air pollution.

Community and special interest groups are seriously concerned about the planned pulp mill. The local authority's environmental planner lists some advantages, but these are outweighed by the river's pollution and continued community resistance.

2. PROBLEMS

(a) River pollution

(b) Air pollution

(c) Deforestation

(d) Unemployment of fishermen

(e) Community relations.

3. ALTERNATIVE STRATEGIES AND THEIR EFFECTS

	STRATEGY	EFFECTS
(a)	Install additional pollution abatement equipment.	At this stage, an expensive solution.
(b)	Install new experimental pulping technology.	This could be very expensive in time and money, and disappointing for the enterprise if the experimental machinery fails.
(c)	Explore the possibility of siting the plant in another, less sensitive location.	Time-consuming, wastes effort already spent on present site. Legislation may impose similar restrictive standards everywhere.
(d)	Set up an "enterprise-community" committee representing the various groups concerned; focus on problems and find mutually acceptable solutions before reaching the stage of legal penalty or public conflict.	May not resolve the highly unstable relations with the community. Positive effects of the committee may be negated by the community's reluctance.

4. PULP MILL PROPOSALS

Arguments for:

- regional development
- new jobs/employment
- piped water
- municipal taxes on the mill to benefit community
- on-site pollution control.

Arguments against:

- river pollution (fish killed)
- air pollution (smell)
- deforestation
- manpower dislocation.

5. DECISION AND JUSTIFICATION

(a) Decision:

* relocate the project to another site where the pollutants will not affect the community.

(b) Justification:

there are serious arguments against the mill by the community and special interest groups. Delaying action on the part of these community groups could prevent ZCP from achieving:

* project start up on time;

* construction within budget limits;

* plant efficiency up to specification.

Although the community may be forced to accept the project initially, the continued environmental degradation would eventually lead to conflict. To resolve such conflict could be highly uneconomic. It would be better to plan for the long term and use EIA to help with reaching a decision on the mill's location.

Note: This was the conclusion reached by a project management team in Asia and the mill was relocated. Other solutions are possible.

6. LEARNING POINTS

(a) During project planning the enterprise must make a special effort to understand long-term environmental impacts.

(b) Enterprise goals and the community's values may sometimes be incompatable; a compromise must be found.

(c) Environmental impact studies are a necessary part of management's decision-making process.

(d) Rigorous EIA may be highly cost effective, especially for plant location and start-up decisions.

(e) A joint community/enterprise public relations committee may not necessarily provide a solution to persistent problems; however, it can help to avoid serious misunderstandings.

(f) Vague promises of an improved community infrastructure are not usually an effective means to achieve community support and the goals of the enterprise.

(g) Changes in lifestyle or livelihood are traumatic for many people; sometimes they may be accepted in exchange for economic and other benefits.

(h) Alternative technologies must be explored as possible solutions to environmental impact problems.

(i) Plant relocation in the face of environmental difficulties may sometimes be the best long-term solution to complex environmental management problems.

(j) A key community concern is the conservation and appropriate use of limited non-renewable local resources. Long-term environmental degradation will eventually lead to conflict.

ANSWERS TO THE MINICASES

1. BHUTAN'S DILEMMA

Local residents will be forced to cut trees and shrubs in an ever-expanding perimeter around the new villages gradually denuding large parts of the countryside which the monsoon rains will then erode as the topsoil of the region is very thin (a process that would be difficult and expensive to stop or reverse).

At first, the tourist trade will flourish due to the beauty of the countryside. However, in the long run as soil erosion increases, the tourist trade and agricultural productivity will decline. Foodstuffs will have to be imported to replace crops that now cannot be grown. There will be widespread unemployment. The resulting rural migration to the towns will cause dissatisfaction in urban areas which in turn will be suffering environmental degradation from the influx of people from the countryside.

2. MINING AND MONSOONS

Monsoon rains will wash most of the tailings into the lake. Their toxicity will have a negative effect on the lake's environment. Fish will die, sediment will increase and the valley people's source of protein will be eliminated. The result may be a migratory movement away from the area, malnutrition, the import of protein substitutes, etc.

3. THE CLEAN CAR

From an environmental as well as an economic viewpoint, the best solution is to build smaller cars with improved engines, which consume less fuel per km and emit less exhaust gases.

Market preference is for big, high-performance cars. The strategy would be to use catalytic after-burners but this solution would require a reconversion of refineries and distribution networks to produce and supply lead-free petrol.

This result would lead to a sharp increase in the import of small, fuel efficient foreign-made cars, with an adverse economic and employment effect on the national car manufacturing industry and on the balance of payments.

The environmental benefit obtained from reduced lead emissions is probably not as great as that obtained from lower levels of exhaust gases and fuel consumption by small cars.

QUIZ

Choose the most correct answer

1. "The environment is a natural asset of non-reproducible capital goods that provides a stream of direct and indirect economic benefits". This statement is:

   (a) False
   (b) True only in regard to non-renewable goods
   (c) True in every respect
   (d) False, natural assets cannot be measured in an economic sense

2. The layer on the earth's surface which contains nearly all environmental resources is called the:

   (a) Biosphere
   (b) Earth's crust
   (c) Volcanic zone
   (d) Ionosphere

3. Man and society adapt to their natural environment to ensure:

   (a) Man's continued existence
   (b) Improved living standards
   (c) Labour productivity
   (d) Peace

4. Development planning uses "land use control" and "pollution control" and "resource conservation", for:

   (a) Avoiding environmental crises
   (b) Controlling the users of resources
   (c) Controlling the use of limited resources
   (d) Environmental management

5. A careful assessment of the stocks and flows of environmental resources, is required to:

   (a) Achieve social justice
   (b) Authorise short term development
   (c) Control the high cost of living
   (d) Sustain long term development

6. The main services and functions of the environment are to provide:

(a) Resources and absorb wastes
(b) Water, air, land for production
(c) Tangible, aesthetic and intangible resources
(d) Renewable and non-renewable resources

7. Some environmental resources are considered "free goods" and are used:

(a) For developmental planning in developing nations
(b) For well-managed recovery programmes
(c) To redistribute income to the poorest groups in society
(d) As common property for which no individual ownership exists

8. "Environmental management" aims at the sustainable management of:

(a) Natural resources and their use in environmental re-habilitation
(b) Development processes which have environmental impact
(c) Social and economic conditions influencing the form of employment
(d) HFA/2000

9. Compared with economic decisions, the time frame for the environmental impacts, is generally:

(a) Irrelevant
(b) Longer
(c) Shorter
(d) Equal

10. The need to preserve the environment:

(a) Slows down the decision-making process
(b) Is crucial to enterprise management
(c) Introduces an element of uncertainty in development
(d) Adds additional cost to the enterprise

11. Environmental conflict:

(a) Is always avoidable with proper environmental management
(b) Results from abuse of resources
(c) Relates to compatible values for the use of scarce resources
(d) Usually arises from perceived unfair use of resources

12. "Environmental management at the national level must be limited by the priority for economic and social development". This statement is:

(a) True for industrialised countries only
(b) False
(c) True
(d) True, provided there is no pollution

13. Environmental decision-making may help the enterprise for all of the following except:

(a) To attain higher profits through more efficient use of energy and raw materials
(b) To motivate the local workforce
(c) To keep the enterprise out of trouble; enabling it to survive and to grow and be profitable
(d) To ensure greater employment for local communities

14. A joint community-enterprise relations panel is the best solution for persistent community relations problems. This statement is true:

(a) Always
(b) Never
(c) Usually
(d) Rarely

15. Sawdust is:

(a) A raw material for fish breeding
(b) A sound absorbent material used in cars
(c) A pollutant
(d) A pollutant in the wrong place, and a resource in the right place

16. Environmental cost-benefit analysis of a new project will help to determine whether:

(a) The project is profitable to the enterprise
(b) The project will be opposed by the community
(c) Community and the enterprise stand to gain or to lose
(d) The project will improve the environment

17. Water is considered a renewable resource because it:

(a) Provides multiple services and functions
(b) Will renew itself if managed properly
(c) Helps to purify and renew waste materials
(d) Is used to make tea

18. Environmental pollution prevention is usually much less costly than cure:

(a) Is only a clever catchphrase
(b) For the enterprise only
(c) Only for the environment and community
(d) For the whole system

19. Environmental management is efficient and effective for the enterprise when it:

(a) Reduces capital investment
(b) Helps the enterprise avoid legal and community problems
(c) Uses a locally recruited workforce
(d) Conserves environmental resources

20. The key factor for the enterprise in avoiding conflict for a new manufacturing project is to:

(a) Use "clean" technology
(b) Set up a community/enterprise information systems
(c) Conserve local resources
(d) Set up an environmental control department

caadd adbbb dcdcd cbdbb

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

notes

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GENERAL ENVIRONMENTAL MANAGEMENT

Unit G.3 Interaction: Nature, Society and the Enterprise

International Labour Office Geneva

environmental management training
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Unit G3: Interaction: Nature, Society, Enterprise

WORKPACK

(Retained by participants)

Contents

INTRODUCTION

The learning objectives of this unit are as follows:

1. To analyse the relationship between Nature, Society and the Enterprise.

2. To identify the basic forms of environmental pollution.

3. To outline the scope of different types of legislation for environmental protection.

4. To recognise the influence of special environmental interest groups in Society.

5. To motivate further study.

In SG add additional objectives as appropriate:

STUDY/LECTURE: INTERACTION: NATURE, SOCIETY, ENTERPRISE

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. NATURE, SOCIETY AND THE ENTERPRISE

(a) The human environment is a system which includes:

* natural environmental resources;

* events and activities which impact on these resources;

* consumption of resources in man-made and natural eco-systems;

* efforts to control and optimise the use of resources and the quality of the environment.

(b) Environmental law relates Enterprise activities with Society's values and Nature's resources. It seeks to:

* define resources: land, water, minerals, energy, forests, wild life, plants and animals, genetic resources and their variety, historical and cultural resources;

* encourage rational resource management in co-operation with an environmental protection agency;

* set environmental standards and policies (an illustration for waste management is shown in Exhibit 1);

* regulate project impacts to protect the various environmental systems (Exhibit 2).

2. SPECIAL ENVIRONMENTAL INTEREST GROUPS

(a) Legislation governing the environment is usually the result of pressure action by special interest groups.

(b) Special interest groups (non-governmental organisations - NGOs) strongly influence the community - at local and national levels - and are often the key motivating factor behind governments enacting and enforcing regulations and restrictions. Because of special interest groups many governments introduce laws defining the conditions under which certain economic activity is allowed to continue.

(c) Special interest groups can influence enterprise goals and operations by focusing on points of conflict between the enterprise and the environment (Exhibit 3).

3. BASIC FORMS OF ENVIRONMENTAL POLLUTION

(a) Water pollution

One of the first impacts of increased development is usually the pollution of the water supply. Most countries now have laws controlling water pollution. Major sources of water pollution include:

* agricultural sewage and industrial effluents; these require specialised treatment;

* wastes, such as phosphates from detergents, discharged into inland bodies of water causing eutrophication;

* thermal pollution which negatively changes the eco-system of bodies of water;

* sewage from coastal cities which affects recreation facilities and marine resources;

* toxic substances, mud and floating debris discharged from coastal industry;

* shipping oil or solid-waste discharges polluting beaches and marine life.

(b) Air pollution

Among the most harmful air pollutants are carbon monoxide, sulphur oxides, nitrogen oxides, hydrocarbons, and particulates. All appear in the emissions of power plants, industry, motor vehicles, space heating, and refuse disposal.

(c) Solid waste pollutants

* Much of the material used in production systems ends up as a solid waste. Solid waste is responsible for pollution-oriented or resource depletion problems.

* Pollution-oriented waste is a threat both to human life by polluting the air through incineration, and to land and water through improperly designed landfills. Furthermore, it can create fire hazards or breed disease-causing germs.

* Even the efficient use of natural resources results in the resource depletion of vital materials and energy sources.

(d) Noise pollution

* Noise pollution can be a serious problem. High noise levels in the workplace can result in workers' hearing loss, absenteeism, reduced productivity, accidents and compensation claims against employers.

* In many countries noise pollution in industry is controlled by legislation requiring:

  - mufflers to be placed on machines,
  - provision of ear protection for workers,
  - noise level verification to protect the community.

4. ENVIRONMENTAL LAW - THE LEGAL FRAMEWORK

(a) Environmental law is interdisciplinary both at the international and national levels. Scientific knowledge and technological developments are covered by legal regulations after extensive political negotiations. Trade offs are continually being made between economic development and environmental protection.

(b) International law deals with three main areas:

* trans-boundary pollution (acid rain) and marine pollution;

* resources shared by two or more states (rivers, lakes and seas);

* protection of international "common" resources (fishing in international waters).

(c) National law usually covers three main areas:

* framework laws (environmental protection agency regulations, powers and responsibilities; environmental accident prevention and safety regulations);

* resource management laws (conservation of forests, fish, wildlife and minerals);

* environmental quality or anti-pollution laws (clean air standards, emission standards and zoning regulations).

5. GOVERNMENT ENFORCEMENT OF ENVIRONMENTAL PROTECTION STANDARDS

(a) Timely, clear and realistic regulations should limit the type and acceptable emission level for each environmental pollutant. The law should provide for measurable emission standards and clean air standards.

The legislative process includes consultation and co-operation with interested/concerned parties to ensure general acceptance as a necessary requirement for effective implementation of the laws.

(b) Implementation may be enforced through punitive or preventive measures. Preventive implementation involves a sophisticated system of legal and fiscal incentives and disincentives and technological measures to safeguard the environment.

These measures seek to prevent environmental impacts and to conserve natural resources through economic and environmentally benign processes such as reuse and recycling;

Administrative and penal sanctions must be available for use only as a last resort.

(c) An effective environmental protection agency requires:

* framework laws and administrative procedures (management, enforcement);

* qualified personnel (recruitment and continuous training);

* resources (materials and equipment for monitoring, testing and research);

* adequate budget allocations for research and for preventive and punitive enforcement of regulations;

* political and public support (a key factor).

(d) Before authorising a new major development project, government must assess its positive and negative impacts. In 1985 most developed and developing countries require an EIA (environmental impact assessment) before approving a project.

6. ENTERPRISE RESPONSIBILITY FOR ENVIRONMENT PROTECTION

(a) Implementation of environmental protection laws reflects a unique set of local needs, government structure and style, development goals, cultural factors, various constraints, and the enterprise's goals.

(b) In some societies non-compliance with environmental protection laws has been accepted as normal and the only practical road to economic development. Thus, environments have become degraded by enterprise development activities.

(c) Individual violators of accepted social behaviour have traditionally been kept in check by their peers. Where the environment is concerned, the community will eventually react against environmental violators.

(d) The enterprise must establish and/or maintain basic environmental standards and the necessary supporting infrastructure - even if legislation is lacking - that takes into account community aims and enterprise goals and also safeguards the environment.

7. ENVIRONMENTAL NEGOTIATIONS

(a) Enterprise decisions that have environmental impacts cannot be taken unilaterally. Enterprise managers must negotiate decisions that are for the good of all.

(b) Environmental negotiation requires enterprise management to:

* agree on aims and set time limits;
* research the facts;
* acknowledge the other party's position and recognise its validity;
* seek areas of agreement to establish trust and long-term relationships;
* find a compromise solution.

(c) Negotiation should achieve consensus within a limited time period; successful negotiation leaves both parties with a sense of achievement and creates a relationship of trust for the future. This is a major factor for long-term enterprise survival.

