EIA INTENSIVE COURSE

MODULE 4:
Impact Assessment

Department of Environment, Malaysia

Objectives

You will be able to:

- apply a systematic framework for evaluating impacts consistently
- apply a systematic framework for analysis of alternatives
- apply standards for different predicted environmental impacts
- make qualified comments on reported impacts in EIA reports

Module Outline

- A brief introduction to the different evaluation methodologies available
- Understanding and applying some of the evaluation methodologies using practical exercise
- How to use environmental standards in evaluating impacts
- How to make qualified comments on reported impacts in EIA report

Introduction

- How much impact is significant? What level is acceptable?
- Interpretation of results and application of judgement
- Comparison of alternatives

What is impact evaluation?

Common criteria for evaluation:

- the magnitude and likelihood of that impact occurring
- the spatial and temporal extent of the impact
- the biophysical context and sensitivity of receptors
- the likely recovery of the affected environment
- the level of public concern for the impact
- political repercussions with respect to the impact

What is impact evaluation?

Two aspects:

- importance of individual impacts
- importance of impacts of different alternatives relative to each other and to other impacts

Impact Evaluation - Illustrated

Impact magnitude
-Large/small
-Short/long term, reversible/irreversible
-Direct/indirect etc.

Sensitivity of the receiving environment
-Number of people affected
-Designated sites etc.

Expert judgement
-Regulations
-PPP objectives
-Carrying capacity
-Public opinion etc.

→ **Significance**

Formal Impact Evaluation

- Environmental Quality Act
- Other related environmental related legislation
- International conventions and legislation

EQA

- Consists of 6 parts and 51 sections and 20 pieces of subsidiary legislation
- Covering:
  - Administration of the Act
  - Licensing
  - Prohibition and control of pollution
  - Control of schedule wastes
  - Appeal and appeal board
  - Payment of cess and environmental fund, and
  - Provisions on securing evidence, prosecution, compounding, power to seize, forfeit and dispose, compensation and delegation

EQA Subsidiary Legislation

List of Subsidiary legislation

1. E. Q. (PRESCRIBED PREMISES) (CRUDE PALM OIL) Regulations 1977
2. E. Q. (LICENSING) Regulations 1977
3. E. Q. (CLEAN AIR) Regulations 1978
4. E. Q. (COMPOUNDING OF OFFENCES) Rules 1978
5. E. Q. (PRESCRIBED PREMISES) (RAW NATURAL RUBBER) Regulations 1978
6. E. Q. (SEWAGE AND INDUSTRIAL EFFLUENTS) Regulations 1979
7. E. Q. (CONTROL OF LEAD CONCENTRATION IN MOTOR GASOLINE) Regulations 1985
8. E. Q. (MOTOR VEHICLE NOISE) Regulations 1987
9. E. Q. (PRESCRIBED ACTIVITIES) (ENVIRONMENTAL IMPACT ASSESSMENT) Order 1987
10. E. Q. (SCHEDULED WASTES) Regulations 1989
11. E. Q. (PRESCRIBED PREMISES) (SCHEDULED WASTES TREATMENT AND DISPOSAL FACILITIES) Order 1989

EQA Subsidiary Legislation

List of Subsidiary legislation

12. E. Q. (PRESCRIBED PREMISES) (SCHEDULED WASTES TREATMENT AND DISPOSAL FACILITIES) Regulations 1989
13. E. Q. (PRESCRIBED PREMISES) (CRUDE PALM OIL) Order 1977
14. E. Q. (PRESCRIBED PREMISES) (RAW NATURAL RUBBER) Order 1978
15. E. Q. (DELEGATION OF POWERS ON MARINE POLLUTION CONTROL) Order 1993
16. E. Q. (PROHIBITION ON THE USE OF CHLOROFLUOROCARBONS AND OTHER GASES AS PROPELLANTS AND BLOWING AGENTS) Order 1993
17. E. Q. (DELEGATION OF POWERS ON MARINE POLLUTION CONTROL) Order 1994
18. E. Q. (PROHIBITION ON THE USE OF CONTROLLED SUBSTANCE IN SOAP, SYNTHETIC DETERGENT AND OTHER CLEANING AGENTS) Order 1995
19. E. Q. (CONTROL OF EMISSION FROM DIESEL ENGINES) Regulations 1996
20. E. Q. (CONTROL OF EMISSION FROM PETROL ENGINES) Regulations 1996

Related Environmental Legislation under other Acts

- Customs (Prohibition of Export)Order(Amendment)(No.2) 1993
- Customs (Prohibition of Import)Order(Amendment)(No.2) 1993
- Continental Shelf Act, 1966.
- Fisheries Act 1963, Amended 1985.
- Water Enactment.
- National Land Code 1965.
- The Exclusive Economic Zone Act 1984. Ref to EEZ under International Conventions and Legislation.
- The National Forestry Act 1984.

