Encyclopaedia of Environmental Pollution

Vol. 5

ENCYCLOPAEDIA OF ENVIRONMENTAL POLLUTION

INDUSTRIAL POLLUTION AND ENVIRONMENTAL ISSUES

VOLUME - 5

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Preface

The evaluation of alternative proposals involves much more than environmental issues. Political technical and economic factors must be considered along with environmental in making evaluations. Value judgements are made so frequently that it is sometimes difficult to identify evaluation as a distinct planning activity.

Before introducing specific techniques, some general observations are in order. Determinations are continually being made revised regarding the planning problem, the alternatives to be considered and so on.

Observe also that more than one set of values is relevant in choosing among alternative public sector proposals. Within democratic nations it is commonly accepted that the values of all individuals who may be affected by bublic decisions should be considered. Apopting this perspective, evaluation also includes the process of identifying different segments of the public and ascertaining their feelings and opinions about alternative plans. Thus, in addition to techniques for organizing information to assist in ranking alternatives evaluation methods include procedures for determining how individuals and groups value alternative public actions.

EDITORS

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Environmental Methodology

To be an effective tool in the planning process the environmental assessment segment of the EIS must be a comprehensive and systematic analysis that encompasses an interdisciplinary approach to the environment and its many related aspects.

A plant (although it could be any living organism) is shown as it is acted upon by the many environmental factors. Each factor is shown to have a direct impact on the plant and also an impact on the other factors which, in turn, results in an indirect impact on the plant. Thus, the environment is a complex interaction of many factors and a change in one aspect of the environment will effect changes of the entire system. Therefore, a comprehensive analysis of the environmental impact of a proposed project is necessary to understand the physical and biological effects and their influences on the social, cultural and aesthetic concerns of man.

The analysis must also be systematic and interdisciplinary because an environmental assessment encompasses a variety of physical, biological and social sciences and is examined and evaluated by numerous special interest groups. It is subjected to a public hearing and expert testimony and must withstand careful scientific scrutinization.

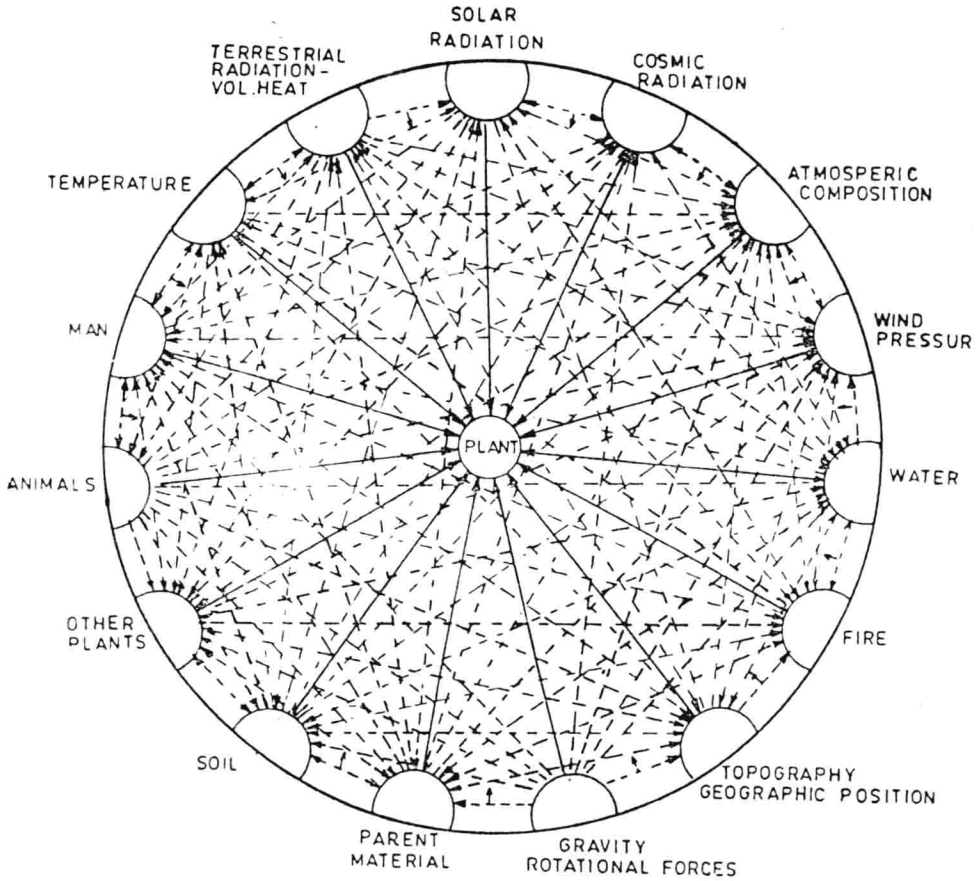

Fig. 1.1: An illustrative view of the direct and indirect interactions of environmental factors on a single plant

Environmental Segmentation

The large amounts of data and information considered in an environmental assessment make it imperative that a system be created for analysis. One approach would be to categorize the environment into its physical and biological components. Table 1.1 lists the principal physical and biological factors of the natural environment. However, what must be stressed in the EIS is the concern with human life quality and any effects on it should be dealt with in detail. These would include cultural and social environments.

