

**Main Theme:** Sustainable development, defined as: ensuring that development meets the needs of the present without compromising the ability of future generations to meet their own needs.

In December 1987, the UN General Assembly passed a resolution recognizing the value of this report and the importance of the above main theme. In other words, sustainable development has been internationally accepted as a principle for addressing the interrelationship between environment and development.

### **(3) Environmental Issues as Addressed by Economic Summits**

#### **a. Environmental Summary in Declaration of Economic Summit in Venice (June 1987)**

The declaration calls for each country to recognize its responsibility to preserve atmosphere, water, endangered species, tropical forests, etc., and to control phenomena such as acid rain, etc.

#### **b. Environmental Summary in Declaration of Economic Summit in Toronto (June 1988)**

The declaration endorses the WCED report and the concept of sustainable development; it recognizes the potential impact induced by agricultural development as negative when the resources are used in an excessively intensive manner, but as positive where agricultural development serves to prevent desertification.

#### **c. Environmental Summary in Declaration of Economic Summit in Arche (July 1989)**

The declaration calls for measures within the agricultural sector to prevent water contamination, soil erosion, and desertification, and to preserve tropical forests, integrity of rivers and inland bodies of water, etc.

## **2.3 OECD Recommendations**

The recommendations and guidelines adopted by the OECD provide suggestions to member countries in practical procedures for environmental screening and scoping and are summarized as follows:

### **(1) Recommendation of the Council on Environmental Assessment of Development Assistance Projects and Programs (June 1985)**

The recommendation identifies extremely fragile environments (e.g., wetlands, mangrove swamps, coral reefs, tropical forests, semi-arid areas) which need in-depth environmental assessment in the case of development projects in developing countries assisted by the member countries. The recommendation also advises the environmental committee of *OECD* to prepare guidelines.

**(2) Recommendation of the Council on Measures Required to Facilitate the Environmental Assessment of Development Assistance Project and Programs (October 1985)**

- a. A mechanism for supervising and providing guidance on the environmental assessment process should be firmly established in the central office of the aid agencies in the member countries.
- b. An initial screening process should be undertaken to determine whether or not a full environmental assessment is required.
- c. An environmental assessment on a project or program should begin at the pre-feasibility or project proposal stage and be fully integrated into cost-benefit and engineering feasibility studies.
- d. Host-government officials, to the extent possible, should be included in the scoping procedure and be encouraged to engage in assessment and monitoring activities.
- e. Aid and environmental agencies in *OECD* member countries are advised to institute training courses in environmental assessment, to establish capability to dispatch environmental advisers to host countries if requested, and to provide financial and technical assistance to host countries.

**(3) Recommendation of Council Concerning an Environmental Checklist for Possible Use by High-Level Decision-Makers in Bilateral and Multilateral Development Assistance**

The recommendation invites the Development Assistance Committee in cooperation with the Environmental Committee to present a report in three years' time on the effectiveness of *OECD* member countries in integrating improved environmental analysis and application of the checklist and other related methodologies.

The checklist is as explained in attached Annex 1 and 2. Pertinent questions on environmental impact are presented in Annex 1, with regard to impact identification, mitigation measures, guidelines, monitoring, etc. In Annex 2, examples of environmentally sensitive areas and the types of projects for which a clear statement of environmental impact should be provided are suggested.

**(4) OECD Environmental Ministerial Meeting**

Recommended practices for environmental impact assessment of development project (extractions are appended as Annex 3) and guidelines for aid agencies on involuntary displacement and resettlement in development projects (extractions are appended as Annex 4) were discussed at this meeting.

## **Annex 1**

### **ENVIRONMENTAL CHECKLIST FOR POSSIBLE USE BY HIGH-LEVEL DECISION-MAKERS**

#### **I. Impact Identification**

1. Does the project have an impact on any environmentally sensitive areas?
2. Is there a clear statement of the significant beneficial and adverse environmental effects of the project? Have the risks been evaluated?
3. Has attention been paid to offsite effects (so-called upstream and downstream effects), including transboundary effects, and to the possible time-lag before effects are exhibited?

#### **II. Mitigation Measures**

4. What mitigation measures are proposed and what alternative sites have been considered?
5. What lessons from previous similar projects have been incorporated into the environmental assessment of this project?
6. Have concerned populations and groups been involved, and have their interests been adequately taken into consideration in project preparations? Is resettlement involved? Are appropriate compensatory measures envisaged?

#### **III. Procedures**

7. How have environmental guidelines used by the agency and the recipient government been taken into consideration?
8. In which phases of the decision-making process has the environmental assessment been included?
9. How have the beneficial and adverse environmental effects of the project been integrated into the economic analysis of the project?

10. Have developing country authorities responsible for environmental protection been consulted in the preparation of the project? Are the central authorities in the developing country responsible for project approval aware of the environmental impact of the project and have they approved the environmental measures to be included?

#### **IV. Implementation**

11. Do developing country institutions need strengthening to make the environmental measures effective, and, if so, what action is foreseen?
12. How and by whom will the environmental impact and mitigation measures be monitored during and after implementation?
13. Have needed environmental measures been costed, and are there adequate and realistic assurances for their funding?

## **Annex 2**

### **EXPLANATORY INFORMATION RELATED TO CERTAIN QUESTIONS ON THE CHECKLIST**

#### **QUESTION 1 Examples of environmentally sensitive areas include:**

- a) Soils and soil conservation areas;
- b) Areas subject to desertification; arid and semi-arid zones;
- c) Tropical forests and vegetation cover;
- d) Water sources;
- e) Habitats of value to protection and conservation and/or sustainable use of fish and wildlife resources, particularly wetlands, mangrove swamps and coral reefs;
- f) Areas of unique interest (historical, archaeological, cultural, aesthetic, scientific);
- g) Areas of concentrations of population or industrial activities where further industrial development or urban expansion could create significant environmental problems (especially regarding air and water quality);
- h) Areas of particular social interest to specific vulnerable population groups (e.g., nomadic people or other people with traditional lifestyles).

#### **QUESTION 2 The types of projects for which a clear statement of environmental effects should be provided include those which involve:**

- a) Substantial changes in renewable resource use (e.g., conversion of land to agricultural production, to forestry or to pasture land, rural development, timber production);
- b) Substantial changes in farming and fishing practices (e.g., introduction of new crops, large scale mechanization); use of chemicals in agriculture (e.g., pesticides, fertilizers);
- c) Exploitation of hydraulic resources (e.g., dams, irrigation and drainage projects, water and basin management, water supply);
- d) Infrastructure (e.g., roads, bridges, airports, harbours, transmission lines, pipelines, railways);
- e) Industrial activities (e.g., metallurgical plants, wood processing plants, chemical plants, power plants, cement plants, refinery and petrochemical plants, agro-industries);
- f) Extractive industries (e.g., mining, quarrying, extraction of peat, oil and gas);

- g) Waste management and disposal (e.g., sewerage systems and treatment plants, waste landfills, treatment plants for household waste and for hazardous waste).

The specific types of beneficial and adverse environmental effects can vary from project to project. For example, an irrigation project [paragraph c) above] can have the beneficial effect of creating a new potential for fresh- water fisheries. At the same time it can have the adverse environmental effects of increasing salinization, soil erosion, etc.

**QUESTION 3** An example of an offsite effect would be the negative effects on aquatic life downstream from an industrial site when effluents are not treated before their discharge into a river or other body of water.

An example of the importance of including considerations of time lag in the decision are the secondary impacts of roads which penetrate undisturbed natural areas, as they are often followed by large-scale (shifting) cultivation and environmental degradation.

**QUESTION 4** Mitigation measures are actions taken to diminish or alleviate negative environmental effects. Examples include:

- a) Treating industrial effluents before they are discharged into bodies of water;
- b) Providing noise barriers for highway and industrial projects;
- c) Establishing wildlife reserves and other protected areas to compensate for land taken for development purposes.