Related Environmental Legislation under other Acts

- The Petroleum Mining Act 1966.
- Land Conservation Act 1960.
- Mineral Development Act, 1994
- Factories and Machineries Act, 1967
- Protection of Wildlife Act, 1984
- National Parks Act, 1980
- Town and Country Planning Act, 1976
- Local Government Act, 1976
- Appropriate state and local legislation

International Conventions and Legislation

- United Nations Convention on Law of the Sea (1982)
- Basel Convention
- Montreal Protocol
- International Convention for the Prevention of Pollution from Ships (MARPOL) 1973
- Ramsar Convention
- Convention on Biological Diversity
- Convention on International Trade in Endangered Species
- Kyoto Convention
- London Guidelines

Other Methodologies for Impact Evaluation

- Comparative evaluation of alternatives
- Cost and monetary valuation techniques
- Ranking/Scoring and Weighting and Multi-criteria Methods

Comparative Evaluation of Alternatives

- Qualitative approaches
- Quantitative approaches
- Ranking, rating or scaling approaches
- Weighting approaches
- Weighting-ranking/rating/ scaling approaches

Cost and Monetary Valuation Techniques

- Partial Approaches
  - Financial appraisal
  - cost effectiveness
- Comprehensive Approaches
  - Cost Benefit Analysis
  - Planning Balance Sheet
- Monetary Valuation Techniques
  - Direct household production function
  - Direct hedonic price methods
  - Direct experimental markets
  - Indirect methods

Partial Approaches

- Financial Appraisal
  - concern with the stream of financial costs and returns associated with an investment
- Cost Effectiveness
  - focus on the selection of an option that achieves a goal at least cost

Comprehensive Approaches

Cost Benefit Analysis (CBA)

- based on welfare economics and attempts to include all relevant costs and benefits in order to evaluate the net social benefit of a project
- to measure in monetary terms
- future annual flows of cost and benefits are discounted to net present value
- interest rates
- monetary values on intangible costs and benefits

Comprehensive Approaches

Cost Benefit Analysis (CBA)(cont.)

- Environmental impacts ~ intangible
- Deciding on the appropriate discount rate
- Discounting attaches a lower weight to benefits and costs in the future - work against the interests of future generation
- Example:
  - Project expected to generate substantial environmental damage far in the future.
  - Conservation projects aimed at protecting endangered species
  - Higher discount rate encourages higher resource extraction rate

Example of Investment Appraisal

This small calculation model shows the costs and benefits of the dam project using various discount rates			NPV at Discount rate	NPV at Discount rate	NPV at Discount rate:
	No of years	Cost or benefit	10%	3%	0%
Dam construction cost today		200	200	200	200
Environmental and other costs per year for number of years	50	10	99	257	500
Total cost (NPV)			**299**	**457**	**700**
Dam benefit per year for no of years	10	60	369	512	600
Difference (Benefits - costs)			**70**	**55**	**-100**

Comprehensive Approaches

Cost Benefit Analysis (CBA)

- Planning Balance Sheet (PBS)
- adaptation of CBA
- attempts to identify, enumerate and evaluate the distribution of costs and benefits between affected parties