TABLE 1.1

Natural Environmental Components

Physical Factors	Biological Factors
Energy	Green Plants
Radiation	Nongreen Plants
Temperature and Heat Flow	Decomposers
Water	Parasites
Atmospheric Gases and Wind	Symbionts
Fire	Animals
Gravity	Man
Topography	
Geologic Substratum	
Soil	

The system presented for environmental analysis divides the human environment into four major categories. The first two are physical and biological, and the latter consider social and cultural factors:

1. Physical/chemical factors describe the physical and chemical effects of air, water and land pollution. Changes in this sector of the environment usually demonstrate their impacts on the other environmental sectors.
2. Ecological factors describe the flora and fauna of the environment and the impacts made on them. Each species and its habitat is considered as to population, growth rate, interactions with its own species, and interactions with other species and life cycles.
3. Aesthetic factors describe the land use impacts of the proposed project and other sensory effects, primarily visual.
4. Social factors describe the human life quality, health and welfare.

The above system of categories permits a more varied

approach to the EIS. Each project will affect each of these environmental segments to a greater or lesser degree. More detail can then be given to the segment that requires it, and the project planner or decision-maker, without too much difficulty, can consider the various aspects and impacts of a project.

The four major components of the environment are broken down into subdivisions in Fig. 1.2. A description of each subdivision and the parameters to consider in the environmental assessment follow. Further, the types of analysis that could be made are included.

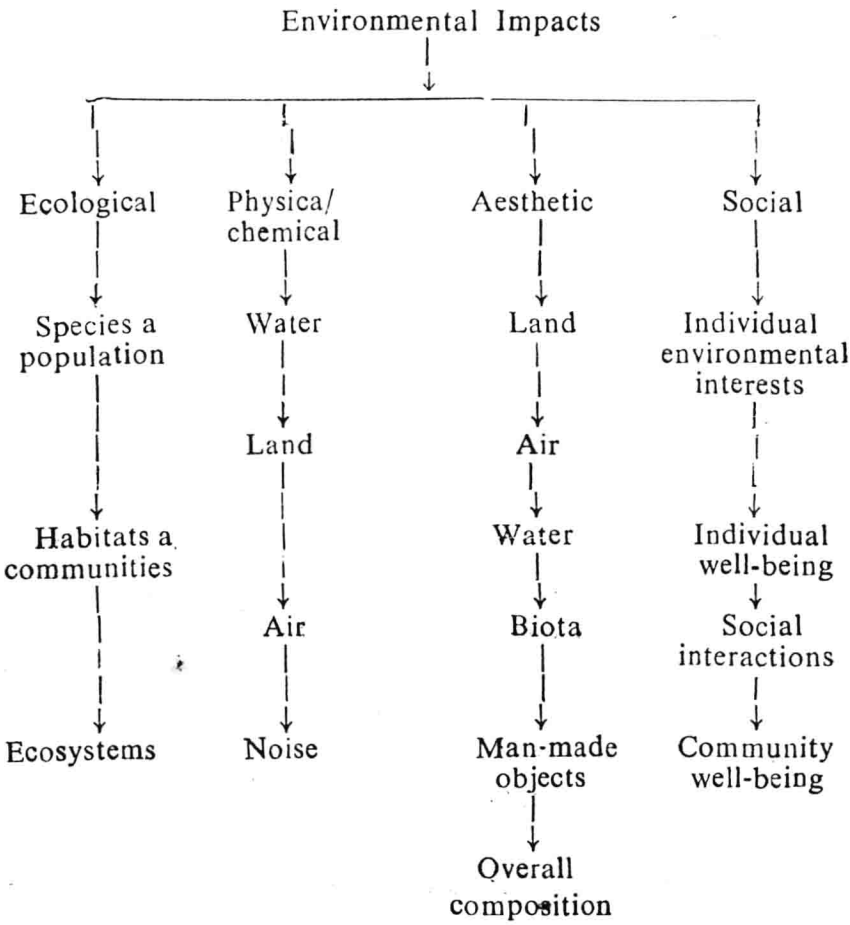

Fig. 1.2: Environmental categories and components for environmental assessment

Physical/Chemical Category

Water

Water is one of the necessities to life as we know it. It is used by all flora and fauna life cycles and as a sink for wastes. These wastes have now begun to inhibit the use of water for its intended purpose. Table 1.2 lists the major types of water pollution and the water uses most affected by them. Thus, water of a region must be assessed as to its quality, quantity and availability. Typical considerations might include:

— What are the nonpoint pollution sources, such as pesticides in agricultural runoff?