**QUESTION 6** Affected populations should participate in defining and understanding the problems in planning and implementing the solutions associated with development projects. This requires a heavy emphasis on equity considerations in development and the need to decentralize decision-making processes. This should be accompanied by efforts which help foster sustainable development and full participation on the part of rural populations.

**QUESTION 8** An environmental assessment of a project or program should begin at the pre-feasibility or project proposal stage and be integrated with cost-benefit and engineering feasibility studies.

**QUESTION 10** One way for ensuring the dissemination of environmental information related to the project is through an inter-ministerial/agency consultative process in the developing country prior to making a final decision on the project.

**QUESTION 11** Examples of measures which can be taken to strengthen developing country governmental institutions include the provision of training courses in environmental assessment and management; the provision of environmental advisors to help government officials assess the environmental impacts that might be expected to arise from projects, programs, or policies and to inform decision-makers and the public of reasonable alternatives which would mitigate negative environmental impacts and enhance the quality of the human environment in the affected area. Private and non-governmental organizations might be supported to strengthen environmental awareness among local populations.



## **Annex 3**

### **GOOD PRACTICES FOR ENVIRONMENTAL IMPACT ASSESSMENT OF DEVELOPMENT PROJECTS**

DAC members have established the following "Good Practices for Environmental Impact Assessment (EIA) of Development Projects". The following main elements have been identified:

- 1) Environmental aspects must be fully integrated in project selection, design and implementation, and the administrative responsibilities for the environmental aspects of assisted projects should be clearly determined.
- 2) The EIA must be conducted, together with screening and scoping, at least for the projects identified by the 1985 OECD Council Recommendation.
- 3) The EIA should address all the expected effects on human health, the natural environment, and property as well as social effects, particularly gender-specific and special group needs, resettlement, and impacts on indigenous people resulting from environmental changes.
- 4) The EIA should consider alternative project designs (including the "non-action" alternative) as well as required mitigation and monitoring measures.
- 5) In conducting EIA of projects, donors should use the standards that will achieve the minimum level of "acceptable", non-mitigable negative effects and maximize the positive effects.
- 6) Active arrangement including access to information should be made wherever possible to obtain the views of the affected indigenous population on projects which could have significant environmental effects.
- 7) The EIA should enable a clear statement of significant beneficial and adverse environmental and related social effects and risks of the project to be made.
- 8) Off-site effects, including transboundary, delayed, and cumulative effects, should be assessed.

- 9) **The governments of developing countries bear the ultimate responsibility for the state of the environment in their respective countries and for the design of the development projects.**

## **Annex 4**

### **GUIDELINES FOR AID AGENCIES ON INVOLUNTARY DISPLACEMENT AND RESETTLEMENT IN DEVELOPMENT PROJECTS**

Resettlement planning should take into account the following basic policy considerations:

- a) Involuntary population displacement should be avoided or minimized whenever feasible by exploring all viable alternative project designs. In every case, the alternative of refraining from carrying out the project (the "non-action" alternative) should seriously be considered, and people's needs and environmental protection must be given due weight in the decision-making process. Where displacement is unavoidable, resettlement plans should be formulated with due care given to peoples' needs and to environmental protection. Donor countries should not support projects that cause population displacement unless they contain acceptable resettlement plans protecting the rights of affected groups
- b) All involuntary resettlement should be conceived and executed as development programs, providing sufficient investment resources and opportunities for resettlers to share in project benefits. Displaced persons should be i) enabled to reconstruct a land-based or employment-based productive existence; ii) compensated for their losses at replacement cost; iii) assisted with the move and during the transition period at the relocation site; and iv) assisted in their efforts to improve their former living standards, income-earning capacity, and production levels, or at least to restore them.
- c) Participation by environmental agencies and community participation in planning and implementing resettlement is essential and should include women. Appropriate existing social and cultural institutions of resettlers and their hosts should be used.
- d) Host communities that accept resettlers should be involved in the planning process and assisted to overcome possible adverse socio-environmental consequences from the resettlement.
- e) Indigenous groups, ethnic minorities, and pastoralists who may have informal customary rights to the land or other resources taken for the project must be provided with adequate land, infrastructure, and other compensation. The absence of legal title to land by such groups should not be a bar to compensation.

- f) Since women are to a great extent responsible for making the natural resource base productive (with their knowledge, skills, and labour) and thereby contribute significantly to the well-being of their families, communities, and national economies, planning for relocation should consider their preferences and should address their specific needs and constraints.
- g) The implementation of the resettlement plan is to be effectively supervised.



## **Appendix C Glossary**



# GLOSSARY

(Terminology used in Environmental Guidelines))

In order to avoid any misunderstanding, the terms most frequently used in these guidelines are defined below.

## A

Acid Rain  
Ad Hoc Method  
Air Pollution  
Arid and Semi-Arid Lands  
Asian Development Bank (ADB)

## B

Bed Load  
Benthos  
Biochemical Oxygen Demand (BOD)  
Biological Diversity

## C

Castes  
Catchment Area  
Checklists  
Coastal Zone  
Compensation Water  
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)  
Convention on Wetlands of International Importance Especially as Waterfowl Habitats (Ramsar Convention)  
Coral Reef  
Cultural Property

## D

Debris Flow  
Desertification  
Diatoms/Bacillariales  
Dieldrin  
Dioxin  
Dissolved Oxygen (DO)  
Droughty Discharge

## E

Ecology  
Ecosystem  
Elephantiasis  
Entrophication  
Environmental Components  
Environmental Impact  
Environmental Impact Assessment (EIA)  
Erosion  
Ethnic Minorities

## F

Filaria  
Freeboard

## G

Genetic Resources  
Greenhouse Effect

## H

High Water Discharge

## I

Indigenous Peoples  
International Convention for the Protection of Birds

## L

Lagoon  
Land Reform  
Low Water Discharge

## M

Malaria  
Mangrove Forests  
Matrices  
Methods of Environmental Impact Assessment  
Microbe

## N

Natural Hazards  
Networks  
Nitrogen Oxides

## O

Opportunity Cost  
Ordinary Water Discharge  
Organization for Economic Cooperation and Development (OECD)  
Organo-chloric Compounds  
Overlays  
Ozone Layer

## P

Peat  
Pedestal Erosion  
Pinnacle Erosion  
Piping

## R

Rangeland  
River-Blindness

## S

Sahel  
Salinization  
Salt Wedge  
Schistosome  
Sediment Yield  
Sifting Cultivation  
Sleeping Sickness  
Slumping  
Soil Degradation  
Species  
Spillways  
Suspended Sediment  
Suspended Solids (SS)

## T

Tribes  
Tropical Forests  
Tsetse Fly  
Turbidity

## V

Vector  
Vetiver Grass

## W

Water Erosion  
Waterlogging  
Water Table  
Wetlands  
Wildlands  
Wind Erosion



## A

### **Acid Rain**

Rain that has a high acidic level, because sulfur oxides, nitrogen oxides and other air pollutants are dissolved in it. Acid rain may be as low as 2.8 pH.

The effects of acid rain are primarily felt by wildlife. Acid rain kills fishes, crops, and trees; buildings are damaged also.

Acid rain rarely falls near the source of the pollution, because the smoke from chimneys can be carried and finally fall as rain.

The absence of international agreement has hampered control of the presence of oxides, especially from industrial and vehicle emissions.

### **Ad Hoc Method**

The ad hoc method provides provide minimal guidance for EIAs.

This methodology gives broad qualitative information that is of value in comparing alternative development sites or schemes. This information is stated in simple terms readily understandable by a lay decision-maker or member of the public, and avoids outlining the actual impacts on the specific limit that will be affected. It is not exactly "Delphic" in nature, nor based on expert opinion. It is only a reasonable statement of the data items for two or more alternatives, and can thus be prepared rapidly. For example, it may indicate the number of people likely to be affected adversely or favorably, the extent of the area likely to be developed or affected, etc.