EXHIBIT 1

SETTING A NEW POLICY FOR WASTE MANAGEMENT

A. EXISTING POLICY: To dispose of waste at the least economic cost to the enterprise

APPROACHES	EFFECTS
Do nothing	Pollution. Environmental and public health problems.
Burn it	Air pollution.
Bury it (sanitary landfill)	Very limited solution. Costly. Limits on available land area.
Liquify it (human wastes)	Pollution. Eutrophication. Parasitic/contagious diseases. High cost (sewers, plants) High fresh water consumption.

B. NEW POLICY: To reduce waste generation, maximise reuse or conversion, and dispose of the remaining fraction at least economic cost to the enterprise

APPROACHES	EFFECTS
Reduce waste generation with: returnable food/beverage containers standardised minimum packaging	Reduction of volume.
Reuse and recycle	Conservation of materials. Energy savings in production.
Aerobic disposal (human waste)	Water savings. No pollution. Cheaper than sewage collection and treatment.
Organic fertiliser (organic waste)	Save cost of chemical fertilizer. Reduce run-off pollution.
Fuel for power plants	Save fossil fuel. Easier air pollution control. 99.99% effective but more costly

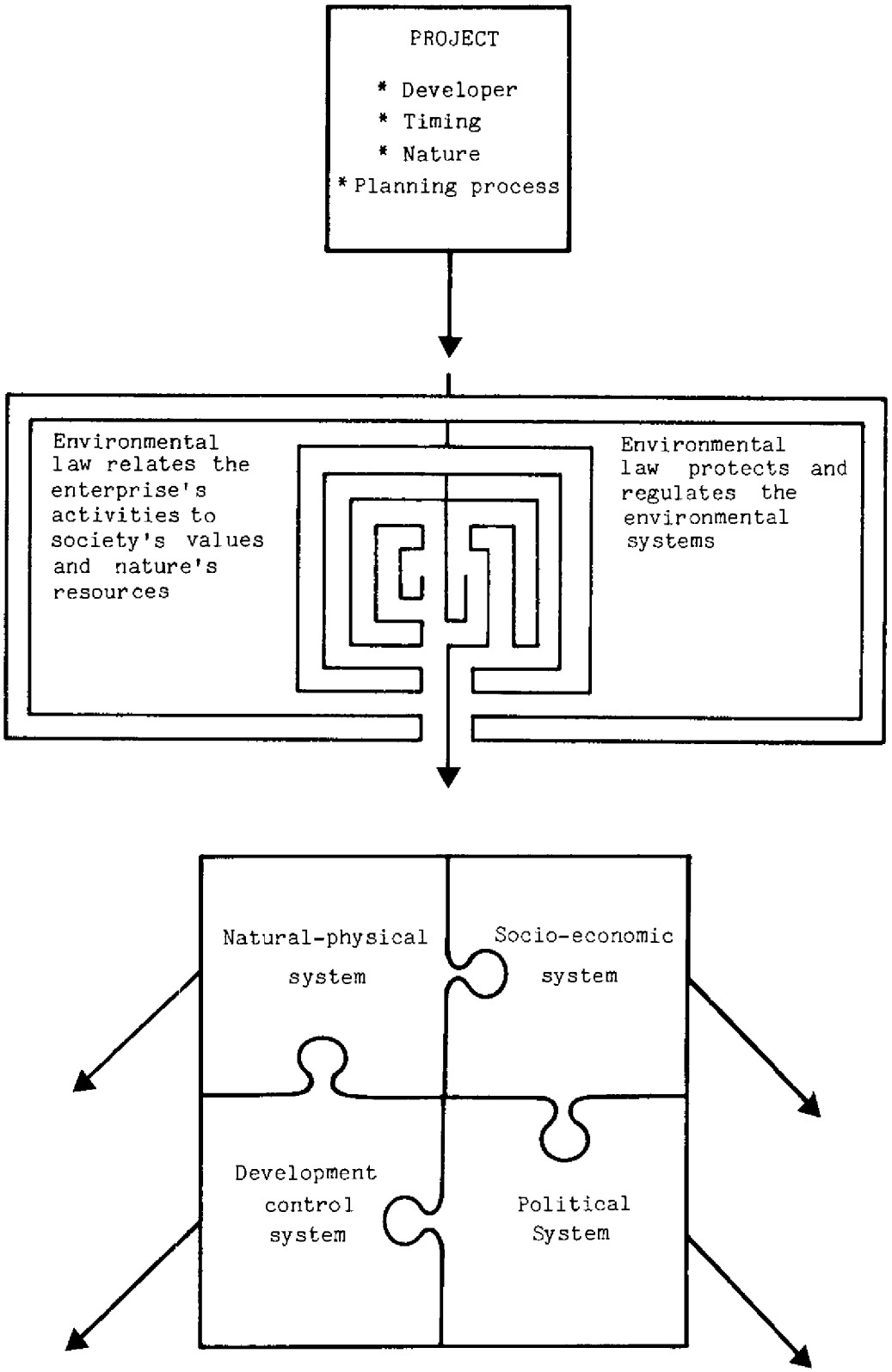
C. COST/BENEFIT EVALUATION: Materials, energy resources conserved: Environmental health and quality of life improved

D. LEGISLATION: Define legal standards, provide fiscal incentives, other types of incentives and set administrative arrangements (management, control, enforcement)

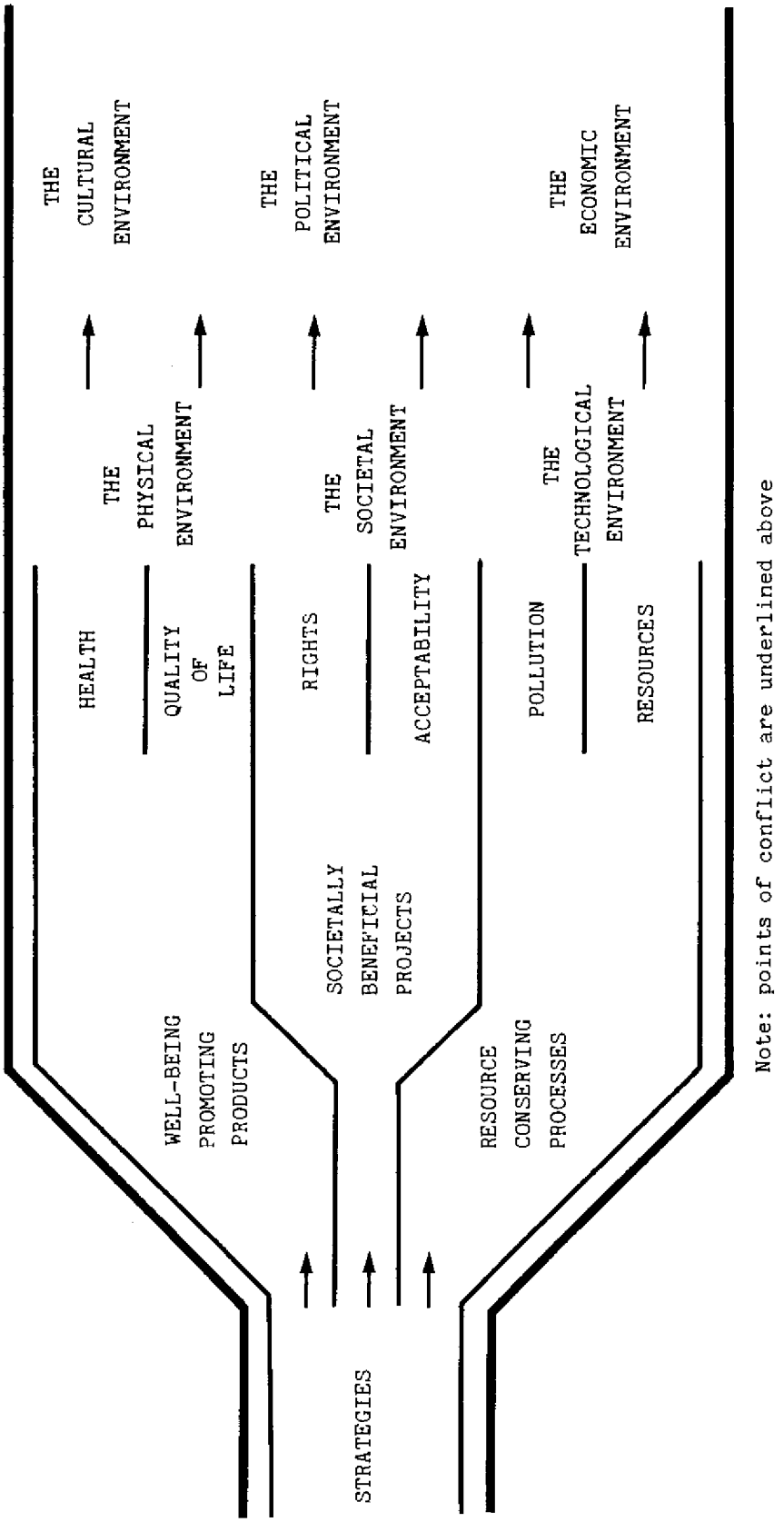
EXHIBIT 2

ENVIRONMENTAL LAW REGULATES

PROJECT-ENVIRONMENT INTERACTION



THE POINTS OF CONFLICT BETWEEN THE ENTERPRISE AND ENVIRONMENT



CASE - CHICOLE RIVER PROJECT

Questions on the case

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

2. Identify the key problems for the Government

3. Explore all alternatives available to the Government and the effects of each alternative.

4. Decide and justify what the Government should do.

CASE - CHICOLE RIVER PROJECT

The Chicole River Project was conceived by a Latin American Government in 1982. In 1984, the British firm, Meyer International, in co-operation with the Engineering and Development Corporation (EDCO) submitted its technical pre-feasibility study for hydro-electric development on the Chicole River.

The dam, projected to generate 1,010 megawatts of electricity, would cover 50 per cent of the Chicole River from its headwaters on Mount Proja to the dam. Total catchment area is 1,400 km^2. The dam would submerge six villages in one municipality and would render at least 1,000 families homeless. Scattered rice fields owned by families in five other municipalities would also be lost. Other areas affected would include 1,200 terraces, 500 hectares of fruit trees and national roads. About 13 million pesos worth of agricultural produce would be lost annually.

The water-shed area would directly affect four agriculture-oriented towns. In the mountain provinces, six municipalities would also be affected indirectly. Altogether an estimated 100,000 people would be negatively impacted by the project.

Strong government sponsorship of the project is related to contracts made with two neighbouring countries to sell electricity for hard currency. The dam's power would also support the rapid growth of the capital city 100 km away. Feasibility studies have shown that the valley slopes and soil would be ideal for run-off and stability. Dam construction is due to start in August 1985.

The Government's international publicity on the dam has raised the international community's awareness to the efforts being made to expand the country's economic base.

Environmental impact studies (required by law for large development projects) showed that the black jaguar's habitat would be flooded, possibly wiping out the rare species. International publicity has highlighted the black jaguar's likely fate. Wildlife preservation advocates around the world have threatened to boycott the country's exports if the Government proceeds to build the dam and destroy the black jaguar's habitat.

In May 1985, farmers, tribesmen and villagers of the affected areas marched into the capital to protest about the project. They demanded that the Government's national power company conduct public meetings in the areas to be affected. High government officials promised to relocate the locals and pay compensation for property damaged or lost. They dismissed the local delegations' requests as being too sentimental.

In July 1985, a River Development Conference was held with the co-operation of the nation's religious leaders, who are also community leaders. Over 150 village leaders together with religious support groups drafted an anti-dam paper and published a suggested alternative plan. They proposed building several small dams along the river so as to preserve villages and farmland.

MINICASES

1. HILEE MINING

Farmers and herders in the rocky hill region of Peru supply meat, fruit and vegetables to nearby small towns. The Government endorses development of mineral resources in this region. The Peruvian mining company plans to scrape off the top soil as it follows the mineral veins just under the surface.

Name the types of non-governmental organisations involved and discuss the implications of the proposed development.

2. RIVER-RUN DAM

From its source in the hills, the river runs through woodland and savannah. Though much of the river is navigable, it includes some rapids. At a point where it reaches flat savannah country that is frequently flooded, the river branches into a number of rivulets and forms a shallow lake dotted with sand hills. Where the river emerges from the lake its flow is broken by numerous impressive waterfalls. Soft-wood forests and prosperous towns trace its banks. Before emptying into the Bay of Bengak, it spreads into an immense delta in which mangrove flourishes. A dam is to be built on the upper portion of the river to control flooding on the savannah (see Exhibit 4).

List the dam's impact on the hill country and the mangrove areas.

3. THE CLEAN POWER STATION

An electric power station burning high sulphur fuel oil was faced with a new sulphur emission standard reducing the permissible sulphur dioxide content to 1,700 mg per m^3 of exhaust gas. To meet this standard, the power company had to choose one of the following:

(a) desulphurise the exhaust gases (a costly and time-consuming investment);

(b) use low-sulphur fuel oil, which is much more expensive;

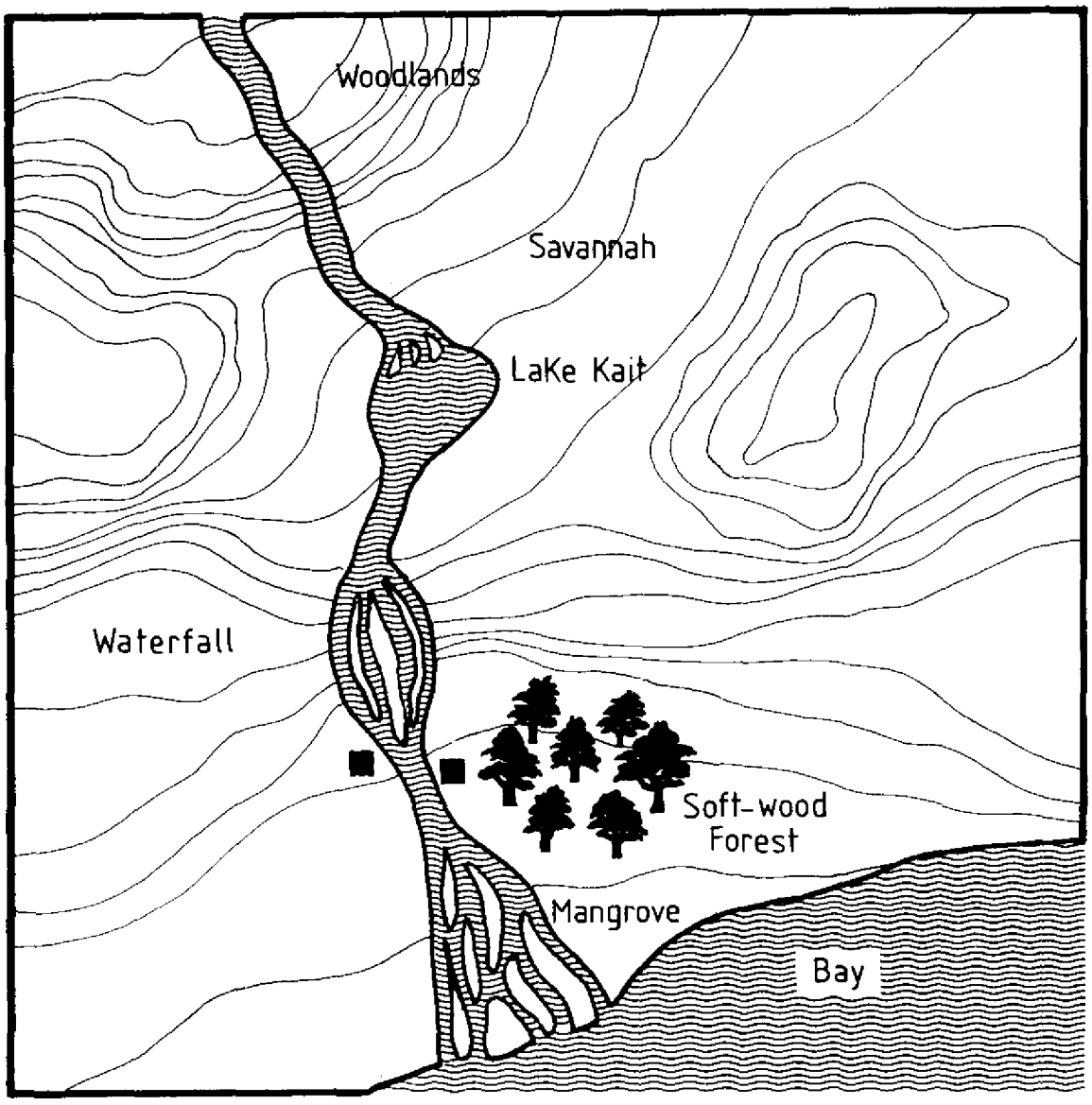
(c) inject air into the stack to dilute the sulphur dioxide emission to the required limit. This involves a relatively simple modification of the stack, but does not reduce the total sulphur emission into the atmosphere.