Monetary Valuation Techniques

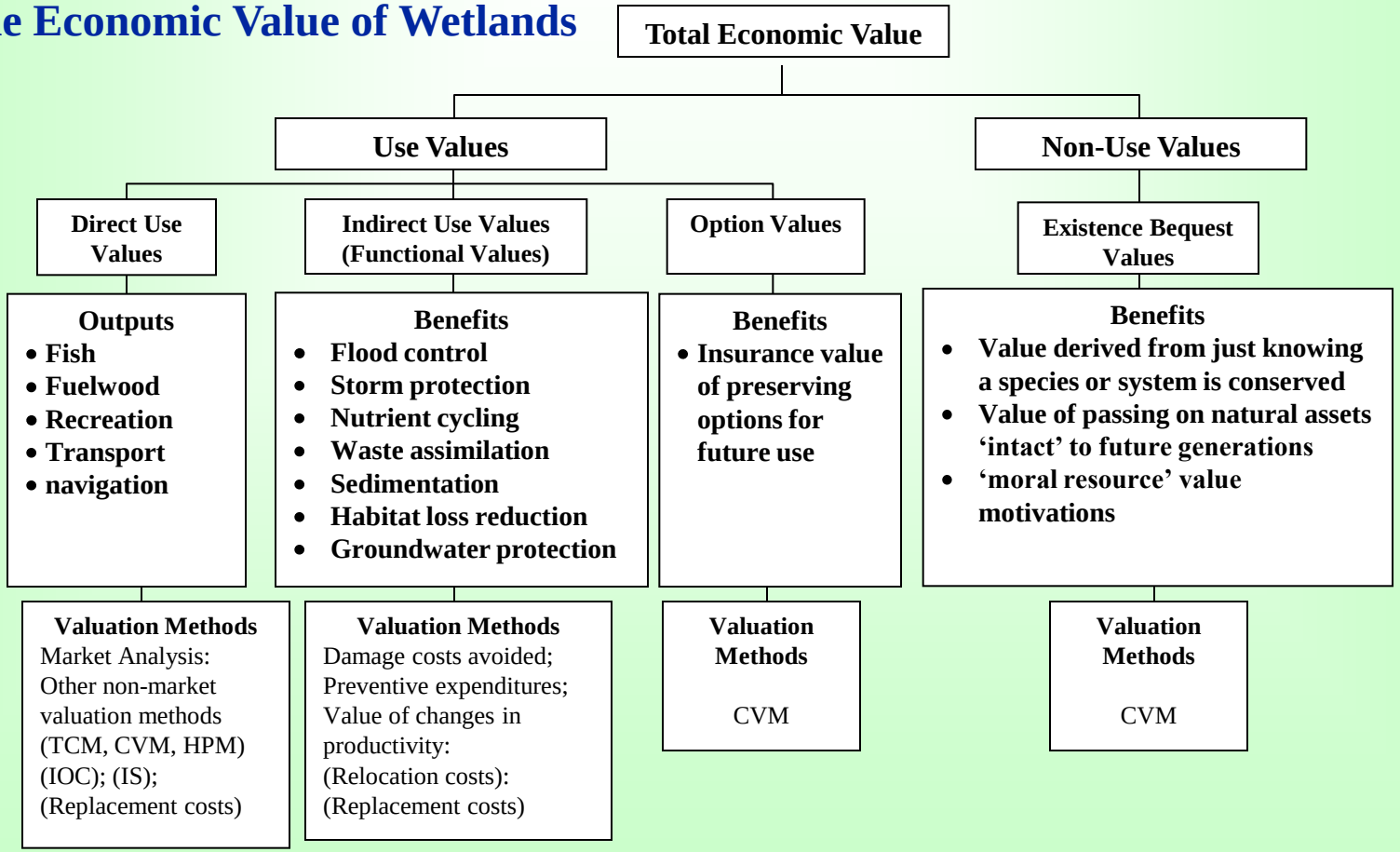
- Direct household production function
  - Avertice expenditures
- Direct hedonic price methods
  - Hedonic house/land prices
  - Wage risk premia

Monetary Valuation Techniques (cont.)

- Direct experimental markets
  - Contingent valuation method
  - Contingent ranking method
- Indirect methods
  - Indirect market price approach
  - Effect on production approach

Example

The Economic Value of Wetlands



Exercise 4-1

Cost and Benefit Analysis in EIA Study

- Examine the comparison of options (table 1) in Annex 10.
- Evaluate generally the validity of the information provided
- Establish some criteria for evaluation

Non-Monetary Valuation Techniques

- Multiple-criteria and multiple-attribute methods
- Scoring and weighting system
- Matrices
- Decision analysis
- Delphi approach

Ranking/Scoring and Weighting and Multi-Criteria Methods

- **Scoring:**
  - to standardise the impact scores in order to compare and evaluate different options
  - uses quantitative or qualitative scales
- **Weighting:**
  - to identify the relative importance of environmental impacts for which scores are already available
- **Matrix:**
  - Leopold matrix measures significance and magnitude

Example - Different Scoring System

Method	Alternatives				Basis of score
	A	B	C	D	
Ratio	65	62	71	75	Absolute L10dBA
Interval	0	-3	+6	+10	Difference in L10dBA using A as a base
Ordinal	B	A	C	D	Ranking according to ascending value of L10dBA
Binary	0	0	1	1	0=less than 70 L10dBA 1=70L10dBA or more