A major advantage of the ad hoc method is that it can be easily used and prepared since it generally consists of statements of data requirements, without outlining the specific impacts on environmental limits that may be caused by a project.

This method should give a basic idea in determining the alternatives for the proposed project or for site selection.

However, this method has several drawbacks, such as:

- no assurance of a comprehensive set of all relevant impacts;
- the possibility of selection of different criteria from different groups, causing a lack of consistency in the analysis;
- its inefficiency because of the effort involved in identifying and assembling an appropriate panel for each impact assessment.

## **Air Pollution**

Polluting of the air by unwanted gases, smoke particles, and other substances which darken the atmosphere and reduce visibility. The six chief classes of air pollutants are carbon monoxide, particulate matter, sulfur oxides, gaseous hydrocarbons, nitrogen oxides, and ozone.

Artificial pollutants are from industrial, automotive, municipal and household activities. Air pollution affects the health, particularly of those with respiratory difficulties like asthma, chronic bronchitis, and emphysema.

Until the Industrial Revolution, air was relatively pure. In the 18th and 19th centuries the coal that powered industry and provided domestic heat progressively blackened buildings and damaged vegetation and health.

Many nations now have clean-air laws to prevent or diminish air pollution.

## **Arid and Semi-Arid Lands**

Arid and semi-arid lands are drylands receiving a long-term annual average precipitation of 200-1000 mm. Arid and semi-arid lands constitute a natural low-productivity environment, where the major factor limiting biological production is normally water. If limiting factors are overcome - economically and technically - these areas can become moderately productive. However, under intensive production systems they require careful management as they are highly prone to soil salinization, alkalization, waterlogging, and wind and water erosion. Insect pests also threaten agricultural production (e.g., locusts, grasshoppers, aphids, etc.), especially where the project reduces the natural pest control value of the dry season.

## **Asian Development Bank (ADB)**

The ADB is the regional organization established under the auspices of ESCAP (the United Nations Economic and Social Commission for Asia and Pacific) in August 1966. It consists of 44 countries.

ADB is the executive agency for the UN Development Program authorized to supervise national and regional projects. ADB aims to foster economic growth within the region by administering direct loans or technical assistance to all member groups.

The headquarters are in Manila.

## **B**

### **Bed Load**

Bed load is defined as the weight or volume of silt, sand, gravel and other material that rolls or slides or bounces along a stream bed in a unit of time.

### **Benthos**

The animals and plants living in, on, or immediately above the sea bottom and directly dependent on it. Starfish, shells, eels, and flounders belong to it, and so do most members of the codfish family.

There is another restricted definition, which that is only for the plants and animals that grow on, rest upon, or burrow in the bottom. Under this definition the members of the codfish family fall into the category of benthonic nekton (free-swimming forms.)

### **Biochemical Oxygen Demand(BOD)**

The amount of pollution in water.

It indicates the amount of oxygen that will be needed to oxidize the polluting substances.

The more organic matter there is, the greater is the number of microbes. The more microbes there are, the greater the need of oxygen to support them.

Therefore the BOD is a reliable gauge of the organic polluting of water.

### **Biological Diversity**

Biological diversity is defined as the variety of the world's biological resources - its living organisms. It is a function not simply of the number of ecosystems and distinct plant and animal species in existence at any given time, but also of genetic differences within individual species. This great diversity of the world's plant and animal species has intrinsic value, simply for existing. Further, biological diversity is more than a concept; it is a precious natural resource - a resource essential to human existence and commerce.

Biological diversity is also the characteristic of wild species and natural ecosystems that allows them to withstand external stress. Genetic variability within a species is the basis for its developing resistance to a disease or a change in climate which would otherwise cause its extinction. Species diversity affords stability to ecosystems: while a particular pollutant may destroy or drive away some of the species at one level in a food chain, others which are more resistant may remain to reproduce in greater numbers and sustain the organisms which depend on them.

## C

### **Castes**

Castes are social and occupational categories based on beliefs in religious purity. People often occupy prescribed positions in society by virtue of the caste group to which they are born. Society is stratified into a complex system of exchanges of ritual, social, and economic services among castes. Lower castes are often technically landless, but many in fact survive by cultivation and livestock rearing on public lands and forests.

### **Catchment Area**

A catchment area is defined as the area of land that collects the water flowing to a given length of stream or providing water for a reservoir or lake.

### **Checklists**

Checklists present a specific list of environmental limit to be investigated for possible impacts. They do not require establishing cause-effect links to project activities. They may or may not include guidelines about how limit data are to be measured and interpreted.

Checklists, four broad categories of which may be defined as follows, represent one of the basic methodologies used in environmental impact assessments:

- Simple checklist. This is a list of limit. No guidelines are provided on how environmental limits are to be measured and interpreted.
- Descriptive checklist. This includes an identification of environmental limit and guidelines on how limit data are to be measured.
- Scaling checklist. This is similar to the descriptive checklist, but with the addition of information basic to subjective scaling or limit values.
- Scaling weighting checklist. This represents the scaling checklist with extra information concerning the subjective evaluation of each limit with respect to every other limit.

### **Coastal Zone**

There is no precise definition of a "coastal zone". All definitions of this term seek to include coastal waters, marine and estuarine areas (and nearshore waters of large lakes and inland seas), and some portion of the land along the coast in which human activities and natural processes both affect and are affected by those in the waters. The extent of land area included varies, because its limits are determined not only by ecological and geological characteristics but also by some concept of what is politically and

administratively manageable. Thus while one might include the entire land area of watersheds which drain to the sea, and the entire water area out to the continental shelf, in practice the coastal zone is a relatively narrow band of water and land along a shoreline. Its natural features include beaches, wetlands, estuaries, lagoons, coral reefs, and dunes.

### **Compensation Water**

Compensation water is defined as the water which must be allowed to pass a dam so as to satisfy those people who used the water before the dam was built. In modern large schemes the amount and type of compensation water have to be agreed on and may take the form of continuous flow, of intermittent freshets, or of some combination of them.

### **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)**

This convention aims to protect certain endangered species from over-exploitation via a system of import / export permits.

For provisions three points are given as follows:

- a) Includes animals and plants whether dead or alive, and any recognizable parts or derivatives thereof
- b) Four appendices- Appendix 1, list of endangered species, trade in which is to be tightly controlled; Appendix 2 list of, species that may become endangered unless trade is regulated; Appendix 3 list of, species that any party wishes to regulate and requires international cooperation to control trade; Appendix 4, model permits;
- c) Species in Appendix 1 and 2 must have a permit stating that export / import will not be detrimental to the survival of that species.

This convention was adopted on 3 March 1973 in Washington, D.C., U.S.A.

### **Convention on Wetlands of International Importance Especially as Waterfowl Habitats (Ramsar Convention )**

This convention aims to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.

For provisions four points are given as follows:

- a) Parties to designate at least one national wetland for inclusion in a List of Wetlands of International Importance;
- b) Parties to consider their international responsibilities for conservation, management, and wise use of migratory stocks of wildfowl;

- c) Parties to establish wetland nature reserve, cooperate in exchange of information, and train personnel for wetland management;
- d) Conferences on the Conservation of Wetlands and Waterfowl to be convened as the need arises. This convention was adopted on 2 February 1971 in Ramsar, Iran.

### **Coral Reef**

A reef lying just above or near the surface of the sea, built mainly of skeletons of coral or other calcium carbonate-secreting animals.

The main types are fringing and barrier. Coral grows in warm, shallow marine water to depths of about 60m. The most striking coral feature is the atoll, a ring or horseshoe-shaped group of coral islands.