Consider the various options, recommend a solution for the enterprise and outline its implications from the viewpoint of national and international environmental law.

EXHIBIT 4

RIVER-RUN DAM

Bay of Bengal



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 G3: Interaction: Nature, Society, Enterprise

CASE GUIDE

(NOT RETAINED BY PARTICIPANTS)

CONTENTS

ANSWERS TO THE CASE - CHICOLE RIVER PROJECT

1. STORY OF THE CASE

The Chicole River Project should generate over 1,000 megawatts of electricity as well as a great deal of hard currency from sales of hydro-electric power to neighbouring countries. Although strongly supported by the Government, the project would submerge villages, crop-lands, and orchards. The project would also flood the habitat of the black jaguar - a rare species. A world-wide boycott, or environmental reaction to the black jaguar's fate, has threatened the country's foreign trade.

Farmers, tribesmen and villagers of the affected areas protest in the capital. Religious leaders organise groups supporting the protest and put forward their own proposal for the project. Government officials reject the protests as being "too sentimental".

2. PROBLEM IDENTIFICATION

* Need for general economic development
* Need for hydro-electric power
* Need for hard currency from the sale of power
* Displacement of communities
* Loss of agricultural products
* Wildlife preservation

* Possible legal action by protesting delegations

* Religious reactions

* Possible international trade boycott.

3. ALTERNATIVE SOLUTIONS

(a) Start the project without gaining support or consensus from the communities concerned and risk the continual threat of their retributive action.

(b) Negotiate with special government-picked local groups to get around the problems and stand firm on the dam siting; eventually communities will see through this facade and they will take measures to kill the project.

(c) Work with the community groups, and act on their proposals (to build several small dams) if they are justified; new thoughts on the project design may be generated and the communities may be satisfied.

(d) Hold a national referendum on the issue; this may be a relatively inexpensive method to achieve a national consensus-based decision; additional research data must be gathered to support the Government's position.

(e) Use force to move the residents and accept the resulting social unrest.

(f) Search for alternative sources of energy and alternative locations.

(g) Initiate professional EIA to explore the project and consider alternative arrangements.

4. DECISION AND JUSTIFICATION

(a) Decision

* Government should order the temporary suspension of all operations at the dam site. Use this delay to meet with representatives of the community (small groups; public meetings) to discuss alternatives to the project. Avoid escalating opposition to the project which could seriously impede progress and strengthen opposition to the Government.

(b) Justification

* Time is used effectively to seek consensus and get the project accepted.

Discussion with the various groups will bring out new ideas on the project siting and provide a forum for the Government to explain its reasons for supporting the project.

Alternative plans would thereby be generated to resolve regional, national and international opposition to the project.

5. LEARNING POINTS

(a) Overall preventive environmental management is essential for the survival of public and private enterprises.

(b) International communications and media coverage now make it essential for enterprise management to consider total external implications of a project and the outcome of any likely opposition to decisions that are taken internally.

(c) There are always alternative solutions to an environmental problem. Consider time, technology, place and people.

(d) Development projects must be tailored to environment priorities (political/social/economic/physical/cultural environment).

(e) Even after a situation has deteriorated into serious conflict negotiations with the community can still be arranged.

(f) Communities constitute a political force (through demonstrations, lobbying and voting) that can influence governments to modify or even abandon development projects.

(g) Flora and fauna also have strong supporting lobbies.

(h) Environmental protection legislation is flexible in relation to political/social/technological/economic forces and priorities.

(i) EIA is a useful tool for preventing environmental conflict and is becoming increasingly a legal requirement for government approval of any project with environmental impact.

ANSWERS TO THE MINICASES

1. HILEE MINING

The list of NGOs would include soil conservation groups, wildlife groups, mineral mining associations and local farmers' associations.

Farmers and herders would be displaced to the city and miners from outside would move to the region of the mine to find jobs, thus unbalancing the situation in many areas. Soil scraped and piled would lead to land erosion if there is no replacement of tree and grass cover.

2. RIVER-RUN DAM

In the hill country, the dam will submerge valleys and rapids. Local inhabitants will be seriously affected and so great care should be taken by project management to include the local community in project planning. Other impacts will include deforestation of the watershed area, changes in fish spawning patterns, disruption of the natural eco-system.

Once the dam is in operation the amount of water processed through the dam must be adequate to meet the needs of the mangrove area which is necessary as a habitat and feeding ground for fish and animals and as a breakwall against the typhoons that regularly hit the area. There is also a risk that the micro-climate will be changed.

3. THE CLEAN POWER STATION

The optimal technical solution for the power company is alternative (c), i.e. to inject air into the stack. From the environmental viewpoint, this is of limited benefit to the immediate environment because it disperses the sulphur dioxide and does not reduce the total amount emitted. Eventually, the sulphur dioxide is transported over long distances and produces acid rain. While conforming to national legislation this infringes international conventions against transboundary pollution by sulphur which are designed to prevent acid rain damage beyond national boundaries.

Therefore investigate the alternatives (a) and (b).

QUIZ

Choose the most correct answer

1. The purpose of restrictive environmental legislation is to:

   (a) impose restrictions
   (b) ensure a safer, cleaner environment
   (c) curtail activities of enterprises
   (d) fine the polluting enterprises

2. The most flexible alternative in solving environmental problems is the manager's choice of:

   (a) place
   (b) technology
   (c) people
   (d) timing

3. Even after a situation has deteriorated into a serious conflict, the situation can still be turned into a ..... process by establishing a working relationship with the community.

   (a) negotiating
   (b) waste avoidance
   (c) socio/political
   (d) technical

4. To deal effectively with the mul itude of forces in the environment, an enterprise needs to:

   (a) seek technology appropriate to the environment
   (b) modify production systems
   (c) appoint an environmental manager
   (d) retain an environmental law specialist

5. Areas of human concern affected by environmental impacts include all of the following except:

   (a) employment levels, transport availability
   (b) life styles: nomadic, settled, pastoral, industrial
   (c) self-expression and passive recreation
   (d) population displ..cement, income, property values

6. Environmental management is:

(a) a multi-disciplinary function
(b) intended for managers with a background in the natural sciences
(c) mainly planning
(d) mainly for government control of interaction between nature, society and the enterprise

7. Since (in the long term) prevention is an easier alternative than cure:

(a) it is best applied to public sector projects and production facilities
(b) countries at an early stage of development enjoy an advantage
(c) it is a sensitive issue only on an international level
(d) every country has an equal chance of controlling pollution

8. "Environmental protection legislation governing the use of natural resources is implemented by a governmental agency". This statement is:

(a) usually true
(b) false
(c) true for North American countries
(d) generally false in developing countries

9. A recent addition to environmental law for mineral resources includes:

(a) obligation for the mining site, after mining operations have ended
(b) noise level measurements
(c) aerobic disposal and biological treatment of fresh water
(d) economic benefits to compensate for mining health problems

10. Air pollution laws are:

(a) defined scientific standards
(b) mainly related to discotheques
(c) equally important both inside and outside the working environment
(d) the most complex environmental laws

11. Environmental systems are best described as:

(a) political, development control, socio-economic, and natural systems
(b) political, development control, and natural systems
(c) mainly of great concern
(d) natural, human and technological systems

12. International environmental law usually covers all of the following except:

(a) trans-boundary pollution
(b) resources shared by two or more states
(c) framework laws
(d) protection of international common resources

13. The enterprises which could cause water pollution:

(a) have not yet been identified in most developing countries
(b) may well include those that provide hot baths for the workers
(c) are usually effected by environmental legislation
(d) invariably affect the potability of tap water

14. National environmental law is usually composed of all of the following except:

(a) framework laws
(b) trans-boundary pollution laws
(c) resource management laws
(d) anti-pollution laws

15. Noise pollution usually relates to all of the following except:

(a) legal standards based upon scientific facts
(b) hearing loss
(c) working accidents
(d) absenteeism

16. Overall preventive environmental management is essential for:

(a) national development plans of most countries
(b) survival of private enterprises
(c) survival of both private and public enterprises
(d) overall of cost control

17. With public responsibility for the environment, the government must do all of the following except:

(a) set environmental protection regulations
(b) eliminate all environmental impacts of development projects
(c) provide administrative and penal sanctions for pollution
(d) require EIA before approving new development projects

18. To meet its responsiblity for the environment, an enterprise should do all of the following except:

(a) force the government to adopt economic environmental standards
(b) train and recruit special environment personnel
(c) provide resources for environmental control
(d) set up environmental management procedures

19. The effectiveness of a government environment protection agency will depend mainly on its:

(a) private/public support
(b) physical support
(c) budget
(d) framework laws

20. Environmental protection legislation is usually enforced to comply with:

(a) International standards only
(b) local, political power
(c) economic realities
(d) many complex factors

bdaac abaac accba cbaad

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

notes

environmental management training
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1

GENERAL ENVIRONMENTAL MANAGEMENT

Unit G.4 Environmental Impact Assessment

International Labour Office Geneva

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

Unit G4: Environmental impact assessment

WORKPACK

(Retained by participants)

Contents

INTRODUCTION

The learning objectives of this unit are as follows:

1. To use the language and concepts of Environmental Impact Assessment (EIA).

2. To recognize the functions and benefits of EIA as a planning tool.

3. To analyse the four step approach to EIA.

4. To practice simple EIA with an activity/impact matrix.

5. To motivate further study.

In small groups (SGs) add additional objectives as appropriate:

STUDY/LECTURE - ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

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. DEFINITION AND FUNCTIONS

(a) Environmental impact assessment (EIA) improves the planning of major projects by predicting and providing for environmental impacts. It involves four steps: identification, prediction, evaluation and communication (Exhibit 1).

(b) In 1985, before a major development project is approved, EIA is required as part of the legal planning process by most developed and some developing countries. EIA procedures differ in each country. An example of an EIA administrative process is given in Exhibit 2.

(c) The basic functions of EIA are to:

* describe proposed new activities;

* relate the activities to planning regulations;

* analyse primary (direct) and secondary (indirect) environmental impacts; these may be physical, ecological, social or aesthetic as listed in the checklist of environmental parameters (Exhibit 3);

* generate alternatives to reduce the impacts;

* provide a process for a "participatory planning activity" between enterprise, government and community.

2. BENEFITS OF EIA

(a) Adds a new environmental dimension to existing planning processes and indicates the likely:

* impacts upon soil erosion, water supplies, wildlife and plants;

* depletion of non-renewable environmental resources;

* pollution of water, air and land etc.

(b) Provides comprehensive coverage of short and long-term technical and social issues.

(c) Generates alternatives which are more acceptable to all parties involved and which anticipate and prevent adverse effects.

(d) Prevents technical trouble before start-up by involving different social groups, disciplines and government departments in the planning process.

(e) Sets the basis for continuous monitoring of key project activities and environmental conditions to prevent problems arising.

3. EIA METHODOLOGY

(a) A variety of simple and complex techniques may be used in EIA data collection and evaluation including various scoring matrix techniques, checklists (descriptive or weighted), risk analysis (for hazardous industries such as in Bhopal), geographic mapping of impacts, resource allocation models, computer simulations, cost-benefit analysis (CBA), simulation models, "participative planning" etc.

(b) Enterprise management and environmental experts working together select EIA methodologies which must cover the major environment impacts, satisfy government regulations and still be cost effective. Criteria for selecting and appraising appropriate methodologies for different parts of an EIA are given in the readings for later study.

(c) EIA procedures can be reduced to four basic steps: identification, prediction, evaluation and communication. These are discussed below.

4. EIA PROCEDURE - STEP 1: IDENTIFICATION

(a) Identify separately, the project activities which may impact on the environment during the planning, construction and operational phases of a new activity.

(b) Use an activity/impact matrix to relate project activities to the physical and social environments affected and to establish the significance of the various environmental impacts (see example in case: Exhibit 4).

Note: In some countries the Planning Authority requires a draft EIA for a new project that sets out project data on land-use, employment and infrastructure effects, resource requirements and initial environmental effects, etc.

5. EIA PROCEDURE - STEP 2: PREDICTION

(a) Predict the nature and extent of future environmental impacts of the new activity.

(b) Use the activity/impact matrix at each stage of the project to prepare for impacts that may arise. During the planning and design phases, start baseline data collection and design project environmental monitoring procedures so that environmental changes can be analysed and impacts predicted. Measure the significance of impacts with objective indicators.

Note: In some countries the Planning Authority examines the draft EIA against existing zoning regulations, development plans, etc., and screens it for potential health hazards, resources and social conflicts. The Planning Authority may then issue an EIS (Environmental Information Statement) requiring further information on the project's environmental impacts in the final EIA.

6. EIA PROCEDURE - STEP 3: EVALUATION

(a) Assess the environmental impacts quantitatively and qualitatively. Use various techniques including the activity/impact matrix to evaluate the impacts and alternatives for short and long-term significance.

(b) All alternatives are essentially compromises (trade-offs) between economic development and environmental values; they are usually of three types:

* to mitigate the adverse affects (anti-pollution laws),
* to change site location (to a more appropriate site) and technology (low waste),
* to limit or abandon the project.

(c) Public involvement improves the value of EIA by revealing potential conflicts early. Such participation also improves the acceptability of the final outcome.

(d) Various types of matrices illustrate major environmental parameters for evaluation of each stage of the project. These matrices assist planners and project managers to focus on the major resources and "actors" (interested parties) impacted by the project.

Note: In some countries the Planning Authority uses professional expertise to evaluate the final EIA. Impact interpretation and evaluation requires a high level of critical judgement.

7. EIA PROCEDURE - STEP 4: COMMUNICATION

(a) Before final approval of the EIA, the public should be encouraged to express its views and to submit them in writing. The issues thus revealed should then be discussed at private and public meetings. This is valuable at all stages of the EIA process and particularly at the later stages when a short-list of options has been prepared.

(b) The manager may communicate with the authorities, the community and specific interest groups using various techniques referred to in the readings for further study.

Note: In some countries, after expert examination and comment by interested parties and the public, the Planning Authority sends the final approved EIA, with or without special conditions, to the appropriate licensing authorities.