— Is a stream-flow reduction affected by diversions set up by the proposed project?

TABLE 1.2

Major Types of Water Pollution and the Water Uses Most Affected by them

Types of Pollution	Water Quality Uses Most Affected			
	Recreation	Aquatic Life	Municipal Water Supply	Industrial Use
Bacteria	X		X	
Turbidity (muddy water)	X	X	X	X
Lack of Dissolved Oxygen		X		
Inorganic materials (iron and manganese)		X	X	
(copper and lead)	X	X	X	
Phenols (smelly, bad taste substances)	X	X	X	
Organic materials (oil, pesticides, exotics)	X	X		
Radioactivity	X	X	X	X
Heat	X	X		X
Nutrients (phosphorus and nitrogen)	X	X	X	X
Dissolved Solids			X	X

— Would BOD, COD and suspended solids be reduced to meet EPA standards with water treatment? How?

— What are the ground water effects due to land application waste disposal?

Land

Land has always been a cherished commodity for man. Its uses range from agricultural production to mineral ore supplier, from housing foundations to industrial sites, from open space beauty to waste disposal sites. Proper land use management is imperative to reaching sound enviromental goals. Typical considerations might include:

— What types of land weathering take place and what are the causes?

— Is the project suitable for local land use ordinances and regional planning criteria?

— What are the solid and liquid waste disposal practices and are they environmentally safe?

Air

The pollutants of our atmosphere are known to have deterimental effects on humans and vegetation; we now know that they contribute to the deterioration of the stratospheric ozone layer resulting in the admission of the cancer-causing ultraviolet rays of the sun. Anything that is emitted to the atmosphere that ordinarily would not be there is a contaminant. Typical considerations might include:

— What is the ambient air quality and how will it be affected by the proposed project?

— As a result of project-induced population shifts, are sulphur dioxide emissions increased due to increased power requirements?

— Will solid waste disposal sites produce objectionable odours?

Noise

Noise is usually considered to be unwanted sounds. It may consist of truck engines or screeching subways or many other undesirable sounds which may have a detrimental effect on man. Typical considerations might be:

— What will be the increase in noise intensity produced by construction blasting?

— Will increased truck and rail traffic to the proposed project increase the noise frequency to surrounding areas?

— Will the natural sounds of the environment (e.g., birds, flowing streams) be drowned out by increased noise levels of the project?

— Are sonic booms going to disrupt everyday life styles in adjacent areas?

Ecological Category

Species and Populations

The local environment's ability to support the life of an organism makes it possible for that organism to live. Species and populations are the basis for the ecological world, and their existence can be greatly influenced by changes in their environments. Care should be taken to describe those species and populations that can be identified. However, many species cannot be identified and how they will be affected by environmental changes is unknown. This should be discussed.

Further, certain species are used a indicators of healthy and unhealthy human environments as well as the status of the general environments. These should be discussed in detail. Typical considerations might be:

— With the removal of natural feeding sites, is the animal life of the area adversely affected?

— Does the effluent of the proposed project suggest impairment to aquatic life?

— Are the flora and fauna of the region significantly affected?

Communities and Habitats

A group of species is a community. A habitat is the environment of a community. The existence of a variety of species and communities living together is the result of numerous and complex interactions. Major habitats include streams, lakes, estuaries, swamps, deserts, marshlands, forests, all components of some river basin. Illustrates the variation in tree species with mountain altitude. Different temperatures and overall climates affect different habitats for the various trees. Typical considerations might be:

— Is the proposed action going to result in the destruction of rare and endangered species habitat (such as filling in a swamp)?

— Are project-induced population shifts eliminating important biological communities of the local ecosystem?

— Are soil communities destroyed due to leachate at waste disposal sites?

Ecosystems

An ecosystem is the entire natural life system of a local environment. River basins, forests and plains are typical natural systems in which ecosystems function. The fundamentals of most ecosystems are known, but data are lacking on the numerous processes and interactions that occur. Thus, in the ecosystem analysis, assumptions are made and the justifications for such assumptions are described.