### **Cultural Property**

Cultural property is defined as sites, structures, and remains of archaeological, historical, religious, cultural, or aesthetic value. Cultural property refers to archaeological sites, building complexes, architecture, monumental sculpture, painting, inscriptions, and heritage. In numerous cases, cultural property sites coincide with important natural sites. Cultural resources are a part of the resource base, and it is therefore important that development options under consideration are screened for potential impacts on cultural property.

## D

### **Debris Flow**

This is the conglomerate matter consisting of rock, lumber, rubble, bricks, stones, etc., created by demolition, or renovation of existing structures. Debris of both types constitute a significant portion of urban wastes, especially in areas undergoing urban renewal.

### **Desertification**

The processes by which arid or semi-arid areas become deserts where precipitation is minimal and sporadic, limiting vegetation growth. Removal of the topsoil by artificial means or erosion by wind, water, or desiccation results in a reduction in the ground's water-storage capacity.

Over-intensive farming and the cutting of trees for firewood has helped to create the arid land in Africa and SW Asia to advance by several kilometers each year.

### **Diatoms/Bacillariales**

Microscopic yellow-green algae of the class Bacillariophyceae, occurring abundantly as single cells or colonies in fresh water, salt water, soil, damp rocks, and tree bark.

They have silicon-rich cell walls (called frustule), often beautifully symmetrical shapes, composed of two halves.

### **Dieldrin**

Aldrin is a chlorinated organic pesticide, chemical formula  $C_{12}H_8Cl_6$ , and its principal decay product is Dieldrin ( $C_{12}H_8Cl_6O$ ), a compound with very toxic and carcinogenic properties that is used as a pesticide.

Aldrin is among the most toxic of the organic compounds, with symptoms of liver and kidney metabolic failure showing up from skin contact with as little as 3 grams. It bioaccumulates easily in aquatic life. It once used as a sheepdip, soil fumigant, seed treatment and general insecticide.

### **Dioxin**

An extremely poisonous hydrocarbon, 2,3,7,8-tetra-chlorodibenzo-p-dioxin(TCDD), that belongs to a class of similar compounds. It is formed as a by-product of the manufacture of the herbicide 2,4,5-T(trichlorophenoxyacetic acid).

Large amounts were released in an industrial accident at Seveso in 1976. It was used in Vietnam by the U. S military and in the United States to kill animals and plants.

Dioxin can produce chronic skin diseases, muscular dysfunction, various bodily inflammations, impotency, birth defects, genetic mutations, and disorders of the nervous system. It was also linked to various cancers.

### **Dissolved Oxygen (DO)**

The oxygen carried in solution in a body of water. Dissolved oxygen is necessary for the survival of all aquatic life except Anaerobic bacteria.

Oxygen enters into solution from air at the water surface. By mixing of the water surface, the water surface increases. Such reoxygenation is necessary because dissolved oxygen is constantly being used up by living things and chemical reactions involving substances suspended or dissolved in the water.

### **Droughty Discharge**

The discharge in river flow when it is not less than discharge during three hundred fifty-five ( 355 ) days in a year.

## **E**

### **Ecology**

The scientific study of organisms in their natural environment. A community of organisms and their habitat is called an ecosystem.

Ecologists can calculate the productivity of various ecosystems in terms of energy, with important applications in agriculture. In addition, the effects of man's intervention on natural ecosystems can be predicted, enabling the effective conservation of wild life and management of game and fish.

### **Ecosystem**

The interacting system made up of a community of living things (animals, plants, bacteria, etc.), and its interrelated physical and chemical environment. An ecosystem receives inputs of solar energy, nutrients, water, and gases and discharges heat, oxygen, carbon dioxide, and organic compounds.

The organisms comprise producers, consumers, and decomposers. Together they form an interdependent food chain or food web.



## **Elephantiasis**

A chronic disease of the skin caused by parasitic invasion of lymph channels in tropical and subtropical regions.

Certain parts of the body enlarge, especially the legs and genitals, and the skin becomes hardened, ulcerated and fissuring. It is caused by nematode worms, called filariae, transmitted to man by mosquitoes, usually *Gulex fotigans*.

The most effective therapeutic drugs are diethylcarbazine and sodium caparsolate, which kill the adult worms and microfilariae. Elephantiasis occurs only in the tropics.

## **Entrophication**

Entrophication is defined as the process by which a body of water, such as a natural lake or pond, ages to the point where it is about to die. The DO level has declined, the BOD has soared, sapropel has strained its way toward the surface, algal growth is acute, weeds choke the edges, etc.

## **Environmental Components**

From each relevant project activity in an agricultural and rural development project, there may be several potential environmental components and elements on which there could be impacts due to a project action.

The following is a list of potential environmental elements that may have to be considered, depending upon the type and scale of the proposed project being analyzed.

The list is not an exhaustive one, and it should be used as a guideline only.

- (1) Physical-chemical (land, surface water, ground water, atmosphere)
- (2) Biological (flora, fauna)
- (3) Human (health and safety, aesthetic and cultural, socio-economic)
- (4) Others

## **Environmental Impact**

A change in effect on an environmental resource or value resulting from human activities including agricultural and rural development projects, often called an "effect."

Environment is the total of all those physical, chemical, biological, and social economic factors that impinge on an individual, a community or a population.

## **Environmental Impact Assessment (EIA)**

A comprehensive evaluation of the effects of human development activities of agricultural and rural development projects or non- action on the various components of the environment.

The main activities of Environmental Impact Assessment (EIA) include:(1) impact identification, (2) impact prediction and measurement, (3) impact interpretation and/or evaluation, (4) identification of monitoring requirements and mitigating measures. Other terms that are similar and frequently used are "Environmental Assessment (EA)" and "Environmental Appraisal (EA)".

### **Erosion**

Erosion is essentially a smoothing or leveling process, with soil and rock particles being carried, rolled, or washed down by the force of gravity. The main agents which loosen and break down the particles are wind and water.

### **Ethnic Minorities**

Ethnic minorities are a segment of society set apart by dialect, race, religion, or historical origin, characteristics which often are taken as the basis for discrimination against them by other groups. Ethnic minority groups may identify with specific territories, but generally lack an organizational structure based on ethnicity alone.

## **F**

### **Filaria**

Any of a group of parasitic worms of the class Nematode (phylum Aschelminthes). Two hosts, an arthropod (the intermediate host ) and another animal (the primary host ) , are usually required to complete the life cycle.

The female worm produces a large number of microscopic, active embryos called microfilariae, into the bloodstream of the primary host. When an insect bites the infected animal, these microfilariae enter the body of the insect. These grow into larvae in the insect's muscles, then are passed to the primary host when the infected insects bite an animal. Thus the cycle repeats.

### **Freeboard**

Freeboard is the vertical distance between the crest of the embankment (without camber) and the reservoir water surface. The more specific term "normal freeboard" is defined as the difference in elevation between the crest of the dam and the normal reservoir water level as fixed by design requirements.

The term "minimum freeboard" is defined as the difference in elevation between the crest of the dam and the maximum reservoir water surface that would result should the works and spillway function as planned.

## **G**

### **Genetic Resources**

Every plant and animal cell possesses vast numbers of genes made of the chemical deoxyribonucleic acid (DNA), grouped together on chromosomes. The aims of using genetic resources include increasing in yield, and also improving such genetically determined characteristics as nutritional value, resistance to disease, and tolerance of unfavorable climates.

New genetic techniques of DNA recombination and cloning make it possible to introduce new characteristics directly into the genetic material of plants and animals.

### **Greenhouse Effect**

An atmospheric effect of increase in earth's temperature. The phenomenon is due to accumulation of carbon dioxide crystals and water vapor in warm air trapped by a mass of cold air. This results in retention of infrared rays from the sun, and increased temperatures of the earth's surface and the world's oceans. The phenomenon takes its name from a greenhouse, in which a similar effect occurs.