8. CONSTRAINTS

(a) Collection of the supporting baseline data for EIA and the design of subsequent monitoring systems may be difficult and expensive.

(b) The Planning Authorities may include members from different ministries, public and private agencies. Sometimes there may be no overall Environmental Protection Agency to set guidelines for the preparation of EIA, to receive and evaluate the draft and eventually the final EIA.

(c) Although the Planning Authority may approve the final EIA, legal licensing of a project may depend upon a multitude of local, regional and national planning commissions, sectorial ministries (industry, transport, labour etc.), and specialised agencies (fire fighting, pollution control, health etc.). It is sometimes a long and confusing process.

(d) EIA complicates an already complex procedure for planning and project approval. Expertise in environmental management and in local, regional and national planning processes is essential.

(e) The enterprise must accept as normal the long delays in EIA studies and negotiations. In the interim period, safeguards must be introduced to avoid environmental violations that would have serious implications for the enterprise in the future.

(f) Implementing the four-step EIA is only the first stage in gaining acceptance of a new activity which may have significant environmental impacts.

(g) To improve the EIA process, enterprises and employers' associations should become involved in setting environmental standards, laws and regulations.

EXHIBIT 1

THE FOUR STEPS FOR EIA

Step		Key elements
1.	Identification	Description of the existing environmental system
		Determination of project components
		Definition of the environment as modified by the project (including all components of the project)
2.	Prediction	Identification of environmental modification that may be significant
		Forecasting the magnitude and/or spatial dimensions of identified change in environment
		Estimation of the probability that the impact (environmental change) will occur (time period)
3.	Evaluation	Determination of the incidence of costs and benefits to user groups and populations affected by the project
		Specification and comparison of the trade-offs (costs or effects being balanced) between various alternatives
4.	Communication	Publish draft EIA , invite commments, final EIA integrates comments and justifies decisions

EXHIBIT 2

EXAMPLE OF AN EIA ADMINISTRATIVE PROCESS
(with responsible persons)

1. Define those projects which will be subject (by law or cabinet order) to the EIA procedure.

2. Setting basic EIA principles (Environmental Protection Agency).
   EIA guidelines (responsible minister).
   Preparation of draft EIA (project proponent or enterprise).

3. Notification, public inspection of project plans and draft EIA (regional governor(s) concerned).

4. Briefing meeting with concerned/affected groups (project proponent or enterprise).

5. Presentation of written comments from concerned members of the community.

6. Views of the municipalities concerned (if necesssary). Public hearing. Comments of regional governor(s) concerned.

7. Preparation of final EIA (project proponent or enterprise).

8. Notification, public inspection (regional governors concerned).

9. Comments of the Environmental Protection Agency to those who issue licence.

10. Due consideration of these views taken in the conditions pertaining to the licence.

11. Licensing, etc.

Note: An EIA system is indispensible in the prevention of environmental pollution and natural environmental disruption. Institutionalisation of this assessment by government requires legislation and complex administrative regulations. Enterprises and employers' associations should become involved.

PHYSICAL

WATER

- BOD
- Ground water flow
- Dissolved oxygen
- Inorganic carbon
- Inorganic nitrogen
- Inorganic phosphate
- Heavy metals
- Pesticides
- Petrochemicals
- pH
- Stream flow
- Temperature
- Totally dissolved solids
- Toxic substances
- Turbidity

LAND

- Soil erosion
- Flood plain usage
- Buffer zones
- Soil suitability for use
- Compatibility of land uses
- Solid waste disposal

AIR

- Carbon monoxide
- Hydrocarbons
- Nitrogen oxides
- Particulate matter
- Photochemical oxidants
- Sulphur oxides
- Methane
- Hydrogen and organic sulphides
- Other

NOISE

- Intensity
- Duration
- Frequency

SOCIAL

INDIVIDUAL ENVIRONMENTAL INTERESTS

- Educational / scientific
- Cultural
- Historical
- Leisure / recreation

SOCIAL INTERACTIONS

- Political
- Socialisation

RELIGIOUS

FAMILY

ECONOMIC

INDIVIDUAL WELL-BEING

- Physiological health
- Psycological health
- Safety
- Hygiene

COMMUNITY WELL-BEING

ECOLOGICAL

SPECIES AND POPULATIONS

- Game and nongame animals
- Natural vegetation
- Managed vegetation
- Resident and migratory birds
- Fisheries
- Pests
- Bio geochemical cycling
- Energy flow

HABITATS AND COMMUNITIES

- Species diversity
- Rare and endangered species
- Food chain index

ECOSYSTEMS

- Productivity

AESTHETIC

LAND

- Geological surface
- Relief topography

AIR

- Odour
- Visual
- Sounds

WATER

- Flow
- Clarity
- Interface land and water
- Floating materials

FLORA / FAUNA

- Animals - wild domestic
- Vegetation type
- Vegetation diversity

- Man-made objects
- Hand-made objects
- Consonance with environment

COMPOSITION

- Composite effect
- Unique composition
- Mood atmosphere

CASE - MULTI-CHEMICALS LTD.

Questions on the case

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

2. List the impacts for each of the three phases of the project: construction, operations and expansion. Then prepare an Activity/Impact Matrix (Exhibit 4).

3. Identify the possible alternatives for MC to operate and develop the plant facilities.

4. Decide and justify what the government should do now.

CASE - MULTI-CHEMICALS LTD.

1. GENERAL BACKGROUND

Multi-Chemicals Ltd. (MC) is a transnational company manufacturing and selling a broad range of chemical products. MC is successful in Europe but wants to locate part of its polyethylene production in South Asia (a rapidly growing market not easily accessible from Europe).

In 1982, MC's attention was drawn by the Mergovian government to the zone of industrial development (ZID) on the coast of Anawak island. The main raw material is available from the local refinery. There are good communication links for sales to South Asia in general and there is room for expansion.

The Government strongly supports the development of petrochemical, steel and nonferrous metal industries in the ZID. Roads and port facilities are being built and water supplies, electricity and telecommunications assured. Public concern about the ZID has already led to suggestions that the environment will suffer. However, the Government is determined that the ZID will be a model of environmental management because of the sensitivity of the bay area.

2. ZID AND THE REGIONAL DEVELOPMENT PLAN

The general objective is to create new industry and to stimulate the local agricultural and fishing economy which is stagnating.

$400 million will be invested in the ZID to create 12,000 new jobs and induce a further 18,000 in supporting industries and services.

The Zone has been the cause of two waves of internal migration. In 1983, temporary workers arrived in large numbers for the construction phase reaching a maximum of 15,000 in 1984, but their numbers have since gradually declined. Since 1984, the number of industrial workers has been increasing and the population is expected to reach 120,000 by 1990.

The MC plan was expected to provide employment and increase foreign reserves by replacing imports of polyethylene. Over $80 million would be invested in the construction and equipment of the plant.

3. OBJECTIVES

The national government seeks to:

(a) resolve the problem of the region's economic underdevelopment and its highly variable seasonal unemployment;

(b) increase the utilization of the deep-water port for tankers and ore carriers - at present under-utilized;

(c) increase employment: the MC plants will hire 2,000 local workers and 50 staff. Another 3,000 jobs will be created in supporting industries;

(d) increase the value of the community's infrastructure and the government treasury through taxes on direct wages and those paid by the company (about $40 million per year) as well as the resulting social benefits.

The enterprise seeks to:

(a) gain access to a growing market for polyethylene in South Asia;

(b) benefit from reduced manufacturing and transportation costs in South Asia (e.g. personnel, distance from market, etc.) by producing in the region.

4. FUTURE EXPANSION

Following the initial stage of plant development, stage 2 of the project will double the LDPE (low density polyethylene) capacity to 100,000 tons per year and add a new facility to produce HDPE (high density polyethylene) at the rate of 40,000 tons per year.

The pollution problems related to LDPE are mainly atmospheric. Waste gases mainly contain ethylene and propylene which are burnt in a small boiler. The expansion in stage 2 will increase the discharge rate to 2 ton/h. This would justify a recycling process.

5. PHYSICAL ENVIRONMENT

The ZID site is on a flat, rocky plain between the hills and the sea. It is bordered by a river which provides adequate fresh water for industry. There is a large protected harbour which can take supertankers. Dredging will be required to maintain the access open to large ships.

The water table under the site is tapped for drinking water by the nearby towns. In order to protect the water table there is a ditch on the downhill seaward side of the ZID site to collect all surface drainage and divert it to the river.

The sea adjacent to the ZID is used both for recreational and commercial fishing. Fishing is a prominent traditional activity in the region and the local fishermen's co-operative has over 500 members. Other main income sources in the area are rice and wheat crops.

Nearby, there are extensive beaches used by both locals and tourists for recreation.

On the other side of the bay the salt marshes provide a widely-known wild life sanctuary for migratory birds (flamingos, egrets, storks, etc.) as well as wild flowers.

6. SOCIAL AND COMMUNITY ENVIRONMENT

The island's inhabitants (pop. 500,000) are extremely proud and self-sufficient despite their relatively low level of economic development. Family links are strong and there is a basic suspicion of outsiders.

The general attitude of the community is that industrialisation is acceptable if it brings income but development should not infringe on the community's traditional social/cultural patterns. Public concern focuses on roads, housing, hospitals, and other improvements to the infrastructure.

Shortages have been the cause of some clashes between the inhabitants of the island and the new workers from the mainland. Animosity also exists between permanent workers in their well-designed houses and the temporary construction workers in their cheaply-built huts.

About 80 per cent of the plant's management is expatriate; 60 per cent of the supervisors and technicians come from outside the island; 90 per cent of production workers will come from the island; 80 per cent of the construction labour force is from the mainland.

The major supply route for fuel and raw materials for the ZID is by sea. There is increasing pressure from local and international groups to limit such activities due to special dangers to the wildlife sanctuary already seriously threatened by large oil spills in the closed bay.

7. DEVELOPMENTS IN 1985

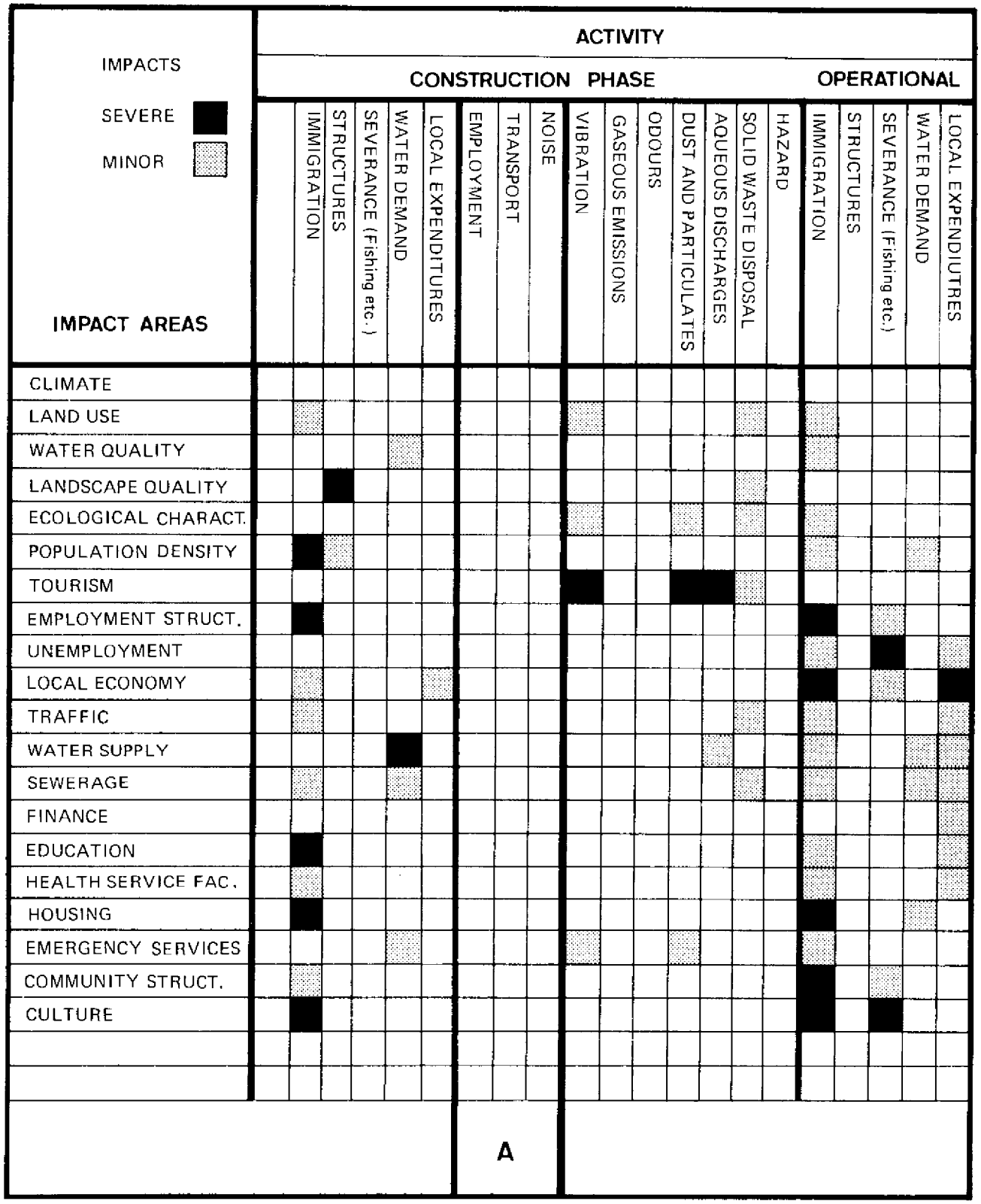
Authority has been mostly centralised, but the creation in 1985 of regional councils represents a move towards decentralisation and greater participation of local communities in decisions, which has led to general social unrest and demonstrations.

In 1985, as a reult of changes brought about by the ZID, citizen groups have formed to preserve the community's structure and identity. The main community action group is the "Society for Protection of the Coast of Anawak". Its basic aim is the preservation of the traditional way of life.