Figure 1.3 Illustrates an island ecosystem showing ocean to lagoon vegetation belts, soils, and fresh water lens. Locations and general environmental conditions for various types of

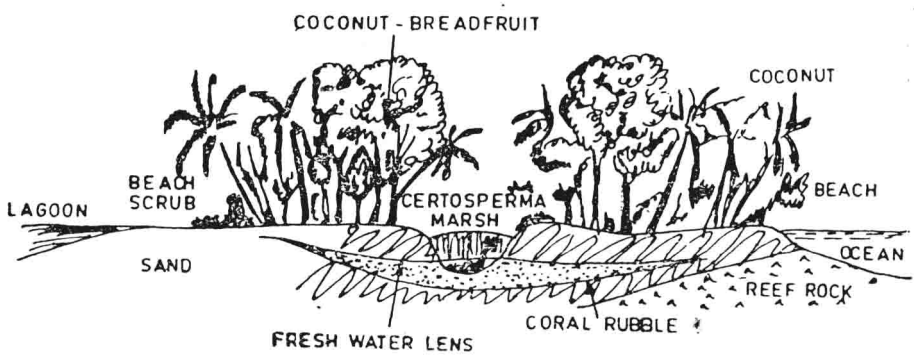

Fig. 1.3: Island ecosystem showing ocean to lagoon vegetation belts, soils, and fresh water lens.

terrestrial ecosystems are listed in Table 1.3. Typical considerations might include:

—Does the addition of nutrients from the project's wastewater result in lake eutrofication?

— Does the urbanization of a region due to the proposed project result in loss of prime agricultural land and other land productivity?

— Does the elimination of vegetation result in a disruption of the energy flow through an ecosystem?

Aesthetics

Land

The scenic beauty produced by a region's land forms is not necessarily dependent on mountain ranges or flowing brooks, but can also include the vast metropolis or rustic rural community which make their own contributions to life quality. Typical considerations might be:

— Does project-induced urbanization result in the alteration of the region's land forms?

— Is the clearing and excavation of trees necessary for project-related power lines going to add unsightly scars to the countryside?

TABLE 1.3

Various Types of Terrestrial Ecosystems, their Locations, and General Environmental Conditions

Climax Ecosystem Type	Principal Locations	Precipitation Range (in./yr)	Temperature Range (F) (Daily Max and Min)	Soils
1	2	3	4	5
Tropical Rain Forest	Central America (Atlantic Coast) Amazon Basin Brazilian Coast West African Coast Congo Basin Malaya East Indies Philippines New Guinea N.E. Australia Pacific Islands	50-500 Equatorial type frequent torrential thunderstorms Tradewind type: steady almost daily rains No dry period	Little annual variation Max 85-95 Min 65-80 No cold period	Mainly reddish latentes
Tropical Savanna	Central America (Pacific Coast) Orinoco Basin	10-75 Warm season thunderstorms	Considerable annual variation, no really cold period Rainy	Some latentes, considerable variety

	Brazil, S. of Amazon Basin N. Central Africa East Africa S. Central Africa Madagascar India S.E. Asia Northern Australia	Almost no rain in cool season Long dry period during low sun	season (high sun) Max 75-90 Min 65-80 Dry season (low sun) Max 70-90 Max 55-65 Dry season (higher sun) Max 85-105 Mix 70-80	
The Atoll	Principally in Tropical Pacific and Indian Oceans	15-150 Convectional but some tropical cyclones Droughts common	Little annual variation or range Max 80-100 Min 65-75 No cold period	Calcareous and, gravel, and rubble Some atolls with phosphate "Jemo" hardpan soils
Broad-Sclerophyll Vegetation	Mediterranean Region California Cape of Good Hope Central Chile S.W. Australia	10-35 Almost all rainfall in cool season Summer very dry	Winter Max 50-75 Min 35-50 Summer Max 65-105 Min 55-80	Terra rossa, noncalcic red soils, considerable variation
Temperate Grasslands	Central N. America Eastern Europe Central & Western Asia Argentina	12-80 Evenly distributed through the year or with a peak in summer	Winter Max 0-65 Min 50-50 Summer	Black prairie soils Chernozems Chestnut and brown soils Almost all have a lime

(Contd.)

TABLE 1.3—*Contd.*

1	2	3	4	5
	New Zealand	Snow in winter	Max 70-120 Min 30-60	layer
Warm Deserts	S.W. North America Peru & N. Chile North Africa Arabia S.W. Asia East Africa S.W. Africa Central Australia	0-10 Great irregularity Long dry season, up to several years in most severe deserts	Great diurnal variation Max 80-135 Min 35-75 Frosts rare	Reddish desert soils, often sandy or rocky Some saline soils
Cold Deserts	Intermountain W. North America Patagonia Transcaspian Asia Central Asia	2-8 Great irregularity Long dry season Most precipitation in winter, some snow	Great diurnal variation Winter Max 20-60 Min 40-25 Frosts common ½-3/4 of yr Summer Max 75-110 Min 40-70	Gray desert soils, often sandy or rocky Some saline soils