In recent years, the amount of carbon dioxide in the atmosphere has greatly increased, because of industrial pollution and the burning forests and increased quantities of fossil fuels.

Greenhouse effects are becoming global problem.

## **H**

### **High Water Discharge**

The discharge in river flow when it is not less than discharge during ninety-five (95) days in a year.

# I

## **Indigenous Peoples**

Indigenous peoples generally refer to native peoples distinguished by their close cultural attachment and economic dependence upon ancestral lands or upon lands to which they have been pushed by dominant groups.

Indigenous peoples threatened by the encroachment of dominant groups have increasingly sought the protection of their lands and their rights to self-determination under domestic and international law.

Indigenous groups may be organized into tribes, loosely knit bands, or villages. While tribes have a strong leadership hierarchy, band or village headmen lead by force of personality and have little mandate to make decisions for the group.

## **International Convention for the Protection of Birds**

The objects of this convention are to protect birds in the wild state, considering that in the interests of science, the protection of nature and the economy of each nation, all birds should as a matter of principle be protected.

For provisions eight points are given as follows:

- a) Parties to protect all birds during the breeding season and migration;
- b) Parties to prohibit the taking of eggs, shells and young birds;
- c) Parties to prohibit or restrict certain methods of hunting;
- d) A pest species may be excepted from protection;
- e) Exceptions may also be made in the interests of science and education;
- f) Each party to draw up lists of birds which may be lawfully taken or killed in compliance with this convention;
- g) Parties to take measures to prevent destruction of birds and to educate children and the public in the need for protection of birds;
- h) Parties to establish reserves for breeding birds.

This convention was adopted on 18 October 1950 in Paris, France.

## L

### **Lagoon**

Lagoons are the shallow parts of marginal marine water. They are isolated from the open sea by sand barriers, coral reefs or partially drowned preexisting topography.

They are two classes of phenomena: one is coastal lagoons, the other is coral-reef lagoons. Coastal lagoons are protected from the oceans by sand island barriers but usually connected with the oceans by one or more tidal inlets. In tropical regions coral reef growth may form effective seaward barriers to linear, curved or circular lagoons.

### **Land Reform**

A purposive change in agricultural land. The most common political objective of land reform is to abolish feuding or (if the land owners are foreign) colonial control; in either case, exploitation of peasants is the target. Economic objectives of land reform may include encouraging more intensive cultivation and coordinating agricultural production with the rest of the economy, particular with an eye to supporting an industrialization program.

The earliest record of land reform is from 6th-century-BC Athens.

### **Low Water Discharge**

The discharge in river flow when it is not less than discharge during two hundred and seventy-five (275 ) days in a year.

## M

### **Malaria**

A serious acute and chronic relapsing infectious disease of human in Africa and South Asia.

The estimated annual rate of incidence is more than 50 million cases, with about 1 million deaths. Malaria is also found in apes, monkeys, rats, birds, and reptiles.

Human malaria is transmitted by female mosquitoes of the genus *Anopheles*, in which the parasite lives during part of its development cycle.

It is characterized by periodic paroxysms of chills and fever, anemia, splenomegaly (enlargement of the spleen), and often fatal complications.

Antimalarial drugs, such as quinine and many synthetic derivatives, may be used either prophylactically to prevent the disease, or suppressively to reduce and eradicate (if possible) the infection.

### **Mangrove Forests**

Any of a group of tropical trees or shrubs growing in salt-water swamps along river banks. The trunks and branches of the common mangrove are the growth habit typically, and they constantly produce adventitious roots, which, descending in arched fashion, strike at some distance from the parent stem and send up new trunks.

There are three types, red, white, and black.

The common mangrove grows to about 9 meters (30 feet) tall. The black mangrove is higher.

### **Matrices**

The matrix consists of a horizontal list of project activities arranged against a vertical list of environmental limits.

This methodology basically incorporates a list of project activities with a checklist of environmental conditions or characteristics that might be affected. Combining these lists as horizontal and vertical axes for the matrix allows the identification of cause-effect relationships between the specific activities and impacts.

The possible cause and effect relationships between particular activities and environmental variables can be identified by placing a mark in the corresponding intersecting cells. The entries in the cells of the matrix can be either qualitative or quantitative estimates of these cause-effect relationships. The latter are in many cases combined into a weighting scheme leading to a total impact score.

-Simple interaction matrix. This is simply a two-dimensional chart showing project activities and a checklist of environmental limits. Those activities that are likely to have an impact on any component of the environment can be identified by placing crosses in the corresponding intersecting cells; this procedure is based on expert judgment.

-Quantified and graded matrix. This is a modification of the simple matrix to which the "magnitude" and "importance" of the impacts are ascribed by using a grading system. Expert judgment can be extended to denote the "magnitude" and "importance" of the impact in each cell by using a grading system.

In the Leopold matrix a grading system ranging from 1 to 10 is used for each characteristic. It involves the use of a matrix with 100 specified actions and 88 environmental items. Each action and its potential for creating an impact on each environmental item are considered. The magnitude of interaction is the extensiveness or scale and is described by the assignment of a numerical value from 1 to 10, with 10 representing a large magnitude and 1 a small magnitude. The scale of importance also ranges from 1 to 10, with 10 representing a very important interaction and 1 an interaction of relatively low importance.

### **Methods of Environmental Impact Assessment (EIA)**

A number of methods have been developed for conducting EIA. These methods have been used for the presentation of environmental impacts' results to decision- makers and the general public.

Some of the most commonly used methods are: ad hoc methods; checklists; matrices; overlays; networks; and cost- benefit and cost -effectiveness analyses.

While all these methods are useful for the identification of environmental impacts, it should, however, be realized that each has its own advantages and limitations. It is important, therefore, when using EIA methods to bear in mind their specific benefits and limitations.

### **Microbe**

Microbes are defined as very minute living things, whether plant or animal, which can only be seen with a microscope. There are well over a million known species of microorganism, including all monera (bacteria and blue-green algae), most Protista (algae and protozoa), many fungi (including yeasts, smuts, and related organisms) and some animals (rotifers, hydra, and similar creatures, along with the larvae of many marine invertebrates). Viruses are a special case. Microorganisms are present everywhere: in air, in and on our bodies and those of other animals, in the water, and in the ground.

Microorganisms form the base of all aquatic food chains.

## N

### **Natural Hazards**

Major areas of the world are subject to risks from natural hazards. Earthquakes, volcanic eruptions, droughts, floods, and hurricanes hinder development through their direct, indirect, and cumulative impacts. There is a two-way, direct relationship between environmental deterioration, and natural hazards; that is, soil erosion, deforestation, desertification, and coastal degradation increase the risks of extreme events, and in turn, natural hazards exacerbate environmental degradation. Furthermore, the potential for human and economic losses in an area is directly related to its vulnerability to natural hazards.

### **Networks**

Networks are an extension of matrices incorporating long-term impacts of the project activities. The network method is an attempt to analyze the series of impacts that may be triggered by project activities. A list of project activities is prepared to identify cause-condition relationships. Environmental components are generally interconnected and form webs or networks, and an ecological approach is often demanded in identifying the secondary and tertiary impacts. Cause-condition networks are established from a list of project activities.

The approach is generally to define a set of possible impacts and allow the users to identify likely impacts from the specific project being addressed. Primary, secondary, and tertiary impacts are identified.

To develop a network requires answering a series of questions relative to each of the project activities, such as the secondary impact areas, the primary impacts within these areas, and so on.

### **Nitrogen Oxides**

When nitrogen is oxidized, it is formed. Representative of it (NO<sub>x</sub>) are nitric or nitrous oxide (NO) or nitrogen dioxide (NO<sub>2</sub>).

