GUIDELINES

FOR

ENVIRONMENTAL ASSESSMENT OF DEVELOPMENT PROJECTS

UNITED NATIONS ENVIRONMENT PROGRAMME
REGIONAL OFFICE FOR ASIA AND THE PACIFIC

AND

ASIAN AND PACIFIC DEVELOPMENT CENTRE
KUALA LUMPUR, MALAYSIA

APRIL 1982

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Introduction

The Regional Symposium on the Environmental Assessment of Development Projects held during 11-15 January, 1982 in Kuala Lumpur, Malaysia decided inter alia to

> support UNEP[1/] in carrying out an analysis to define those elements that are common to all development evaluation, and to determine what may be optionally included.

This analysis is to take the form of guidelines for distribution to countries in order to assist them in evaluating development projects, using the Test Model.

2. This decision arose from discussions by participants in the Regional Symposium as to the need to identify the resource elements that should figure in the Test Model. Several delegates pointed out that it may well be the policy of their governments to be selective in the choice of elements for environmental assessment. It was also pointed out that what might be of considerable significance in one country might be of little consequence in another. There was also some uncertainty as to where a resource element should be entered into the Test Model sections. To help provide some guidelines, delegates postulated that there were some resource elements that were common to all types of development projects, while there were others which were specific to individual projects. The above decision therefore requested UNEP to determine broad guidelines in this matter so that the test cases in each cantry could proceed on a common basis.

1/ UNEP Regional Office, jointly with APDC.

Background

3. The purpose of the Test Model is to make available to the policy and decision makers environmental information in a form they can readily use. It facilitates development decisions that are conducive to making resources available on a sustained basis. This recognizes the symbiotic and mutually supportive relationship between development and environmental enhancement.

4. Recognizing the varying levels of experience among countries in the region in respect of environmental assessment of projects, the Guidelines serve as an aid to environmental assessment by using a common list of resource elements. This list may be produced in a format which easily lends itself to be transferred to the Test Model, thus providing a systematic way of presenting environmental information about the project.

5. As experience is gained in environmental assessment using the Test Model, more specific lists of resource elements can be developed. These project-specific lists would allow for variability in resource requirements and impacts due to location, size, technology, life-time of the project etc.

6. Not every resource element will be utilized or enhanced by a development project to the same degree. The effects on many resource elements will be minimal, and the assessment can conveniently omit them. The assessment will focus only on those that are relevant to the specific project. Evaluation carried out in the Test Model will then show whether the degree of use or enhancement of those resources is optimal. The end-result is that the decision maker will have access to the relevant environmental information to make a well-informed decision.

7. The classification adopted in compiling the resource list is not unique. Certain countries may find it more useful to list the resource elements by geographic regions, or by ecosystem types. Listing resources by medium (land, water, air, etc.) is the most commonly accepted practice among environmental scientists. A starting point for this classification was the familiar checklist developed for the U.S. Geological Survey, known popularly as the Leopold Matrix.

Methodology

8. The starting point for assessment is a description of the project. The Test Model, Section I, provides the format in which this is to be presented. The next step is to select those resource elements from the checklist upon which this particular project will impact.

9. The selected resource elements can be listed in the left hand column of the Project Work Sheet (proforma 'A' attached). Once these entries are made, notes should be provided for each of the adjacent ten columns.

10. These ten columns have the same headings as the Test Model Sections II, III, IV and V and it is intended that where possible, quantities or estimates of impacts be entered directly on the worksheet. Neither quantification nor estimation of impact needs to be exact since this worksheet merely serves as an intermediate step before transferring the information on to the Test Model Format. The Worksheet provides a summary of data which will help eliminate trivial elements, recognize significant ones, and establish linkages. For example, a waste listed under Section II, can become a residue utilized, or a resource restored, under Sections IV and V.

11. Once the Worksheet is completed, one should proceed to fill in

Sections II, III, IV and V. Detailed support sheets for each entry may be used as necessary. These detailed support sheets (Cost Sheets, pro forma 'B' attached) should carry all the data necessary to quantify the resource element, assigning a dollar value at current prices. The combination of the Test Model Format and the Detailed Cost Sheets provides the main working document for presenting the cost information about the project, and its impacts. Once the Sections II, III, IV and V of the Test Model Format are completed it is possible to prepare the project summary, Section VI. Specimens of these sections are attached (Proforma set 'C'). From the Summary, the project cost-benefit, with and without environmental enhancement and restoration, is computed. This procedure was illustrated in the case studies discussed at the Regional Symposium, January 1982.