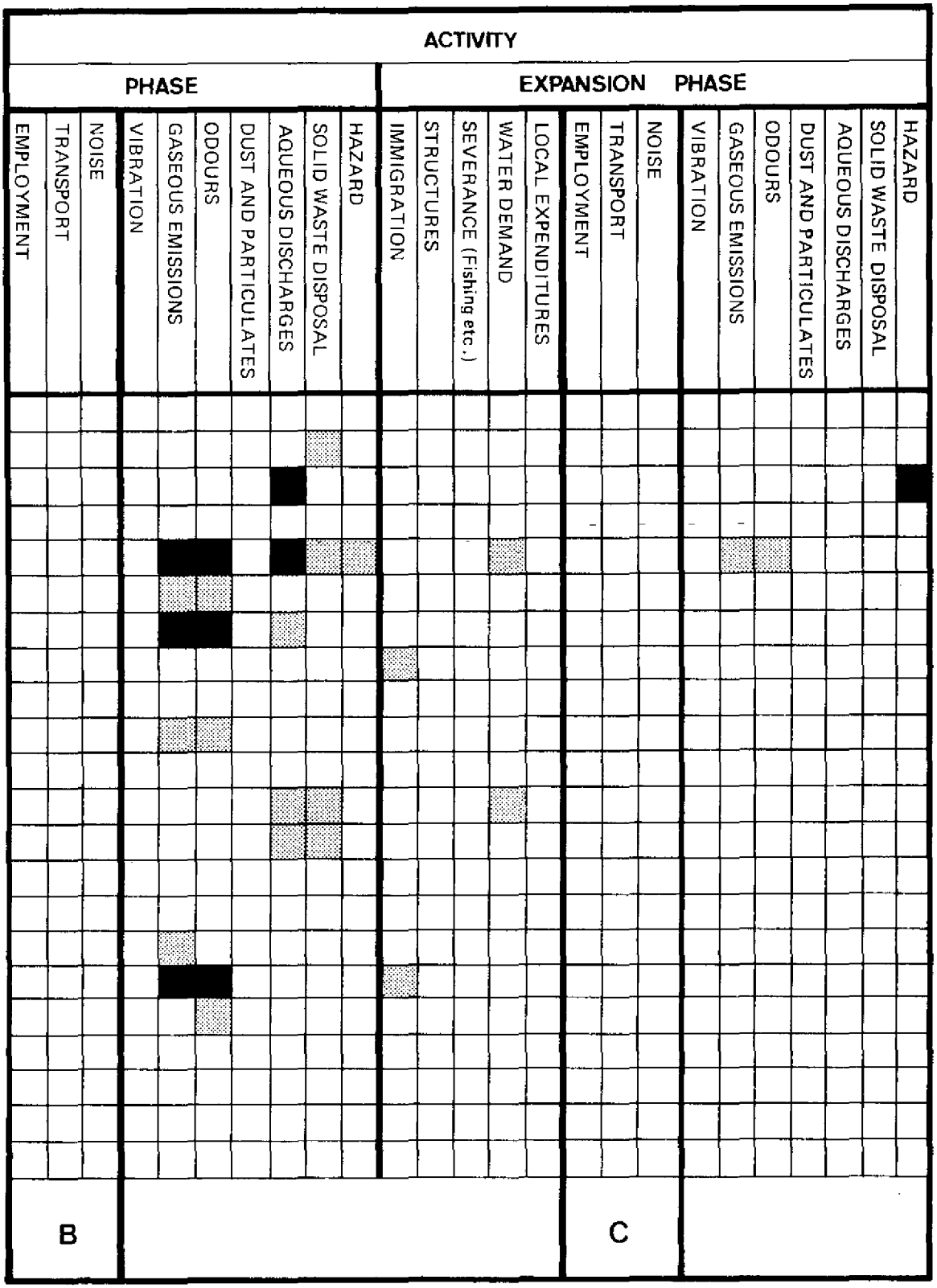
In 1985, local communes and regional councils adopted a policy to prevent further ZID expansion. In fact, the issue of containment of the zone was used as a vehicle by local groups in their fight for greater political power and revenues. The mayors, in particular, are very vocal in their complaints that they have not been consulted on the development of the ZID and do not get a fair share of taxes.

EXHIBIT 4

ACTIVITY/IMPACT MATRIX FOR MC/ZID PROJECT



Fill in sections A, B, and C.


ACTIVITY
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EXPANSION PHASE
EMPLOYMENT
TRANSPORT
NOISE
VIBRATION
GASEOUS EMISSIONS
ODOURS
DUST AND PARTICULATES
AQUEOUS DISCHARGES
SOLID WASTE DISPOSAL
HAZARD
IMMIGRATION
STRUCTURES
SEVERANCE (Fishing etc.)
WATER DEMAND
LOCAL EXPENDITURES
EMPLOYMENT
TRANSPORT
NOISE
VIBRATION
GASEOUS EMISSIONS
ODOURS
DUST AND PARTICULATES
AQUEOUS DISCHARGES
SOLID WASTE DISPOSAL
HAZARD
B
C

MINICASES

1. BY THE CORAL SEA

The forests on the mountain slopes behind the village of Bimbini were cut extensively for fuel, building material and other commercial purposes. The mountain became almost bare leaving the soil exposed to wind and rain erosion. In due time, mud and silt run-offs were deposited in the nearby coral reef region, inhibiting oxygen circulation and light in the reef area.

Discuss the implications to the village if the reef should cease to be the centre of coastal marine life.

2. RUSH FOR FISHING GOLD

The Ministry of Fisheries financed the building of the largest sardine fishing fleet in the world. The world market price for the fish was continually climbing and the best sardine fishing in the world was just off shore. The ministry took no environmental surveys and placed no limits on catch size. Tanna City was chosen as the base for the fleet.

Forecast the possible impacts on the environment (physical, social/cultural).

3. THE CALTHOUM CEMENT FACTORY

The Calthoum Cement Factory is located at the foot of a scenic mountain range densely covered by forests of Mediterranean pine. The top of the mountain had recently been declared a natural park in which only limited development was allowed.

For many years, the CC factory received the necessary limestone from an open-pit quarry situated at the foot of the mountain but, little by little the quarry became exhausted. Drillings indicated a suitable deposit higher up the mountain road within the confines of the national park. The company submitted an application for a quarrying permit to the regional planning board on the grounds that it was the most economic deposit and that the continued production of this key building material and the employment of thousands of workers was at stake. Strong opposition was voiced by the non-governmental Friends of Nature Society. Government was divided over the issue, with the Ministry of Industry supporting and the Environment Protection Agency opposing the project.

Consider possible action by (a) the company, (b) the opponents, (c) the Regional Planning Board.

CRITERIA FOR SELECTING AND APPRAISING APPROPRIATE METHODOLOGIES FOR DIFFERENT EIA STAGES

1. CRITERIA QUESTIONS FOR IMPACT IDENTIFICATION

Criteria	Questions
Comprehensive	Does the methodology address a full range of impacts?
Specificity	Are specific environmental parameters identified?
Isolate project impacts	Does the method suggest ways of identifying project impacts?
Timing and duration	Does the method suggest construction phase impacts vs. operational phase impacts?
Data sources	Does the method require identification of data sources?

2. CRITERIA QUESTIONS FOR IMPACT INTERPRETATION

Criteria	Questions
Significance	Does the method require an assessment of significance on a local, regional and national scale?
Explicit criteria	Does the method require that the criteria and assumptions in significance determination be stated?
Uncertainty	Does the method address uncertainty or the degree of confidence in impact projections?
Risk	Does the method focus on impacts of low probability of occurrence but high potential damage?
Alternative comparison	Does the method provide a way of comparing alternatives?
Aggregation	Does the method provide a way for aggregation of information on impact measurement and interpretation?
Public involvement	Does the method provide a way for public input in the interpretation of impact significance?

3. CRITERIA QUESTIONS FOR IMPACT MEASUREMENT: RESOURCE REQUIREMENTS, REPLICABILITY AND FLEXIBILITY

Criteria	Questions
	Resource requirements
Data requirement	Does the method use current data or are special studies required?
Manpower requirements	Are special skills required?
Time requirement	How much time is necessary to learn the method?
Costs	What are the costs of using the method?
Technologies	Are special technologies required?
	Replicability
Ambiguity	Is the method ambiguous?
Analyst bias	To what degree will different results occur depending on the analyst?
	Flexibility
Scale flexibility	Does the method apply to projects of different size or scale?
Adaptability	Can the method be applied to different basic environmental settings?

4. CRITERIA QUESTIONS FOR IMPACT COMMUNICATION

Criteria	Questions
Affected parties	Does the method link impacts to affected human groups?
Setting description	Does the method require a description of the environmental setting?
Summary format	Does the method contain a suggested summary format?
Key issues	Does the method suggest a way of highlighting key impacts or issues?

5. CRITERIA QUESTIONS FOR METHODOLOGY RESOURCE

Criteria	Questions
Explicit indicators	Does the method suggest specific measurable indicators for impact quantification?
Magnitude	Does the method require determination of impact magnitude?
Objectivity	Does the method stress objective rather than subjective measurements?

TECHNIQUES FOR HANDLING INTEREST GROUPS

COMMUNICATION CHARACTERISTICS

CORPORATE PLANNING OBJECTIVES

LEVEL OF PUBLIC CONTACT ACHIEVED	ABILITY TO HANDLE SPECIFIC INTEREST	DEGREE OF 2-WAY COMMUNICATION	1 = low, 2 = medium, 3 = high; ▒ = capability PUBLIC COMMUNICATION TECHNIQUES	INFORM AND EDUCATE	IDENTIFY PROBLEMS & VALUES	GET IDEAS & SOLVE PROBLEMS	FEEDBACK	EVALUATE	RESOLVE CONFLICT & REACH CONCENSUS
2	1	1	PUBLIC HEARING		▒		▒		
2	1	2	PUBLIC MEETINGS	▒	▒		▒		
1	2	3	INFORMAL SMALL GROUP MEETINGS	▒	▒	▒	▒	▒	▒
2	1	2	GENERAL PUBLIC INFORMATION MEETINGS	▒					
1	2	2	PRESENTATIONS TO COMMUNITY GROUPS	▒	▒		▒		
1	3	3	INFORMATION COORDINATION SEMINARS	▒			▒		
1	2	1	OPERATING FIELD OFFICES		▒	▒	▒	▒	
1	3	3	LOCAL PLANNING VISITS		▒		▒	▒	
2	2	1	COMMUNITY SURVEY RESEARCH		▒	▒	▒		
2	2	1	INFORMATION BROCHURES & PAMPHLETS	▒					
1	3	3	FIELD TRIPS AND SITE VISITS	▒	▒				
3	1	2	PUBLIC DISPLAYS	▒		▒	▒		
2	1	2	MODEL DEMONSTRATION PROJECTS	▒			▒	▒	▒
3	1	1	MATERIAL FOR MASS MEDIA	▒					
1	3	2	RESPONSE TO PUBLIC INQUIRIES	▒					
3	1	1	PRESS RELEASES INVITING COMMENTS	▒			▒		
1	3	1	LETTER REQUESTS FOR COMMENTS			▒	▒		
1	3	3	WORKSHOPS		▒	▒	▒	▒	▒
1	3	3	ADVISORY COMMITTEES		▒	▒	▒	▒	
1	3	3	TASK FORCES		▒	▒		▒	
1	3	3	EMPLOYMENT OF COMMUNITY RESIDENTS		▒	▒			▒
1	3	3	COMMUNITY INTEREST ADVOCATES			▒		▒	▒
1	3	3	OMBUDSMAN OR REPRESENTATIVE		▒	▒	▒	▒	▒
2	3	1	PUBLIC REVIEW OF IMPACT STATEMENT	▒		▒	▒		

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 G4: Environmental impact assessment

CASE GUIDE

(NOT RETAINED BY PARTICIPANTS)

CONTENTS

ANSWERS TO THE CASE - MULTI CHEMICALS LTD.

1. STORY OF THE CASE

Multi-Chemical Ltd., a multinational chemical manufacturer, is building a polyethylene plant in Asia because of an expanding regional market. A site in a new industrial zone on an off-shore island seems suitable. The host government supports the MC project since it fits well with the government's plan for industrial development in the area.

A deep-sea harbour and a refinery are already in operation near the site. Land and the necessary infrastructure have been provided for industrial development. The area is now used primarily for agriculture, fishing, and recreation (e.g. beaches for tourists).

Animosity towards the migrant industrial workers is based on the housing shortage and the slums of temporary construction workers. The original half million population will be increased by about 120,000 new residents. Most of the plant's management is expatriate; most of the skilled operational workforce comes from the mainland.

The major supply route for fuel and raw materials for the ZID site is by sea. Environmental opposition is building to the shipping traffic in the closed bay which is bordered by sensitive ecological reserves. Beaches have already been polluted by accidental oil spills.

There is social unrest generally in the country, and local protests against the Government for development in the ZID. The attitude of the local community is rather negative: distrust of the central government and animosity towards foreigners who disrupt the local lifestyle. The case does not mention any EIA requirement before approval of the project.

2. ENVIRONMENTAL IMPACTS

(a) Construction:

Main adverse impacts are due to:

* earth moving (excavation and fillup);
* surface waters and coastal water pollution;
* port traffic congestion, dust;
* noise and vibrations due to foundation work;
* congestion of ferry and roads due to labour and materials movements;
* slums and temporary housing coming up
* social disruption due to the sudden influx of a temporary (mostly male) labour force.

(b) Operations:

Ethylene gas effluents from the polyethylene converter contribute slightly to the other hydrocarbon pollutants emitted by the refinery. Any abatement measures would depend on general air quality management in the ZID.

At this early stage, the Regional Council will require producing companies to contribute resources towards an air-quality monitoring station network, to be operated under the guidance of the Ministry of the Environment. The network will collect data for future action.

Social impacts of the project are due to increased demand for housing, public services, health, education, etc.

(c) Expansion:

The HDPE plant emits toxic wastes which could affect surface waters (river) and the water table (landfill). Increased gaseous emissions may require abatement measures (recycling).

(d) Activity/impact matrix:

A solution is given in Exhibit 5; other alternative solutions are possible.

3. ALTERNATIVES FOR MC

(a) Limit development in the ZID and search for another more appropriate site for the chemical plant.

(b) Work with the national government on community-relations programmes aimed at gaining acceptance by providing benefits for the local community.

(c) Pollution prevention programmes to prevent accidents which could pollute the bay and contain shipping spills which occur during loading and unloading in the harbour or along the coast.

4. GOVERNMENT DECISIONS AND JUSTIFICATION

(a) Decisions:

* Require an immediate EIA, baseline data and monitoring systems and should set conditions for continuing development.

* Require MC to set up realistic safeguards for the marshes, beaches, water table and other points of local concern in operational plants.

* Initiate community relations programmes to act as a barometer in local matters for the government. Such programmes can also serve as a starting point for community education.

(b) Justifications:

* Urgent action is necessary to prevent increased conflict.

* Conflict between the traditional way of life and structural changes is unlikely to inhibit the change.

* Since basic investments (port facilities, refinery, industrial zone infrastructure) in the ZID had already been made by the government at the time of MC project negotiations, they are not easily reversible.

5. LEARNING POINTS

(a) National support for a development project is not enough. National objectives and community values are not necessarily compatible.

(b) Employment opportunities offered by the enterprise may not suffice to induce a community to accept a new project.

(c) EIA is necessary for all parties - enterprise, government and community - at an earlier stage, long before a critical point of change is reached in the social and physical environment.

(d) A community participation programme by the national government even prior to the enterprise development may facilitate national plans.

(e) The enterprise has environmental impacts during all project phases: construction, operations, expansion and abandonment.

(f) Before importing migrant workers the enterprise must make sure that the local infrastructure can support them.

(g) Community participation must be established early if it is to influence the local community to positive criticism rather that negative backlash.