Nitrous oxide is produced by burning fossil fuel, and is not directly dangerous to human health. Nitrogen oxides and sunlight react to form photosynthetic smog.

Nitrogen dioxide produced by car engines is toxic. It is a major source of atmospheric pollution.

Nitrogen oxides are also produced when farmland is sprayed with fertilizers; the bacteria in the soil feed on the fertilizer and produce the gas.



## O

### **Opportunity Cost**

In economics, the true cost of a good or service, measured in terms of foregone opportunities to put the resources tied up by the good or service to use in other ways. For example, to build a road into a previously unroaded area is to forgo not only the opportunity to spend the money for other purposes but also the opportunity to use the land for unroaded recreation.

### **Ordinary Water Discharge**

The discharge in river flow when it is not less than discharge during one hundred and eighty-five (185 ) days in a year.

### **Organization for Economic Cooperation and Development (OECD)**

Organization for Economic Cooperation and Development (OECD) is an international organization founded in 1961. This organization succeeded the Organization for European Economic Cooperation, which had been set up in 1948 to coordinate the Marshall Plan for European economic recovery after World War II. One of the fundamental purposes of the OECD is to achieve the highest possible economic growth and employment and rising standard of living in member countries; at the same time, it emphasizes maintaining financial stability. The organization attempted to reach this goal by liberalizing international trade and the movement of capital between countries. A further major goal is the coordination of economic aid to developing countries.

### **Organo-Chloric Compounds**

Chemical compounds used to kill unwanted plants and insects. They include such compounds as dichlorodiphenyltrichloroethane (DDT), benzenehexa chloride(BHC), 2,4-dichlorophenoxyacetic acid(2,4-D). As they can be made cheaply and very effective, they were utilized extensively after World War II. However in the present they are forbidden because of their toxic residue. In the Antarctic Ocean and the Arctic Ocean the emission of concentration is high. In spite of their toxic residue, some kinds of them are still used in developing countries.

### **Overlays**

This methodology relies on a set of maps of environmental characteristics (physical, social, ecological, aesthetic)for a project area. These maps are overlaid to produce a composite characterization of the regional environment. Impacts are identified by noting the impacted environmental characteristics lying within the project boundaries.

Mc Harg(1968) published a method employing the technique with a specific orientation towards the highway. The method consists of transparencies of environmental characteristics overlaid on a regional base map. Eleven to sixteen environmental and land-use characteristics are mapped. The maps represent three levels of the characteristics based upon "compatibility with the highway ".

The approach seems most useful when employed in screening alternative project sites or routes as a preliminary to detailed impact analysis.

### **Ozone Layer**

The zone in the upper atmosphere, generally between about 10 and 50 km(6-30mi) above the earth's surface. It absorbs in the 230-320nm waveband, protecting the earth from dangerous excessive ultraviolet radiation.

Use of aerosols can reduce the amounts of ozone in the upper atmosphere, and in the late 1980s' holes in the ozone layer were detected over both poles. This fact has prompted the EC to urge a cessation in the use of harmful fluorocarbons by 2000, and individual governments to make similar decisions.

## **P**

### **Peat**

Decomposed dark-brown or black plant debris laid down in waterlogged conditions in temperate or cold climates. It is found in ancient bogs and swamps.

Peat deposition is the first step in the formation of coal. The humid climate of the Carboniferous period (360 to 286 million years ago ), which favored the growth of huge tropical seeds ferns and giant non- flowering trees, created the vast swamp areas that comprise the coal beds of today. Under pressure the peat dried and hardened to become low- grade coal, or lignite; further pressure and time created bituminous coal; and even more extreme pressures created anthracite.

Peat consists of a light, spongy material and is used for domestic heating purposes and forms a fuel suitable for boiler firing in either briquetted or pulverized form; it also has been used in gas production.

### **Pedestal Erosion**

When an easily eroded soil is protected from splash erosion by a stone or tree root, isolated pedestals capped by the resistant material are left standing up from the surrounding ground. The erosion of the surrounding soil is shown to be mainly by splash rather than by surface flow because there is little or no undercutting at the base of the pedestal. This type of erosion develops slowly over several years and is often found on bare patches of grazing land. It can occur in arable lands which suffer excessive erosion during exceptional storms.

### **Pinnacle Erosion**

The characteristic erosion pattern which leaves high pinnacles in gully sides and bottoms is usually associated with difficult soils which are highly erodible. This erosion is always associated with deep vertical rills in the gully sides, and these cut back rapidly until they join and leave the isolated pinnacles. A more resistant soil layer, of gravel or stones, often caps the pinnacle, as in pedestal erosion. Banks eroded in this form are usually severely undercut by either flowing or standing water, and pipe erosion is also frequent. The chemical or physical soil conditions which cause this severe erosion are not clearly defined, but it is usually found where there is some severe imbalance such as excessive sodium and complete deflocculation.

### **Piping**

The formation of continuous pipes or channels underground is most common in those soil types subject to pinnacle erosion, but not entirely restricted to such soils. It occurs when surface water infiltrates through the soil surface and moves downwards until it comes to a less permeable layer.

## **R**

### **Rangeland**

Rangeland is land with natural or semi-natural vegetation that provides habitat for domestic ruminants and wildlife. This term is often used interchangeably with arid and semi-arid land, shrubland, wasteland, savanna, and grassland. These areas are characterized by low population densities, human populations that are heavily dependent on herds of domesticated livestock, mobility over an extensive area, and complex cultures specially adapted to the harsh conditions of drought-prone areas.

## **River-Blindness**

An infection of the skin by *Onchocerca volvulus*, a parasitic threadlike worm. This disease is one of the filariases, caused by various roundworms belonging to the superfamily Filarioidea.

It is transmitted to humans by the bite of the black fly *Simulium*. It has this name because the flies that transmit the disease breed on rivers and mostly affect riverine populations. Blindness is caused by microfilariae-the larvae that can be produced for some 15 to 18 years by adult worms inside the eye.

Treatment consists of surgically removing the growths and drugs to kill the remaining adults and microfilariae.

It occurs in parts of Africa and Central and South America.

## **S**

### **Sahel**

An area in West Africa, mainly in Mauritania, Mali, Niger, and Chad. It is located south of the Sahara.

Normally, the land receives very little rainfall and is encroached by desert gradually.

From the late 1960s to mid 1980s it suffered severe droughts.

The terrain is chiefly of the savanna type, with little continuous cover and a dangerous tendency to merge into desert because of overstocking and over-farming.

Loss of human life by starvation and disease was estimated in 1973 at 100,000, and although losses declined afterward through relief efforts, the consequences of malnutrition for those who survived, especially the children, were appalling.

### **Salinization**

Salinization of soils is one of the common problems associated with surface irrigation.

Salinization, naturally more acute in arid and semi-arid areas which have more rapid surface evaporation and saline soils, is exacerbated by irrigation. On a global basis it has been estimated that annually irrigation takes out of production as much land as it puts in because of soil deterioration, principally salinization.

Alkalization is a particularly detrimental form of salinization which is difficult to rectify.

While soils in arid and semi-arid zones have a natural tendency toward salinization, many soil-related problems could be minimized by installing adequate drainage systems.

### **Salt Wedge**

Salt wedge is defined as the shape of the interfuse between fresh water and salt water at the point where rivers go down to the sea. The upper level of the wedge increases in salinity as the river flows downstream. The lower level of the wedge decreases in salinity as it travels upstream. This phenomenon is part of the hydraulics of the mixing process of fresh water and salt water.

### **Schistosome**

The flukes called Schistosomes occur in most vertebrates. Three species attack humans and cause shistosomiasis in Africa and East Asia.