12. A presentation of the foregoing sequence in the form of a flow diagram is attached hereto (Proforma 'D').

Quantification and Pricing of Resource Elements

13. Any of the project elements that form the basis for raw material or other inputs of a project, or are affected by the project necessarily undergo change. These "changes" can be quantified and costed for the most part. The costing is, thus, not of the resource elements, but of the results of a project on these elements (seen as resource base). The results may be physical or non-physical, direct or indirect. There can be numerous examples and variations as illustration of such changes, as also of quantification and costing. Three simplified illustrations are provided very briefly below to indicate the process that may normally apply in the quantification and costing.

14. Before doing so, it should be pointed out that many major environmental benefits that can accrue, under any of the project elements mentioned, will figure rather under economic cost-benefit than the environmental cost-benefit analysis. For example, when in a hostile terrain in conditions of stark privation, a dam is put up which yields the water to convert the soils below into thriving rice land, which also leads to enhanced human settlement and welfare, virtually the whole of that improvement may be even considered environmental enhancement. But in the cost-benefit computation it will count as an economic cost-benefit. This is immaterial for the final decision-making, since the purpose of integrated resource use management is to combine environmental and economic cost-benefit as envisaged in the Test Model.

Case (1)

15. Let us consider a mangrove and coral ecosystem resource area in which two activities occur. (a) One has been a traditional eroding process of over-cutting mangroves at village level, as also of blasting corals for limestone; (b) the other has to do with a recent introduction of a chemical plant whose effluent is carrying deleterious effects on the spawning grounds in both the mangrove and coral reefs.

16. Quantification would involve (a) computing the excess of mangrove felling over renewal capacity, and similarly for coral; in the latter case probably an 'excess' all the way; and (b) computing the extent of the physical area polluted by the effluent that has been affected, under both mangrove and coral.

17. Costing would be by imputing, under (a), net loss of mangrove resources for sustaining current level of end-users; and the reduction in

fish catch in both mangrove and coral areas. (The fish catch itself may be in a zone quite away from the spawning ground). Where the mangrove felling is really extensive, a further computing may need to be done in terms of disaster evaluation from cyclone or typhoon, based on comparative experience. It is known that mangroves serve as effective wind and tidal barriers. Under (b), it would be as for fish spawning estimates above. In addition if the effluent is of a type which may be converted to productive use, the resultant economic gain should also be priced.

18. For all of these, as for the last, a programme of arresting deterioration and renewing a resource base if undertaken, could be similarly costed, also pricing the benefit.

Case (2)

19. We may consider a case of a project, of which there are numerous examples, resulting in siltation and salinity, or chemical run-off. One such case can be run-off from an agro industrial activity which affects at the same time fish catch in a pond or stream, water for irrigation and potable water for the human settlement.

20. Quantification would be of the extent of area affected respectively under fish catch, farm produce and population. Costing would be, in the case of fish as net loss of fish catch, in the case of irrigation, as farm produce foregone, and in the case of human settlement as estimate of public health or medical costs. Arresting degradation and renewal of the resource base in all these areas could similarly be quantified and costed for estimate of the net gain.

Case (3)

21. An activity may result in an elimination of a recreational area

or centre or may threaten a cultural monument and so on. The approach in such cases would be somewhat similar and therefore let us take the case of an urban development activity which involves the closing down of a park which serves as a 'green lung' for the human settlement in that area.

22. The quantification in this case would be the proportion of the population using the facility and the imputation of a notional figure, based on comparative experience, of health gain or loss. Costing will not have an equivalent in terms of product values in the market, since it must be derived from the social will, i.e. the social decision to maintain it, or otherwise. Already its existence provides a starting point in which the cost of its maintenance and operation may be taken as equivalent to the benefit, or the product value. Medical costs saved can be an alternative. If, unfortunately, the social decision is to close down the park there would be no (input) cost, but there is a product loss which must be netted from the product gain arising out of the urban development.

Future program

23. As agreed at the Regional Symposium each country will consider undertaking an environmental assessment of one or more development projects of different types using the basic concepts and methods presented in the Test Model. The Guidelines are issued to assist countries in this assessment. In this way, the Regional Symposium envisaged a follow-up meeting upon completion of the proposed assessment case studies.

Resource persons may be made available on request to assist countries in applying the Test Model. In this context, technical cooperation among developing countries (TCDC) of the region will be encouraged.

25. A glossary of terms for the resource element listing, project specific checklists, and illustrative costing methods will be prepared as experience is gained.

Resource Elements - Check List

26. The terms presented here as resource elements use the nomenclature commonly in vogue amongst environmental scientists. These terms, however, tend to have a negative connotation, viz. that impact on a resource is generally degrading. In the context of the Test Model it is explicit that impact can also mean enhancement of an environmental resource. These terms must therefore be understood to include both beneficial and detrimental effects.