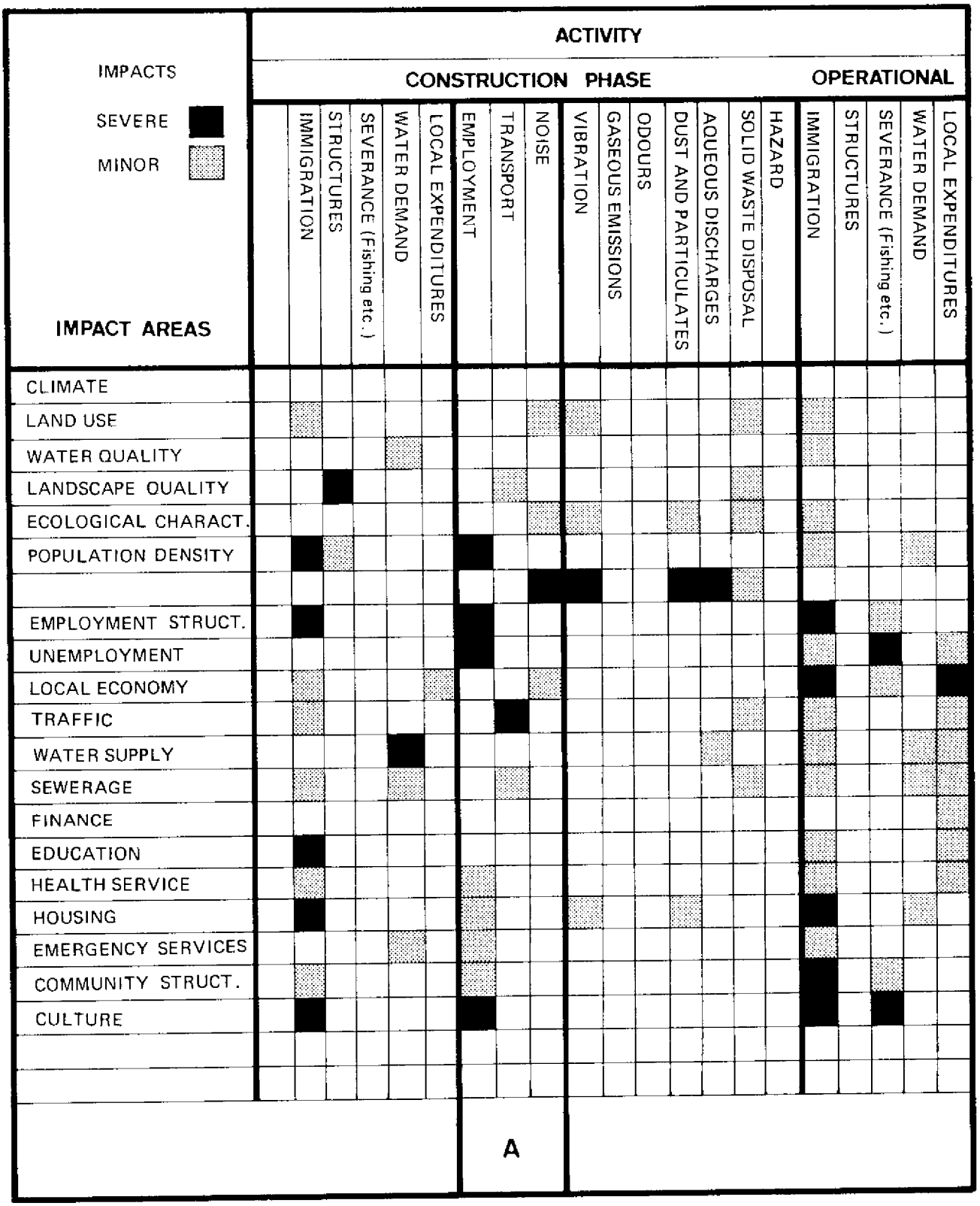
(h) Development planning is a complex technical/administrative process; EIA adds a new complexity and dimension to long and complicated procedures.

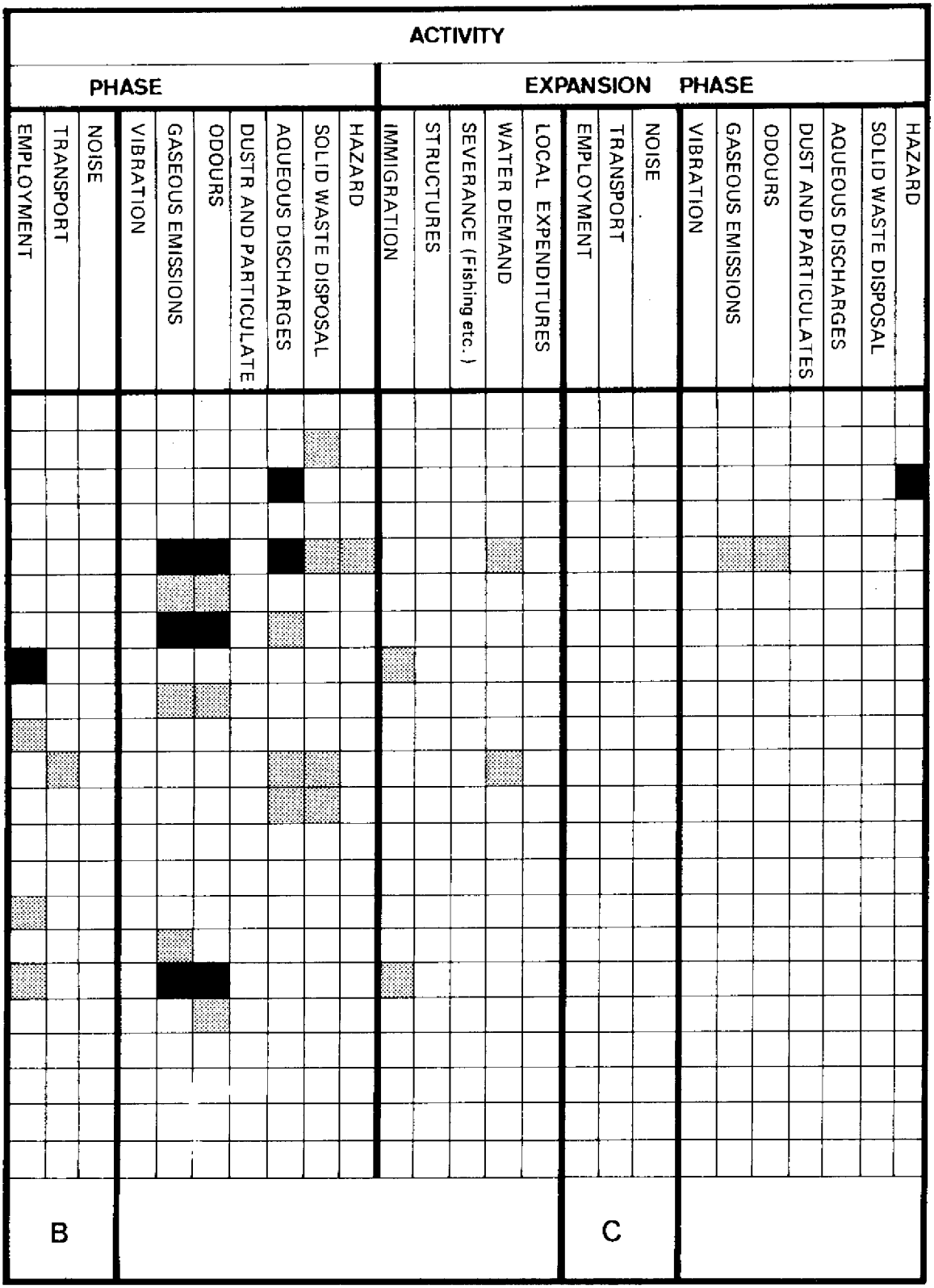
(i) EIA is absolutely vital in this increasingly sophisticated world to assure survival of the enterprise.

(j) The enterprise cannot "wait for a new Bhopal", but must become involved in environmental management now.

Note: In fact, MC modified its objectives and activities to meet community needs and developed a positive long-term relationship with the community and the government for environmental protection.

SOLUTION TO ACTIVITY/IMPACT MATRIX FOR MC/ZID PROJECT




ACTIVITY
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VIBRATION
GASEOUS EMISSIONS
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DUSTR AND PARTICULATE
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NOISE
VIBRATION
GASEOUS EMISSIONS
ODOURS
DUST AND PARTICULATES
AQUEOUS DISCHARGES
SOLID WASTE DISPOSAL
HAZARD
B
C

ANSWERS TO THE MINICASES

1. CORAL SEA

(a) The once-clear coastal waters will change gradually to mud-red as the soil from the hills washes into the ocean.

(b) The coral reef area, centre of coastal marine life, will be choked by the soil run-off and no longer provide a food source for fish. Fishermen will desert the coastal waters to find jobs in urban areas.

2. FISHING GOLD

(a) The high world price for sardines dropped sharply possibly because of overfishing by the fleet. The depleted sardine supply seriously disrupted the food chain in the sea. Fishing in the area has never regained its previous prosperity.

(b) The "boom" town is once again only a village with a view of 40 rusting ships on the beach.

3. **CALTHOUM CEMENT FACTORY**

(a) Company: suggest alternative sources, shut down and request assistance from the government, reduce production, involve the community, use alternative mining strategy other than open pit.

(b) Opponents: lobby RPB and the goverment; publicise dangers.

(c) RPB: refuse permission, insist on pit mining, insist on pit filling/landscaping.

QUIZ

Choose the most correct answer

1. An EIA is best performed by:

   (a) environment ministry
   (b) enterprise management
   (c) specialised consultants
   (e) community people

2. Impact measurement and evaluation in EIA requires:

   (a) knowledge of physical and social sciences
   (b) flexibility in measurement standards
   (c) impact matrices
   (d) quantitative indicators

3. "Most developed and many developing countries, have legal requirements for EIA". This statement is:

   (a) true for developed countries only
   (b) true
   (c) false
   (d) incompatible with free enterprise

4. EIA ensures that a project location study considers:

   (a) resources for expansion
   (b) baseline conditions
   (c) at least three alternatives
   (d) the weather

5. EIA demands:

   (a) simulation models
   (b) a clear moral code to protect wild animals
   (c) modification of the ecosystem to suit the project
   (d) the answers to certain basic questions

6. Step 2 in EIA implementation includes all, except:

(a) predicting the nature of the impacts
(b) evaluating the magnitude of the impacts
(c) estimating probabilities
(d) calculating implementation costs

7. Step 3 in EIA implementation entails:

(a) determining cost/benefit to the enterprise and community
(b) resolving conflict within the community
(c) analysing market opportunities
(d) formulating community action plans

8. To communicate EIA results to the community, the enterprise manager should do all, except:

(a) hold public hearings and meetings
(b) make local planning visits, public displays
(c) avoid all conflicting issues
(d) provide model demonstration projects and material for mass media

9. "National goals and community values are usually parallel". This statement is:

(a) mathematically difficult
(b) usually true
(c) true
(d) usually false

10. The key purpose of EIA is to:

(a) satisfy pollution control regulations by preventive measures
(b) evaluate manpower requirements
(c) communicate with government and community
(d) clean up the environment

11. Environmental law on EIA usually:

(a) divides departmental responsibility on political grounds
(b) assigns responsibility to a single government agency
(c) co-ordinates responsibilities between various agencies
(d) leaves environmental responsibility with the project manager

12. Public participation in planning is useful for:

(a) funding projects
(b) more cost-effective planning
(c) conflict prevention
(d) higher productive acceptance

13. Selection of an EIA methodology is best left to:

(a) environmental experts
(b) Providence
(c) enterprise managers in consultation with experts
(d) the environmental protection agency

14. A critical question on EIA methodology is:

(a) is government assistance available
(b) what is its probability of success
(c) can it be programmed on a computer
(d) will it focus on the major impacts/problems

15. To improve the efficiency of the regulations for approval of EIA will require more active involvement in environmental standards and laws by:

(a) environmental scientists
(b) enterprises and employers associations
(c) lawyers
(d) public interest groups

16. Developing countries should delay applying EIA until they have trained experts. This statement is:

(a) always true, because only they can set a methodology
(b) always false, as no experts are required
(c) generally true
(d) generally false

17. Long-term environmental impacts can "....." be predicted:

(a) never
(b) usually
(c) very rarely
(d) sometimes

18. To gain acceptance and support for a development project, the enterprise should usually:

(a) encourage community participation and provide benefits
(b) provide employment
(c) get government and community support (possibly legislative).
(d) move as slowly as possible

19. A practical EIA methodology for developing countries, is:

(a) the activity/impact matrix
(b) computer simulation
(c) astrology
(d) the Geiger-Müller pathway

20. For a developing country EIA often seeks to do all, except:

(a) satisfy resource requirements
(b) reduce importation of locally available resources
(c) assess impacts and prevent trouble even before it can start
(d) convince the community to support economic development

cdbbd dacdc bccdb ddaad

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

1

GENERAL ENVIRONMENTAL MANAGEMENT

Unit G.5 Pollution Prevention pays

International Labour Office Geneva

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

Unit G5: Pollution Prevention Pays

WORKPACK

(Retained by participants)

Contents

INTRODUCTION

The learning objectives of this unit are as follows:

1. To use the language and concepts of PPP, to seek profitable pollution prevention investment opportunities.

2. To evaluate the key benefits of preventive rather than corrective pollution control.

3. To demonstrate how pollution prevention policies may lead to the development of new markets for selling "know-how" on "clean technology".

4. To recognise pollution prevention as a potentially profitable investment for the enterprise.

5. To motivate further study.

In SG add additional objectives as appropriate:

STUDY/LECTURE: POLLUTION PREVENTION PAYS (PPP)

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. OVERVIEW

(a) The PPP concept demonstrates that:

* profitable opportunites exist for the enterprise to invest in pollution prevention and resource conservation;

* environmental safeguard costs are a necessary part of the long-term environmental management of the enterprise;

* a positive effort by top management and operating management is necessary to seek and develop such investment opportunities.

(b) Pollution as an enterprise problem can be tackled by an input approach, an output approach, or both, thus:

* the input approach focuses on the amount of matter and energy flowing into the process and attempts to reduce this flow by eliminating waste materials and energy. This is called "non-waste technology" or the "preventive" approach;

* the output approach attempts to reduce pollution as a product of the system mainly after the pollution has been generated. This is called the "end-of-pipe" or "corrective" approach.

(c) The input approach is far more efficient because it not only reduces pollution but also ensures a lower cost of inputs; hence it is normally more profitable to the enterprise.

2. ENTERPRISE AND ENVIRONMENTAL DAMAGE

(a) Managers continually face conflicting short and long-term goals regarding:

* economic survival (cash flow, profit, growth, etc.);

* human and social responsibilities to employees, community, region, state, and even to the international environment.

(b) Environmental damage by enterprises can become a significant social cost for the total community which is politically influential (e.g. environmental damage in the USA costs over US$25 billion each year).

(c) Immediate economic pressures on the enterprise manager make it hard for him to feel responsible for social costs (Exhibit 1).

(d) The enterprise manager may recognise that poor environmental management (social conflict, jobs lost, materials wasted, health problems, pollution, etc.) means profits lost to the enterprise through a failure to invest in PPP (Exhibit 2).

3. CRITERIA FOR A PPP PROGRAMME

(a) Eliminate waste or reduce pollution.

(b) Reduce energy consumption by using raw materials and other resources more efficiently.

(c) Add innovative features to manufacturing technology or product design.

(d) Increase profit.

4. STRATEGIES FOR PPP

(a) Ensure that PPP provides ecological and economic pay-offs. An example of agro industry is given in Exhibit 3.

(b) PPP is usually a programme with four strategies:

* product change or re-design;

* process modification;

* equipment re-design;

* waste material recovery for re-use.

5. PROFIT MAKING WITH PPP

(a) Creative profit making with PPP is demonstrated in Exhibit 4.

(b) Profits result from:

* cutting costs through improved material efficiency;

* using your own staff and know-how to make improvements;

* selling by-products or residues (waste exchanges);

* selling acquired know-how.

(c) There is a big and growing market for know-how in clean technology. Estimated investment in clean technology in the 1980s exceeds US$2,000 million annually in the USA.

6. IMPLEMENTATION

(a) A three-step approach to PPP is given in Exhibit 5:

* Analysis of the current situation.

* Search for alternatives.

* Decision for change.

(b) Responsibilities of top management:

* Set constructive policies which relate the enterprise to the community in which it operates.

* Consider environmental legislation and its observance.

* Evaluate staff performance by environmental as well as economic criteria; establish an information system to support this evaluation.