Example - Simple Ranking Technique

Magnitude		Extent		Duration	
High/major (M)	60	Regional (R)	60	Long-term (LT)	20
Moderate (MO)	20	Local (L)	20	Medium-term (MT)	10
Minor (MI)	10	Site specific (SP)	10	Short-term (ST)	5

Impact Categorisation

ISSUE	MAGNITUDE	EXTENT	DURATION
Reduced downstream water supply	Minor	Local	Long-term
Reduced downstream water quality	Minor	Local	Long-term
Increased downstream sediment transport	Minor	Local	Long-term
Increased downstream scouring	Minor	Local	Long-term
Deteriorating reservoir water quality	Major	Site-specific	Long-term
Increased erosion in general due to project	Major	Local	Long-term

Ranking Impact Categorisation

Issues	Magnitude	Extent	Duration	Total
Reduced downstream water supply	10	20	20	50
Reduced downstream water quality	10	20	20	50
Increased downstream sediment transport	10	20	20	50
Increased downstream scouring	10	20	20	50
Deteriorating reservoir water quality	60	10	20	90
Increased erosion in general due to project	60	20	20	100

Relative Impact Probabilities

Issue	Water Supply Scheme		
	Melamchi	Modified	Lower Roshi Khola
Reduced downstream water supply	0.1	0.1	0.2
Reduced downstream water quality	0.1	0.1	0.2
Increased downstream sediment transport	0.1	0.1	0.2
Increased downstream scouring	0	0	0.2
Deteriorating reservoir water quality	0.2	0.4	0.6
Increased erosion in general due to project	0.4	0.4	0.2

Result Comparison of Three Schemes

Issue	Water Supply Scheme		
	Melamchi	Modified	Lower Roshi Khola
Reduced downstream water supply	5	5	10
Reduced downstream water quality	5	5	10
Increased downstream sediment transport	5	5	10
Increased downstream scouring	0	0	10
Deteriorating reservoir water quality	18	36	54
Increased erosion in general due to project	40	40	20
Total	73	91	114

Weighting, Scoring and Trade-offs

Impact Type	Weight	Scheme A		Scheme B	
	(w)	score (a)	(aw)	score (b)	(bw)
Noise	3	5	15	1	3
Loss of flora	4	1	4	3	12
Air pollution	3	2	6	2	6
Total			25		21

Weighting attempts to identify the relative importance of environmental impacts for which scores are already available

Exercise 4-2

Ranking and Weighting System for Impact Evaluation

- Use the list of impacts identified for the Sg. Selangor case study
- Establish a ranking or weighting system for the impacts
- Compare the various options in the case study and present the 'preferred' alternative according to the evaluation system established

The Delphi Approach

- Widely used evaluation method
- Expert judgement of panelists to arrive at a decision concerning a project
- Used in DOE
- Way of collecting expert opinion and developing consensus about a topic of concern
- Cheaper, quicker and simpler

The Delphi Method (cont.)

Three steps:

- panel members independently identify key issues of a proposed development. A full list is drawn up based on the input of all members.
- The list is circulated and panel experts are requested to rank the impacts identified. The response is discussed in a group forum
- The panelists are asked to re-rank the impacts based on the group discussions.

After a number of rounds of discussion and re-ranking, the group will eventually arrive at consensus on the main issues and requirements.

Social Impact Assessment and Health Impact Assessment

- **Social Impact Assessment-**
  - included in EIA as part of the more general impact identification and analysis, and details on social issues are also included in the TOR for the project
  - Sociologist is needed in the EIA team
- **Health Impact Assessment-**
  - included in the EIA as a separate chapter in cases where health is expected to be a significant issue
  - Health specialist is needed in the EIA team

Exercise 4-3

Evaluation of Impact Evaluation Methodologies in EIA Study

- Select one EIA report
- Examine the impact evaluation methodologies employed by the consultant
- Present a summary of approach used
- Present an evaluation of the adequacy of the methodology
- Make recommendations

Exercise 4-4

Using Delphi Approach for identifying impacts

- Use information collected to date on the Sg. Selangor Case Study
- Select a Delphi co-ordinator
- Each group member should rank the top four impacts without discussion
- Co-ordinator will present the ranking of the groups and discuss
- Group members will re-rank individually the top four impacts.
- Co-ordinator will present the new rankings and determine whether consensus has been achieved