Shistosomes have two distinct sexes ; the male has a special ventral canal in which he carries the female. The female deposits eggs one at a time, filling the venules. When the excreted eggs reach fresh water, the miracidia (ciliated embryos) hatch and enter a snail. The miracidia shed their ciliated covering as they penetrate the snail to become sporocysts. Finally, mature sporocysts produce fork-tailed cercariae, and swim in the water. Thus, Schistosomes require a snail host for part of their life cycle.

### **Sediment Yield**

Sediment yield is defined as particles which settle to the bottom of a body of water because of gravity. It forms sediment, is carried along by rivers and streams and is deposited into the ocean.

### **Sifting Cultivation**

A method of cultivation often used by tropical-forest root-crop farmers. Areas of the forest are burned and cleared for planting; the ashes enrich the soil. After several years of cultivation, fertility declines and weeds increase; then the area is abandoned and the cultivator moves on to another plot.

Without advanced techniques of soil conservation and the use of fertilizers, it would be extremely detrimental to the fertility of the land.

It is one of the reason for reduction in tropical forest.

### **Sleeping Sickness**

A common infectious disease in tropical Africa caused by protozoan of the genus trypanosome, which is transmitted by the tsetse fly. It is the African form of trypanosomiasis.

Initial symptoms are swelling of the lymph nodes and fever, which persists for several months. Then the brain and spinal cord infected, causing lethargy, weakness, and depression, and finally prolonged coma ending in death.

Drugs (pentamidine and suramin) are helpful in early stages.

### **Slumping**

Slumping is usually a process of geological erosion, and although it may be accelerated as in the sides of gullies, it can occur without any intervention of man. It becomes prominent in high rainfall areas with deep soils. This is shown in cases where the head of the gully has worked back right up to the crest and beyond, where there can be no inflow at the head of the gully.

### **Soil Degradation**

Soil degradation refers to five kinds of degradation: water erosion, wind erosion, excess of salts, chemical degradation, and biological degradation. There are also some forms of degradation which do not involve any physical removal of soil.

Fertility erosion is the loss of plant nutrients by erosion and can be comparable in magnitude with the removal of the same elements in the harvested crop. Phosphorous is mainly lost when colloidal particles are eroded, but nitrogen can be lost in solution without any soil movement occurring.

### **Species**

Groups of physically and genetically similar individuals that interbreed under natural conditions. Some species are subdivided into subspecies and varieties. Over 300,000 plant species and more than 1,000,000 animal species have been identified, and 15-20,000 new ones are identified every year.

For economic or other purposes domestic animals and cultivated plants have been developed by man.

### **Spillways**

Spillways are provided for storage and detention dams to release surplus or flood water which cannot be contained in the allotted storage space, and at diversion dams to bypass flows exceeding those which are turned into the diversion system. Ordinarily, the excess is drawn from the top of the pool created by the dam and conveyed through an artificial waterway back to the river or to some natural drainage channel.

### **Suspended Sediment**

All rivers or streams carry material downstream as suspended sediment to bed load. Reservoirs are provided with scouring sluices to enable their sediment to be washed out periodically.

### **Suspended Solids (S S)**

The solids suspended in a liquid include settleable and non-settleable solids. The total suspended solids are measured by filtering the water through a glassfibre filter paper and drying the paper at 105 c for an hour. The measure of suspended solids in a specific amount of water is part of identifying the quality of that water.

## **T**

### **Tribes**

Tribes are people organized into local descent group lineages and clans. Genealogical position in the clan often determines the right to use land held in customary ownership by the tribe. Tribes are often stratified into age sets, whereby young men and young women in one generation are treated as a set for their entire lives. Age sets cross lineage and clan ties. Resource management activity is often organized along age set lines, but decision-making authority for management of land, livestock, and other resources is usually vested with elders of the lineage or clan.

### **Tropical Forests**

Tropical forests are areas where tropical plants are evergreen, large-leaved tropical trees, and trees with edible fruits - coconut palm, bananas, and breadfruit. Because of constant daily sunshine, equatorial and tropical regions are warm throughout the year, and the moving air masses that affect them are also warm. Temperatures vary only slightly and rainfall is steady throughout the year. Tropical forests in mountain regions are considered fragile ecosystems. Tropical forest zones are fragile in part because high annual rainfall is concentrated in brief but violent storms so that areas of even slight slope have a high level of erosion when not protected by vegetation. Tropical forest cut in zones prone to erosion and other forms of soil degradation can be regenerated only under controlled conditions and at great expense.

### **Tsetse Fly**

A fly, 6-16mm long, restricted to tropical Africa. Both sexes bite and suck the blood of animals.

The larvae develop to maturity with the female, and burrow into the ground and pupate within an hour; after several weeks the adults emerge.

It passes trypanosomes into the bloodstream of humans and other animals, and causes sleeping sickness. (A similar disease is called nagana in animals.)

Of the tsetse flies that attack man 80 percent or more may be males; the females usually attack larger animals.

### **Turbidity**

The cloudiness in a liquid caused by the presence of finely divided, suspended material is termed turbidity. A turbidimeter measures this quality by determining the reduction in transmission of light that is caused by interposing a turbid solution between a light source and detector, such as the eye or a photocell. Turbidimetry is applicable to the determination of suspended material in liquids encountered in nature and in manufacturing processes.

The turbidity may be due to a single chemical substance, or it may be due to a combination of several components.

## **V**

### **Vector**

In epidemiology, the means by which a pathogen is transferred from one host to another. For example, mosquitoes serve as the principal vector for plasmodium (it causes malaria in humans), picking it up by biting an infected individual and carrying it in their digestive tracts and saliva to the next individual they bite.

### **Vetiver Grass**

It is also called Khus-Khus (*Vetiveria zizanioides*), native to tropical Asia, especially the Indian region.

Its thick, fragrant roots contain an oil used in perfumes. Since ancient times in India, the roots have been made into mats, screens, and baskets. It is planted as hedges in some areas. In others it has escaped cultivation and become a weed.



# W

## **Water Erosion**

The classification of water erosion is into stages corresponding with the progressive concentration of surface run-off. It starts with interrill erosion, then rill erosion as the water concentrates into small rivulets in the fields, then gully erosion when the eroded channels are larger, and finally stream bank erosion when rivers or streams are cutting into the bank. Interrill erosion means both movement by rain splash and transport of raindrop-detached soil by thin-flow surface flow whose erosive capacity is increased by raindrop impact turbulence. Rill erosion is usually defined as small washes which can be eliminated by normal cultural methods, and gullies when the channels are so large and well established that they cannot be crossed by farm implements.

## **Waterlogging**

Waterlogging is one of the common problems associated with surface irrigation. Waterlogging results primarily from inadequate drainage and over-irrigation, and to a lesser extent from seepage from canals and ditches. Waterlogging concentrates salts, drawn up from lower in the soil profile, in the plant's rooting zone. Waterlogging can be reduced or minimized by using sprinkler or drip irrigation which applies water more precisely and can easily limit quantities to no more than the crop needs.

## **Water Table**

Water table refers to the surface defined by the upper level of the zone of saturation, or the surface of unconfined ground water. Water percolates through the soil and rock downward into the ground through the force of gravity until it is blocked by bedrock. There it spreads to form a water-logged or saturated zone, directly over the bedrock. The water accumulated in this zone is the ground water, and the upper level of it is the water table.

## **Wetlands**

Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters (Ramsar Convention). Among the most important wetlands are tidal and fresh water marshes, bogs, fens, herbaceous and wooded freshwater and peat swamps, mangroves, coastal lagoons, floodplains, deltas, and estuaries.

Wetlands are wildlands of particular importance both economically and environmentally. The most important roles which wetlands perform are production of services, preservation of biological diversity, and production of goods.

### **Wildlands**

Wildlands are natural land and water areas that have been modified by human activities only slightly or not at all. Any relatively undisturbed natural ecosystem may be a wildland: forests, grasslands, inland bodies of water, inland and coastal wetlands, and marine areas.