* Plan for emergencies and accidents.

* Encourage environmental awarenesss and involve staff at all levels in the PPP programme.

(c) Responsibility of production/project managers:

* Train personnel in the skills needed to:

  - comply with regulations for safe operation;
  - protect against health hazards;
  - control pollution and use preventive measures.

* Assign responsibilities and train personnel to implement hazard management and emergency procedures.

* Re-examine existing processes with a view to introducing low-waste technologies which will minimise consumption of energy, raw materials and water.

* Sell wastes as raw materials and buy wastes as raw materials (look for waste exchange markets).

* Look for ways to conserve energy (insulation, heat recovery, fuel substitution).

* Establish maintenance and good housekeeping procedures and check on their implementation.

* Review analytically all proposed project stages, or changes in products, production, packaging or transportation for their impacts on health, safety, and the total environment.

* Involve enterprise personnel:

  - in a consultative process (joint committees);
  - installing a complaints system;
  - establishing a regular information system;
  - rewarding outstanding contributions.

EXHIBIT 1

THE ENTERPRISE AS PART OF THE TOTAL COMMUNITY

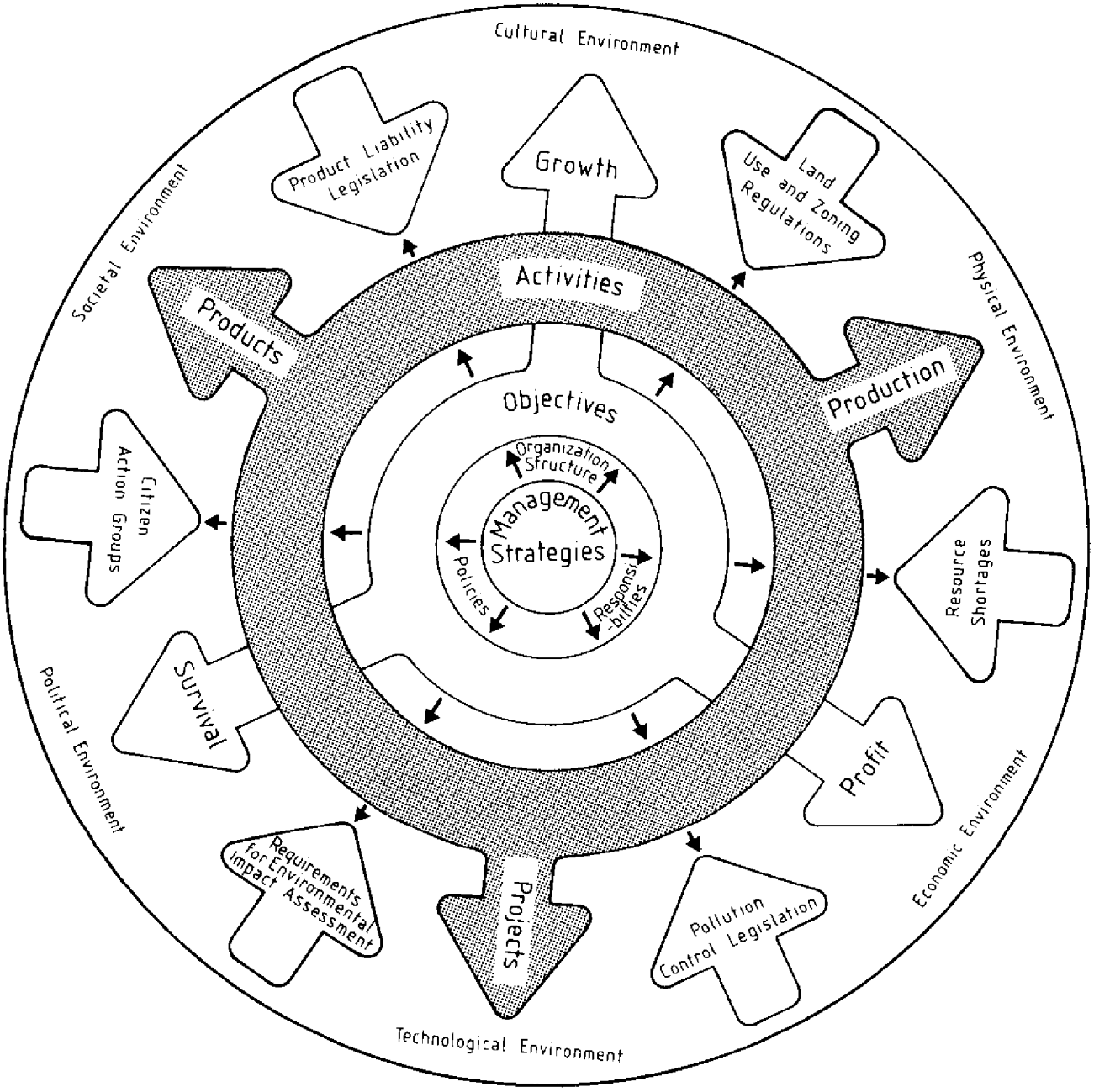

EXHIBIT 2

PPP INVESTMENT OPPORTUNITY IN WASTE REDUCTION
IN A PULP AND PAPER MILL

MILL PRODUCTION DATA	BEFORE PPP	AFTER PPP
Waste solids (ash) to dispose	150 tons per day	3 tons per day
Consistency of waste	20% solids	30% solids
Unit cost of disposal	$14 /ton	$14/ton
Annual disposal cost	$765,000	$15,000
Fuel value of solids (dry)	9200 Btu/ton	
Consistency of ash		90% solids
PPP INVESTMENT OPPORTUNITY		
Capital cost of improvements		$2,900,000
Savings:		
Fuel	$365,000/yr.	
Disposal costs	$750,000/yr.	
Total		$1,115,000/yr.
System operating costs		$305,000
Net annual savings		$810,000
Estimated return on investment		30%
Payback		4 years

EXHIBIT 3

PPP ECOLOGICAL AND ECONOMIC PAY-OFFS: EXAMPLE FOR THE AGRO-INDUSTRY

TECHNOLOGIES	RESIDUES USED WITH TECHNOLOGIES
1. ENERGY	
Methane generation	Animal manures, food processing, liquids and solids, crop residues, palm oil sludge, fish wastes, meat slaughtering and processing residues
Pyrolysis	Animal manures, wood processing residue
Burning	Dried animal manures, wood, forestry residues, bagasse, nut husks, rubber wood, rice husk, cotton stalks, coconut leaf
Ethanol	Molasses, sugar cane, cassava
Charcoal	Coconut shell, coconut stem and husk, rice husk
2. HUMAN FOOD	
Mushrooms	Rice straw compost, manure compost
3. ANIMAL FEED	
Direct refeeding, single cell protein production, microbial or chemical processing	Maize stalk, cobs and husk, coconut meal, cassava residues, molasses, treated straw, rubber seed meal, fish silage, edible oil refining residues, separated fruit and vegetable processing solids, ensiled manure, blood, feather meal, animal manures
4. FERTILIZERS	
Nutrients and soil conditioners	Sugar cane filter mud, distillery stillage, manure, rice straw ash, coconut coir
5. CONSTRUCTION MATERIAL AND PAPER	Bagasse, rice straw, coconut stem
6. HANDICRAFTS	Coconut tree parts

7. CHEMICALS

Vinegar, glycerine, furfural, silica, organic acids, activated carbon, glue	Coconut shell, whey, rubber seed, lignocellulosic residues, molasses, cassava pulp, palm oil refining residues

8. WATER

Irrigation, recycle and reuse	Agro-industrial wastewaters

Source: F. Walker, Industry and Environment, Jan/Feb/March 1980.

EXHIBIT 4

CREATIVE PROFIT MAKING WITH PPP

1. Cut down waste by improving efficiency. Build a plant to convert waste into raw materials or products of value to the enterprise or to someone else. Sell what is left over.

2. Analyse the self-cleansing and dispersing level of the environment. Work out the maximum amount of effluent that can be safely discharged. Negotiate emission standards and subsidies with the authorities and the community on the basis of these calculations. Build treatment facilities jointly with another enterprise or the local authorities to treat any remaining pollution.

3. Use your own manpower and know-how. Sell acquired experience to others.

Practical results in the chemical industry:

(a) Westvaco, a firm in the United States, converted chemical wastes to fine chemicals and thus doubled its turnover to $45 million.

(b) Energy conversion and water recycling costs in an ammonia plant in the Soviet Union were cut to 40-45 roubles/ton.

(c) An FMC rayon plant recovered 7.5 million pounds of zinc with an investment pay-back time of two-and-a-half years.

(d) A Finnish chemical plant used activated carbon to recover 95 per cent of solvent vapours, resulting in a return on investment of 51 per cent.

EXHIBIT 5

IMPLEMENTATION OF PPP - A THREE-STEP APPROACH

STEP 1. Analysis of current situation

- Site analysis
- Flow sheets, operating conditions and flexibility
- Pipe runs and drains
- Material balance
- Energy balance
- Water balance
- Legislative trends
- Waste treatment costs (actual and potential)

STEP 2. Search for alternatives

(a) For reduced water consumption including measures to:
- Reduce wastage
- Re-use waste waters
- Treat and recycle water in the plant
- Use separate drains
- Substitute other solvents, etc.

(b) For reduced material use including measures to:
- Increase conversion
- Increase yields
- Recycle materials
- Avoid spillage
- Re-use wastes from other processes
- Reduce wastes, etc.

(c) For reduced energy use including measures to:
- Re-use waste heat
- Couple endothermic and exothermic processes
- Integrate heat and power production
- Reduce temperatures
- Reduce boil-up rates
- Reduce pump and compressor loads
- Reduce heat losses, insulate, etc.

STEP 3. Decision for change

- Examine the impact of the proposed alternatives on the capital and operating costs of the site (process plants and waste treatment plants) taking into account practicability of the suggestions and their interactions.

CASE - LAYLA FARMS

Questions on the case

NOTE: DO NOT READ THE CASE ANNEX UNTIL
YOU DEAL WITH QUESTION 4 (BELOW)

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

2. How adequate are the existing waste disposal arrangements?

3. What are the key environmental management problems? Identify alternative actions that management could take.

4. Outline the advantages and disadvantages of the proposal in the annex to the case (you may read it now). Is it the only solution?

5. Decide and justify how Layla Farms could apply PPP. List the issues that need further investigation.

CASE - LAYLA FARMS

1. FARM HISTORY

The Leon Flour Mills (LFM) in Locarno, Uruguay, produce wheat flour from imported grain. As a by-product, the process yields pollard, a wheat residue, which is a principal ingredient in animal feed.

LFM expanded into feed milling, and kept a herd of experimental animals at a farm in Layla for testing feed formulations. A pilot piggery was also established and a strain suitable for processed meat was developed. Based on satisfactory results obtained from tests made on pig carcasses and on finished products, it was decided:

(a) to set up a combined piggery, meat-processing and canning plant near Locarno;

(b) to purchase a farm close to the processing plant to save on transportation and avoid livestock weight loss in transit.

For this purpose, a 24-hectare tract of rolling land in the hills was purchased about 10 km south of Locarno and named Layla Farms. There are three poultry farms nearby on the service road to the city. A stream passes through the farm on its way to the Locarno River. The area is under grass and a few fruit trees grow here and there. Except for birds, there is no wild game. The setting is typical pasture-land.

In 1973 the project started with 2,000 pigs and increased to 5,000 by 1975. By 1983 the pig population had reached over 20,000. A 12-hectare adjacent lot was acquired increasing the size of Layla Farms to 36 hectares. This expansion required more animal feed (pollard) than was produced by the Leon Flour Mills and the external purchase of pollard became necessary.

2. POSITIVE IMPACTS

The positive impacts of the Layla Farms on the country include:

(a) Employment. The farm employs 300 staff and labourers, 85 per cent of whom come from the surrounding municipalities.

(b) Land use. The hilly site was unsuitable for farming or residential use. Save for shrubs and a few fruit trees, most of the area was covered with grass and thick undergrowth. Clearing the site did not adversely affect the ecosystem.

(c) Area development. Since its establishment in 1972, two housing estates totalling 400 units have been built in the vicinity, following improvement to the service road. The two poultry farms nearby and various commercial establishments have benefited by supplying construction materials and food stuffs.

(d) Enhanced community image. The presence of this well-managed modern establishment adds prestige and revenue to the host municipality.

(e) Food source. The farm's meat production makes an important contribution to the growing protein requirement of Locarno. Monthly output is 2,000 live pigs, 2,000 cases of canned meat and 30 metric tons of processed meat products.

(f) Feed technology development. Research and development activities at Layla Farms on bio-energy conversion have produced a considerable amount of valuable data in this field. They have contributed greatly to improved feed composition and attracted the attention of foreign firms.

3. ADVERSE IMPACTS

The negative impacts of Layla Farms on the country include:

(a) Pollution by piggery wastes. Substantial amounts of solid and liquid organic wastes pose disposal problems, emit foul odours and contaminate the nearby stream. Manure and urine from 20,000 pigs amount to 10,000 kg per day.

(b) Slaughterhouse. About 30 per cent of the farm's hog output goes to the slaughterhouse for canning and meat processing. The rest is sold live to hog dealers. Slaughtering and dressing operations yield large amounts of blood, entrails, hair, etc.

(c) Meat processing. The meat is processed into ham, bacon, sausages and canned meat. The process yields bones and traces of curing chemicals.

(d) Feed mill. The feed mill produces 45 tons per day of hog feed of which 38 tons are consumed, leaving the rest as buffer stock. Pollard is mixed with milled corn and protein adjuncts (blood and bone meal). The rendering of these animal proteins causes odours. The milling process creates great quantities of dust.

(e) Resource requirements. The 50 cubic metres/hour of water needed to maintain the livestock pens, for meat processing and personal use is drawn from deep wells, and contribute to the depletion of local water resources. 20 tons/day of fuel oil is needed for feed milling, meat processing and slaughterhouse operations.

4. PRESENT POLLUTION ABATEMENT

The arrangements for pollution abatement include:

(a) Firstly, the installation of a settling pond system for the piggery effluents. This consists of running the effluent stream through man-made ponds so that it travels a long, serpentine route from the inlet to the point of discharge, in this case, the stream. For all its simplicity, it has some drawbacks. One is the long residence time required for the oxidation process which requires large ponds for a given volume of effluent. Another problem is the system's open nature, which causes mosquitos to multiply and is malodorous. A further disadvantage is that it does not pay for itself, since it produces no direct benefits.

By 1975, the ponds were too small and needed to be expanded at considerable cost, or replaced by a new system (to service a five-fold hog population increase). Had partially treated effluent been allowed to pollute the stream, it would have created a nuisance for the nearby communities. The resulting adverse publicity would have been serious in terms of lost sales and tarnished public image (very critical for a food company). Furthermore, legal sanctions by the National Environmental Agency would have been the outcome.

Liquid effluents from the slaughterhouse/meat packing plant contain soluble organic material and suspended solids, both with a high BOD (biological oxygen demand). They undergo primary treatment (coagulation and filtering) before entering the sewers.

(b) The piggery produces solid wastes in the form of a sludge which is periodically dredged from the settling ponds and spread over a drying surface, then trucked to a sanitary landfill. The sludge is high in fibre materials and no longer presents a health hazard.

A different type of solid waste is produced in the slaughterhouse/meat packing plant, it has a high protein content, a strong odour and high BOD. It is dried and milled as a protein-rich additive to animal feed mix.