Resource Elements - Check List

LAND

Land form
Unique form or feature of the land (1)
Reserves of raw materials
Reserves of minerals, fuels
Soil productivity
Structural stability of soil, seismicity
Erosion potential
Compaction of soil
Dereliction of land (2)
Deposition on land (3)
Wilderness, open space
Wetlands
Corals, deltas, coastal areas
Forests, mangroves
Mountains, highlands
Sorption of soils (4)
Subsidance

LAND USE

Forestry
Grazing (11)
Agriculture (11)
Human settlement
Commercial
Industrial
Mining and quarrying
Recreation
Fisheries (11)

WATER

Surface water quality
Surface water quantity
Underground water quality
Underground water quantity
Estuarine + ocean water quality
Estuarine + ocean water quantity
Temperature
Waterway siltation
Eutrophication
Salinisation

AIR

Air quality
Temperature
Local winds
Micro climate
Rainfall (5)
Odour (6)

FLORA

Trees
Shrubs, herbs
Grasses
Genetic resource
Crops
Microflora
Aquatic plants
Phytoplankton
Unique, rare, endangered species
Plant barriers
Plant corridors
Pest plants (7)
Forest fires

FAUNA

Birds
Land animals (11)
Fish, shellfish (11)
Benthic
Insects
Microfauna
Genetic resource
Endangered species
Animal corridors
Domestic + farm animals (11)
Pest species (8)
Disease vectors
Habitats

SOCIAL, CULTURAL

Archaeological
Historical, monuments
Changes in lifestyles (9)
Recreation
Aesthetic
Spiritual
Occupational
Mental
Human health
Human safety
Overcrowding
Noise, vibration
Scenic views
Landscape design (10)
Parks + reserves

PROCESSES, CYCLES

Energy cycles, insolation
Nitrogen cycle
Carbon cycle

Hydrogen cycle
Food chains
Nutrients

MANMADE FACILITIES (12)

Developed land
Buildings, structure
Plant + machinery
Transportation
Utilities
Communication
Goods, services
Labor, management
Capital

FOOTNOTES

1. Unique features may be physical or non-physical in form. They may include geological or visual features, a rare productive capability, be in an unusual location

2. Dereliction means letting the land degrade, and includes salinisation and desertification

3. Deposition means the placing of material on the land either naturally or deliberately. It therefore includes sedimentation, and waste disposal.

4. Sorption of soils includes ion exchange and complexing.

5. Rainfall includes changes in the pattern of precipitation as well as the quantity, and includes falls of snow and ice.

6. Odours are a perceived element, in that they are subjectively detected by the human nose. If the odour is not perceived by man it has no impact.

7. Pest plants are those species of flora which degrade an ecosystem and which man has decided to eliminate.

8. Pest species are those fauna which degrade an ecosystem and which man has decided to eliminate.

9. The introduction of exogenous elements into present lifestyles, and the management of the changes this may cause.

10. Landscape design will include recognition of unharmonious elements in the landscape.

11. The categories

land animals	:	grazing
Fish, shell fish	:	fisheries
Farm animals	:	agriculture

may give the impression of an overlap. However the categories on the left of the colon relate to the fauna as a genetic resource, while the categories on the right relate to land use.

12. This is a list of the produced means of production that are needed for the project. Without them the production process cannot proceed. Supplying these produced means may in itself cause environmental impacts or enhancements. The costs of these produced means is included in the socio economic evaluation of the project and must not enter into the environmental assessment, or else double counting will occur.

However some of these produced means will also be used to enhance resources, or to utilise residues, or to restore or expand resources impacted by the project. The net environmental benefit credited to the project evaluation for this use must have the cost of providing these produced means subtracted from it, so that a net benefit results.

PROFORMA 'A'

PROJECT WORKSHEET

DATE:

PROJECT RESOURCES	II RESOURCES USED, PRODUCTS AND RESIDUES					III EFFECT ON RESOURCES EXHAUSTED, DEPLETED DETERIORATED		IV RESOURCES ENHANCED RESIDUES UTILIZED		V RESOURCE RESTORATION
	DIRECTLY DURING INVESTMENT	DIRECTLY DURING OPERATION/ MAINTENANCE	INDIRECTLY AFFECTED	PRODUCTS PRODUCED	RESIDUES PRODUCED	DIRECTLY AFFECTED	INDIRECTLY AFFECTED	RESOURCES ENHANCED	RESIDUES UTILIZED	RESOURCES RESTORED OR EXPANDED
LAND LAND USE WATER AIR FLORA FAUNA SOCIAL, CULTURAL PROCESSES, CYCLES MAN MADE FACILITIES				C O M M O N E L E M E N T S						