Wildlands are valuable because: (a) they constitute habits for indigenous plant and animal species ; (b) they perform important environmental services for society at little or no direct cost ; and (c) they are in some cases essential to the livelihood of indigenous peoples. Wildlands of special concern are those recognized as exceptionally important in preserving biological diversity or performing environmental services.

### **Wind Erosion**

Five different forms of wind erosion are recognized, although there is some overlapping, and several of the processes will usually occur at the same time.

Detrusion is the wearing away of rocks and soil projections by fine particles carried in suspension. A similar action takes place close to the ground where the moving particles are larger and bouncing along over the surface. This is known as abrasion. The three other forms relate to the way the material is carried away. The removal of very fine particles, carried off in suspension, is efflation, and the rolling away of large particles is extrusion. Particles of intermediate size move off downwind in the bouncing action called saltation, and removal in this manner is termed effluxion.



# Index



# Index

Chapter numbers are shown in heavy type.

## A.

Adjustment and regulation of water or fishing rights	4 - 10, A - 15
Air pollution	4 - 11, A - 54
Arid and semi-arid lands	3 - 12, 4 - 12, A - 58

## B.

Biological and ecological issues	4 - 2
Bird Sanctuary	4 - 6

## C.

Changes in bases of economic activities	4 - 10, A - 11
Changes in existing institutions and customs	4 - 10, A - 17
Changes in groundwater hydrology	4 - 11, A - 45
Changes in social and institutional structures	4 - 10, A - 16
Changes in surface water hydrology	4 - 11, A - 44
Changes in vegetation	4 - 11, A - 26
Change in temperature of water	4 - 11, A - 52
Checklist for Initial Scoping	4 - 9
Checklist for Initial Screening	4 - 3
Checklist for Joint Scoping	5 - 7
Checklist for Joint Screening	5 - 2
Coastal Zones	4 - 12, A - 69
Conflict among communities and peoples	4 - 10, A - 5
Convention on International Trade in Endangered Species of wild Fauna and Flora (CITES)	4 - 6, B - 3
Coral Reefs	3 - 13, 4 - 12
Cultural assets	4 - 6, A - 78
Cultural asset issues	4 - 2

<b>D.</b>	
Dam and reservoir	3 - 5
Damage to aesthetic sites	4 - 10, A - 25
Damage to landscape	4 - 11, A - 55
Degradation of coral reefs	4 - 11, A - 33
Degradation of ecosystems with biological diversity	4 - 11, A - 28
Degradation of soil fertility	4 - 11, A - 37
Destruction of wetlands and peatlands	4 - 11, A - 30
Destruction or degradation of mangrove forests	4 - 11, A - 32
Devastation of hinterland	4 - 11, A - 41
Devastation or desertification of land	4 - 11, A - 40
Drainage	3 - 5
Drastic change in population composition	4 - 10, A - 9
<b>E.</b>	
Ecosystem with biological diversity	4 - 6, A - 71
Encroachment into tropical rain forests and wildlands	4 - 11, A - 31
Environmental consideration	1 - 1
Environmental Impact	2 - 2
Environmental Impact Assessment	2 - 2
Environmentally sensitive area	3 - 7, 3 - 9, 3 - 11
Environmental Study	2 - 3
Environmental Summaries in Declarations of Economic Summits	B - 8
Erodible and devastated land	3 - 13, 4 - 12
Ethnic minorities	A - 75
<b>F.</b>	
Feasibility Study	1 - 4
<b>G.</b>	
Ground Subsidence	4 - 11, A - 42
<b>H.</b>	
Habitat of fauna and flora listed in CITES	3 - 11, 4 - 6
Health and sanitary issues	4 - 2
Heritage sites listed in the World Heritage Convention	3 - 12, 4 - 6
Hydrology and air and water quality	4 - 2

<b>I.</b>			
Impact on native peoples	4 - 10,	A - 6	
Impairment of historic remains and cultural assets	4 - 10,	A - 24	
Impediment of inland navigation	4 - 11,	A - 48	
Impediment of mining resources exploitation	4 - 11,	A - 56	
Increase in domestic and other human wastes	4 - 10,	A - 23	
Increase in income disparities	4 - 10,	A - 13	
Increased use of agrochemicals	4 - 10,	A - 19	
Indigenous peoples	A - 75		
Initial Environmental Examination	2 - 2		
Initial Scoping	2 - 4,	4 - 1	
Initial Screening	2 - 4,	4 - 1	
Environmental Study	2 - 3		
International convention for Protection of Birds	B - 2		
Inundation and flooding	4 - 11,	A - 46	
Involuntary resettlement	4 - 10,	A - 2,	A - 80
Irrigation	3 - 5		
<b>J.</b>			
JICA Development Study	1 - 7		
Joint Scoping	2 - 7,	5 - 1	
Joint Screening	2 - 7,	5 - 1	
<b>L.</b>			
Lakes	3 - 13,	4 - 12	
Land clearing and leveling	3 - 5		
Land consolidation	3 - 5		
Landscape and mining resources	4 - 2		
<b>M.</b>			
Main development study	2 - 3		
Main project components	3 - 5		
Mangrove forests	3 - 13,	4 - 12	
Master plan study	1 - 4		
Mountainous, steep sloped lands	3 - 13,	4 - 12	



**N.**

National park	4 - 6
Natural environment	4 - 6
Natural reserve	4 - 6
Negative impacts on important or indigenous fauna and flora	4 - 11, A - 27
New land settlement	3 - 5

**O.**

Occupational change and loss of job opportunity	4 - 10, A - 12
OECD Environmental Ministerial Meeting	B - 10
Outbreak of enclenic diseases	4 - 10, A - 20

**P.**

PD form	3 - 2
Peat lands	3 - 13, 4 - 16
Planned residential settlement	4 - 10, A - 1
Population increase	4 - 10, A - 8
Preparatory Study	1 - 4, 3 - 2
Project Cycle	1 - 3
Project Description	2 - 3
Project type	3 - 6
Proliferation of exotic and hazardous species	4 - 11, A - 29

**R.**

Ramsar Convention	4 - 6, B - 1
Rangeland	4 - 12
Reservoirs	3 - 13, 4 - 12
Residual toxicity of agrochemicals	4 - 10, A - 22
Riverbed degradation	4 - 11, A - 48

## **S.**

Savanna	4 - 12
Scale of project	3 - 6
Scoping	1 - 6
Screening	1 - 6
Screening items	4 - 6
SD form	3 - 7
Sea/Swamp reclamation	3 - 5
Sea water intrusion	4 - 11, A - 52
Sedimentation	4 - 11, A - 47
Significant Environmental Impacts	4 - 9
Site Description	2 - 3, 3 - 7
Social environment	4 - 6
Socio-economic issues	4 - 1
Soil and land resources	4 - 2
Soil contamination by agrochemicals and others	4 - 11, A - 38
Soil erosion	4 - 11, A - 35
Soil salinization	4 - 11, A - 36
Spreading of epidemic diseases	4 - 10
Stockholm Declaration	A - 21, B - 6
Substantial changes in farming system	3 - 6
Substantial changes in way of life	4 - 10, A - 4
Swamps	3 - 13, 4 - 12

## **T.**

Tropical forests	3 - 13, A - 67
Tropical rain forests	3 - 13, 4 - 12

## **U.**

United Nations (UN)	B - 5
---------------------	-------

## **W.**

Water contamination and deterioration of water quality	4 - 11, A - 50
Water eutrophication	4 - 11, A - 51
WCED Report	B - 7
Wetlands	3 - 13, 4 - 12, A - 61
Wetland designated under the Ramsar Convention	3 - 11, 4 - 6
Wild lands	3 - 13, 4 - 12, A - 64





JICA