(c) Air pollution consists mainly of odours from the settling ponds and from slaughterhouse wastes. The plant also has a boiler house for process steam, using fuel oil which emits a limited amount of sulphur dioxide dispersed through a high stack. No abatement measures are applied to the odour or combustion gases.

The feed milling plant limits organic particulates (dust). This is collected by a bag-filter system and the dust is recycled to the mix.

5. THE COMMUNITY

In the past ten years, there has been no pressure from either national or community groups to change pollution prevention methods.

NOTE: STOP HERE, DO NOT READ THE ANNEX TO THE CASE UNTIL EACH SG DEALS WITH QUESTION 4.

CASE - LAYLA FARMS

ANNEX TO THE CASE

NOT TO BE READ UNTIL EACH SG DEALS

WITH QUESTION NO. 4

ANNEX TO THE CASE*

LAYLA FARMS

BIOGAS INSTALLATIONS FOR POLLUTION CONTROL AND FOR ENERGY, FERTILIZER AND FEED PRODUCTION.

Anaerobic (i.e. without air) fermentation of organic wastes produces biogas (a fuel gas) and a solid residue. Animal manure is mixed with water (usually 1:15 by volume). The slurry is fed into an air-tight concrete digester where bacteria decompose the organic substances, giving rise to biogas (65% methane).

The conversion process takes 25-30 days and the digester is designed for continuous operation. Since the digesters are air-tight, no bad odour escapes to cause nuisance. The spent material settles to the bottom and is continuously drawn off proportionally to the daily charge of fresh slurry. This material is free of the original dung odour, not attractive to flies and can be processed into fertilizer and feed components.

The biogas is piped into a constant-pressure, steel gasholder. From here, it is used directly for cooking and heating like bottled gas. For use in internal combustion engines, the gas undergoes a scrubbing process to eliminate hydrogen sulphide (H_2S) which is corrosive to metals.

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* Source: Adapted from A.A. Juden Jr. (see bibliography).

The solid residue from biogas digesters is a dark sludge and contains fine fibre, with some odour of hydrogen sulfide. Its volume is large, for there is very little contraction by methane fermentation. Disposal can present a problem for large biogas plants. The problem has been satisfactorily solved, by processing the residue to produce a hog feed ingredient. The liquids of the sludge are a very dilute organic solution. Several uses could be considered:

(a) for irrigation and as liquid fertilizer;
(b) as a culture medium for growing chlorella and similar algae;
(c) in hydroponics and aquaculture.

There is one drawback though. The sludge cannot be readily used, because it is toxic, even the hardy "tilapia" fish and the "kangkong" plant die in experimental ponds filled with diluted fresh sludge. Early literature on biogas was generally silent about the toxic effects of the sludge. Sludge must be aerated very well, to eliminate the hydrogen sulfide, so that it is no longer toxic.

By installing a processing unit, dry sludge can be processed into feed ingredients. The biogas fermentation synthesizes vitamin B12 which is an important growth-promoting factor in animals. The remaining liquids can be used to grow high protein algae called chlorella, which can replace soybean meal as a protein supplement. However, at the current costs of soybean meal and other protein sources, commercial production of chlorella is not yet economically feasible; but this may change in the future, as prices of feed rise. In the case described below the processed digester residue replaces pollard in the mixed feed formulation. The price of pollard is used as the value of the processed residue in calculating the return on the biogas investment described in Exhibit 7 (the monetary unit is hypothetical).

EXHIBIT 7

ROUGH INVESTMENT PROPOSAL FOR BIOGAS PRODUCTION
AT LAYLA FARMS

Capital investment		$ (000)
1.	Biogas plant	186
2.	Sludge conditioning	78
3.	Feed processing unit	42
	Total	306

Operating expenses		
1.	Labour	45
2.	Interest	36
3.	Depreciation	30
4.	Repair and maintenance	9
5.	Administrative overhead	15
	Total	135

Return on biogas capital investment of $306,000		
Savings		
1.	Energy savings	278
2.	Income from fertilizer sales	66
3.	Savings from feed grade material	197
	Total	541
Less operating expenses		135
Net savings		406

Pay-back period - less than 1 year

Note: The energy generated by the biogas covers all of the purchased energy needs of the integrated plant-farm operation (fuel oil, electricity, motor fuel, gas), at an annual saving of $278,000.

The processing of the solid digester residue to feed-grade material allows the farm to replace purchased pollard at the rate of 7.5 tons per day. The price of pollard is $720/ton.

1. BLACK GOLD

In a provincial town in Brazil a small tyre manufacturer has an ever-increasing stock of defective tyres building up in his back lot. Burning them is forbidden by law, and the retreaded tyre business is limited. What can the enterprise do to reduce waste and increase profit?

2. STEEL TOWN

A steel mill in a river valley is under attack by the local community which is tired of river pollution and the ugly sight of slag heaps (millions of tons) surrounding the mill. The board of directors has issued a statement to the community informing them of the company's intention to clean up the pollution. What can the mill do to reduce pollution?

3. CHEMICAL COMPANY

Due to a recession in the chemical market, chemical plants in Baden are facing difficulties. Engineers have many ideas for by-products, but are concerned that other chemical companies may produce the same by-products and flood the market. 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 G5: Pollution Prevention Pays

CASE GUIDE

(NOT RETAINED BY PARTICIPANTS)

CONTENTS

ANSWERS TO THE CASE - LAYLA FARMS

1. STORY OF THE CASE

Layla Farms is the largest agro-industry in Uruguay which started with farming and flour milling and expanded into pig breeding, abattoirs, meat processing, canning etc.

Positive environmental impacts include substantial employment of local labour, better land use, indigenous protein source, and development of energy conserving technology.

Negative environmental impacts include large amounts of solid and liquid organic wastes, foul odours, contamination of the nearby stream, air pollution, increased traffic and depletion of the water table.

Farm wastes are processed through a series of ponds to final disposal of liquid waste in the stream. Layla Farms has outgrown the land capacity for existing pollution control technologies. In the past ten years there has been no pressure to reduce pollution from government or coummunity groups.

2. WASTE DISPOSAL

(a) Pig effluents. Over 10,000 kg daily disposed of by a settling pond system which discharges into a stream. Problems:

* excess use of limited land;
* no revenue from waste;
* odour, mosquitoes and health hazard;
* high use of water;
* long time delays;
* stream pollution;
* potential for adverse publicity and government action.

OVERALL JUDGMENT: NOT ADEQUATE.

(b) Slaughterhouse effluents. Soluble organic materials and suspended solids coagulated, filtered and disposed of in sewers. Problems:

* sewer's capacity exceeded;
* no revenue from potential food stuff;
* cost of processing not reimbursed;
* potential for adverse publicity.

OVERALL JUDGMENT: NOT ADEQUATE.

(c) Boiler house smoke includes sulphur dioxide, limited in quantity.

OVERALL JUDGMENT: ADEQUATE.

(d) Flour milling plant. Organic dust collected by bag filters and recycled.

OVERALL JUDGMENT: ADEQUATE.

3. ENVIRONMENTAL MANAGEMENT PROBLEMS AND ALTERNATIVES

Problems

(a) Size of the enterprise increasing and thus more susceptible to adverse environmental publicity and controls over time.

(b) Pollution of the stream.

(c) Amount of land becoming insufficient for pig effluent disposal.

(d) Sewage system limits slaughterhouse waste disposal.

(e) Community health hazard from ponds and polluted stream.

(f) Large quantities (10,000 kgs) of waste not being turned into saleable products.

Alternatives

(a) Do nothing now, relocate to larger land surface later.

(b) Subcontract waste disposal.

(c) Extend existing disposal system.

(d) Sell waste to another enterprise or a subcontractor.

(e) Carry on with the pond/stream system, but limit expansion.

(f) Investigate alternative use of the water for irrigation.

(g) Consider other techniques such as septic tanks, chemical precipitation,
sand filtration, activate sludge, trickle filter, etc.

(h) Consider biogas production.

4. THE BIOGAS ALTERNATIVE

(a) It is not the only solution. The potential investment must be investigated in detail to determine whether the proposed costs and the estimated savings are realistic to the real environment of Layla Farms.

(b) Advantages:

* highly profitable if only 50% realizable;
* uses PPP concept to create new products;
* pay-back very short therefore risk low;
* reduces land required and releases it for other purposes;
* diversifies products line;
* provides independence of outside fuel uncertainties;
* reduces risk of adverse environmental publicity;
* improves efficiency of resource usage.

(c) Disadvantages:

* toxic, danger to safety and health;
* savings may be too optimistic;
* technology may not work in Layla Farms environment;
* maintenance and risk of breakdown of the processing unit;
* technology choice may be wrong;
* service for spares and maintenance;
* technical capacity to run the plant.

5. DECISION AND JUSTIFICATION

(a) Decision: Select the biogas digestor system because it is clearly profitable: investment payback time is less than one year.

(b) Justification:

* short pay-back period;
* increase profitability and environmental benefits;
* better public image;
* reclamation of much of the land now used in the pond system, thus further farm expansion is possible (but the consumption of water may be too great for the system);
* self-sufficiency in energy use, again saving money for Layla Farms, considering rising energy costs.

(c) Issues for further investigation:

* make detailed investigation of the biogas investment proposal and check computation and underlying assumptions; check the total cost of biogas installation including how to bring the biogas from the farm to the slaughterhouse: piping or electricity?
* investigate the real savings;
* consider risks and side effects of implementing a new system without the backing of the old system. Test the new system while old system is still running (new technology also requires maintenance, etc.).

6. LEARNING POINTS

(a) A pollutant may be a resource in the wrong place.

(b) Wastes can be made to pay for their own disposal and possibly even generate extra income.

(c) Improvements in pollution abatement improve community relations and reduce the risk of adverse environmental publicity.

(d) Once developed, an enterprise can sell its "clean technology" expertise in waste re-cycling/re-use to other enterprises for profit.

(e) Pollution prevention may lead to enterprise diversification which could lead to greater profits.

(f) Investigate PPP carefully to verify that expected savings justify the investments.

(g) Beware of false economies. A cheaper solution may not always be the best. Greater investment could result in a solution which pays for itself.

(h) The PPP concept requires both top management and operating management support.

(i) The PPP concept requires three steps: analysis of the current situation; search for alternatives; and a decision on the course of action to be taken. It is not obvious at all if pollution prevention will be profitable. It is obvious that a creative search for alternatives may well find profitable alternatives.

(j) The enterprise needs some pressure to investigate PPP; this pressure may come from government or community groups: it may come from within the enterprise when the crucial sources (i.e. land in this case) are used up.

(k) It may take some years before an enterprise makes the PPP investment which seems obvious (afterwards).

(l) New technologies must be carefully tested not only technically, but also from the point of view of personnel training, spare parts maintenance, climate suitability, side effects, etc.

(m) Do a "provision for disaster" analysis to forecast significant unknown side effects of new PPP projects.

(n) It may be prudent to keep the old system running until the new waste disposal system is reliably operative with an assured maintenance back up.

ANSWERS TO THE MINICASES

1. BLACK GOLD

(a) Continue selling the waste tyres to retreaders.

(b) Investigate new markets such as road asphalt and road filler suppliers, airport construction operations, and coastal protection projects, etc.

(c) By introducing new technology, the company may be able to recycle old tyres as raw material for new tyre manufacturing.

2. STEEL TOWN

(a) Install a water recycling and cooling system to re-use 95 per cent of the water.

(b) Recover iron dust by installing a collector and recycle it into products.

(c) Slag is a good substitute for gravel and sand in concrete mixes; sales to construction material enterprises may reduce the waste heaps.

3. **CHEMICAL COMPANY**

(a) Use the low production period to re-examine possible modifications that will reduce pollution, re-cycle waste into saleable products, get better use of materials and thus cut production costs and improve employee safety.

(Ciba-Geigy did this and with only marginal additional investment was able to cut pollution by 50 per cent and increase profitablility at the same time).

(b) Relate by-products directly to market potential; if the company floods the market with profitable by-products, they may become unprofitable - beware.

QUIZ

Choose the most correct answer

1. The statement "A pollutant is a resource in the wrong place" is:

   (a) usually wrong in developing countries
   (b) a clever catchphrase
   (c) a contradicton of terms
   (d) a new concept in technology

2. The pollution prevention pays (PPP) concept suggests that:

   (a) investment for pollution prevention may be profitable
   (b) waste reduction improves environment and health
   (c) reduced pollution requires minimal investment
   (d) most investment to prevent pollution is profitable

3. "No waste" technology consists of:

   (a) removing pollutants from plant effluents
   (b) using only clean materials
   (c) dumping pollutants away from local communities
   (d) modifying the process to conserve resources

4. PPP with low cost and high efficiency is usually:

   (a) input oriented
   (b) output oriented
   (c) "clean technology"
   (d) "retro-fitting"

5. The key advantage to the PPP concept is for the enterprise to make profits by using ..... and know-how to make improvements in waste disposal and resource utilities:

   (a) special consultants
   (b) own resources
   (c) other peoples money
   (d) international expertise

6. Pollution prevention pays involves all, except:

(a) pollution reduction through product reformulation
(b) modification of processes
(c) subsidized waste disposal
(d) recovery of waste-materials for re-use

7. In environmental management additional profits are gained by:

(a) retro-fitting regularly
(b) using the environmental matrix to identify nuisances
(c) reprocessing residues for sale
(d) introducing new technology

8. The top management of an enterprise can create the environment for PPP by safety policies that evaluate management performance by.....as well as economic criteria.

(a) ethical
(b) technological
(c) environmental
(d) political

9. From the economic viewpoint, polluting industries are generally:

(a) essential basic industries
(b) inefficient
(c) a necessary evil
(d) inevitable with low GNP p.c.

10. The environmental policy of the enterprise will probably:

(a) complicate the decision-making process
(b) introduce an additional element of uncertainty
(c) reduce uncertainty about long term survival
(d) be crucial to every management decision

11. Creativity of the PPP concept usually arises from:

(a) new ways to create saleable products
(b) seeking every alternative to reduce pollution
(c) cutting costs without pain
(d) making waste removable

12. A PPP investment estimated to provide a 50% return per annum is:

(a) definitely profitable
(b) a dire necessity
(c) probably good environmental management
(d) very unusual

13. To prevent pollution at its source:

(a) install waste abatement and control equipment
(b) modify raw materials, processes and products
(c) install pollution monitoring devices
(d) use electric power only

14. For effective PPP an enterprise should mainly rely upon:

(a) financial backing from the government
(b) shared industry know-how
(c) poor enforcement of environmental standards
(d) environmental consultants

15. The best time to implement a new PPP policy at the factory is:

(a) low production and high profit period
(b) recession period
(c) summer leave
(d) now because the time is right

16. A company's environmental management leads to:

(a) cyclical growth
(b) stability
(c) diversification
(d) good labour relations

17. Chemical wastes dumped at the plant are all except :

(a) a cost effective way to dispose of residues
(b) a danger to the environment
(c) potential intermediates
(d) a hazard to office staff

18. Biogas technology is generally more useful to :

(a) manufacturing industries
(b) agricultural sector
(c) transport sector
(d) service sector

19. Non-waste technology is best available from:

(a) manufacturing enterprises
(b) environmental data banks
(c) international organisations
(d) UN bodies

20. PPP is usually best achieved by:

(a) government subsidy
(b) good community relations
(c) critical self examination
(d) all of the above

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

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

notes

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GENERAL ENVIRONMENTAL MANAGEMENT

Appendix

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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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GENERAL ENVIRONMENTAL MANAGEMENT

Basic glossary

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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.