PROFORMA 'B'

ITEM

DESCRIPTION

COST DATA

CALCULATION

PROFORMA 'C'

ENVIRONMENTAL ASSESSMENT

A Note on Definition and Content of Relevant Terms

1. The Environment is the total surroundings, of our natural, human and man-made resources.
2. Environmental Impact (of a development including past or already existing development) is:
   - the adverse impact on the environment of the development (the familiar syndrome)
   - the beneficial impact on the environment of the development (e.g. rice fields, inherently following construction of a dam)
   - the adverse impact on the development of the environment (e.g. saline, marsh or arid ground)
   - the beneficial impact on the development of the environment (confluence of e.g. soil, rain, raw material, transport, labour, etc.)
3. Environmental Quality is a given state in the quantum or composition of resources involved in the development, created by any or all of the processes of:
   - exhaustion; depletion; deterioration (the last, per se; or transformed as residue or waste)
   - enhancement (i.e. inherent in the development)
   - restoration; maintenance; expansion (all three, by planned action)

   While quality is a static measure of a state at a given time, quality itself is the result of a dynamic process of change over a period of time.
4. Environmental Management is the obtenance, by judicious handling of the impact and quality changes above, of the optimum sustained benefits from the development. Benefits mean accretion of positive gains as well as minimizing of adverse effects to the extent possible.
5. Environmental Assessment/Environmental Impact Assessment is the evaluation of the various impacts and the resultant natural and induced changes, as simply and precisely as possible for optimizing the total benefit to the development and to the environment, the latter conceived as the basis for sustained development.
6. Environmental Assessment Statement is the presentation of the foregoing in a manner conducive to making the required investment and development decisions.

ENVIRONMENTAL ASSESSMENT STATEMENT (EAS)

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WORK SHEET

TEST MODEL
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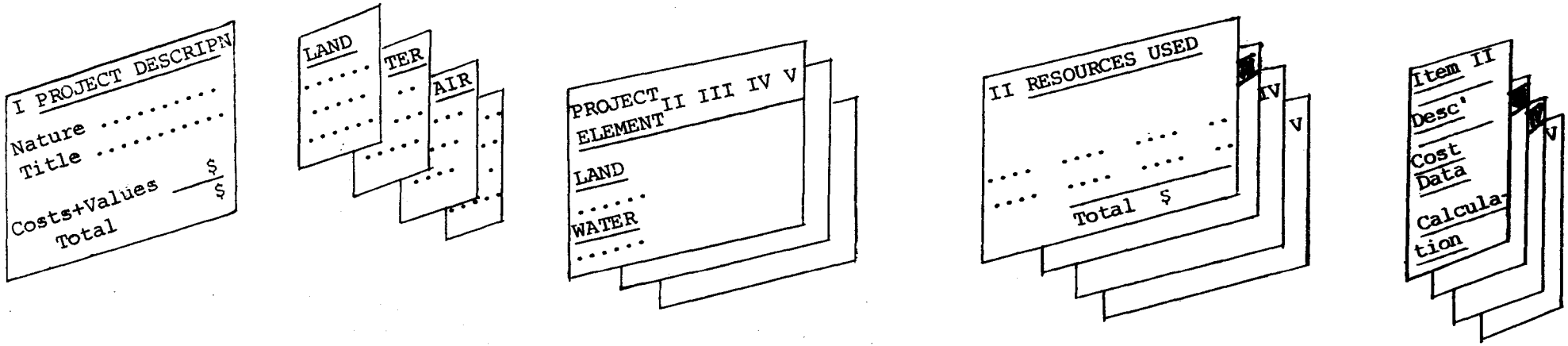
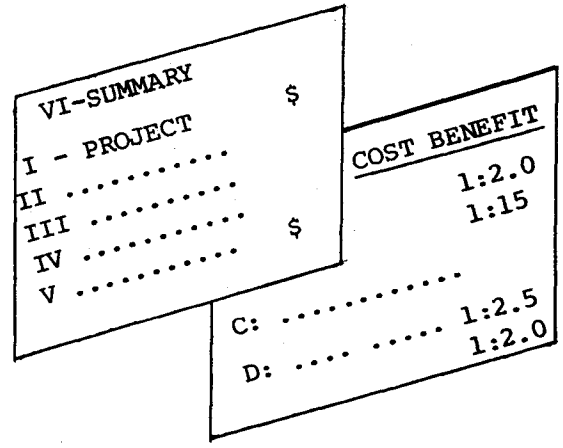
DETAILED
COST SHEETS
(AS INDEX)



TEST MODEL
SEC. VI



TEST MODEL WORK FLOW DIAGRAM