EWCE 431, SA

LO1

15/06

Environment and Social Impact Assessment (ESIA)

Objective

Assignment : Report + Presentation (summary of book)

Introduction to ESIA :

BRTA proj
bus lane

Defⁿ

Background

Key elements

ESIA process

Scoping : Aim ← ques of these type may arrive

Purpose

Example : Highway proj.

Baseline study : Purpose

Example

Alternatives : Purpose

Example

L02 22/06

ESIA process / Mitigation
Monitoring
Impact prediction & evaluation
Impact analysis steps
Identification
Interpretation on evaluation

On exam, a project may be given and asked to identify impacts.

Introduction to EIA

7 8 9 11

Ø Ø Find SDG relations to proj 13
Direct, indirect (may write separately)

L03 29/06

Objectives of EIA
Advantages
Disadvantages
Basic principles
Main functions
Sustainability ...
Stages – Preliminary assessment | Screening, IEE
Detailed "
Review process

CT during class hour (20th July)
Three topic
T/F, MCQ, short ques

L04 06/07

Scoping

Methods of scoping

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Auditing

EIA Study Techniques

CT 13/07/2026 Marks 20

1. ESIA
2. EIA

MCQ
T/F
} 50%

Short ques → 50%

EIA Methodology

Common methods

Checklists

Env. Impact value

$$EIV = \sum_{i=1}^{n} (V_i) W_i$$

- --

Matrices

LOG

20/07

Network:

Advantages / Disadvantages
Example

Cost - Benefit Analysis:

Simulation model workshop:

Overlays / GIs

Applications of EIA

Applications

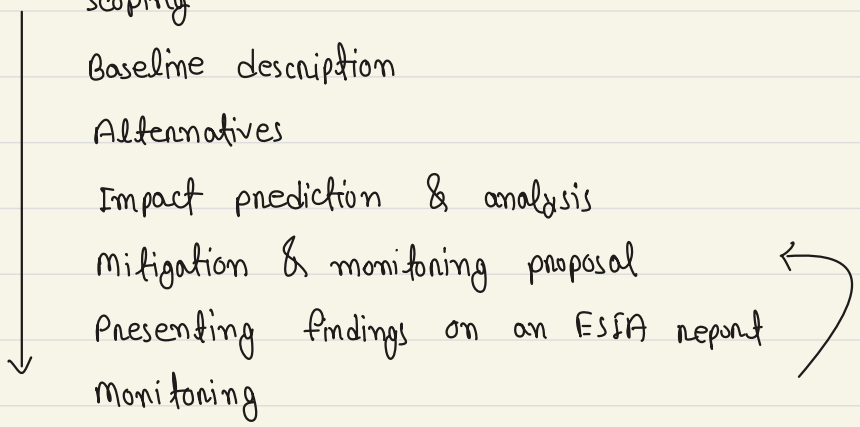
Rough / CT-2 27/07

ESIA (Env. & Social Impact Assessment)

A comprehensive framework used to evaluate both environmental and social consequences of a development project, ensuring regulatory compliance, sustainability, and social acceptance.

Produces ESMP → Env. and social Management Plan

ESIA Processes :



1. Scoping

Aim: i. Determine whether ESIA is required and what level of assessment.
ii. Set temporal, spatial and thematic boundaries of assessment.

Purpose: i. Identify key env. & social issues directly affected.
ii. Set up communication link between developer, regulator, community, and consultants
iii. Guides baseline methodology, required data, study model.
iv. Prevent costly project delay by identifying major constraints.

Example: For highway construction,

Boundary: 5 km buffer zone
Env. : Noise and air pollution
Social : Land acquisition, resettlement, roadside business
Stakeholders: Local residents, transport authority, env. NGOs

Baseline studies:

Aim: Collect quantitative and qualitative background data in pre-project state.

Purpose: Establish pre-project cond., serve as ref point for prediction.
Identify sensitive receptors (fragile ecosys).
Factual foundation for mitigation & monitoring plan.

Example: Hydropower project,

Env: fish species, river flow, sediment load
Social: household demographics, education lvl, health fac.
Cultural: Sacred sites along the d/s, fishing practices

Consideration of alternatives:

Aim: Systematically evaluate & compare different locations, design, forms, access routes, and technologies.

Purpose: i. Avoid / minimize impact
ii. Promote transparency
iii. Promote sustainability
iv. Support decision making

Example: Industrial plant
Location → Site A – near river, risk of contamination
B – away from it, transport cost
Technology → Coal fired boiler, natural gas, biomass
Design → Compact, expanded layout w/ green buffers
No-project → no profit

Mitigation:

Aim: 1. Strategies to avoid, minimize reduce or offset env. or social impacts
2 Find opportunities for env. enhancements.

Purpose: 1. Controls negative impacts while maximizing benefits.
2. Minimizes legal disputes, regulatory compliance
3. Ensures env. and socially sustainable.

Example: Hydropower, i. Install fish ladders
ii. Execute resettlement plan

Rough/ CT-2/ Cont. 27/07

ESIA report & management plan:

Aim: Document the entire assessment process into an integrated report featuring a non-technical executive summary.

Purpose: i) Delivers the end product – ESMP
ii) Outline actionable steps, mitigation, monitoring recommendations and institutional responsibilities.

Monitoring & env. auditing:

Aim: i) Track env. & social conditional data
ii) Conduct post-implementation analysis

Purpose: i) Verify compliance
ii) Measure effectiveness
iii) Provide adaptive measure
iv) Build trust

Categories: i) Baseline monitoring
ii) Compliance monitoring
iii) Impact & mitigation monitoring

Impact prediction & mitigation: (direct indirect cumulative)

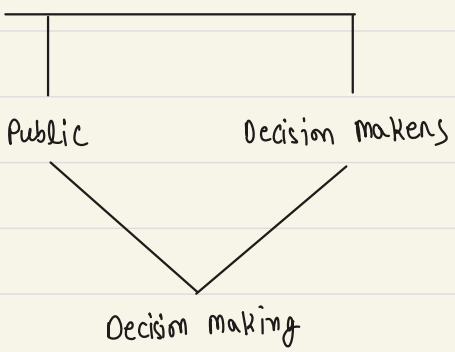
Aim: Forecast, quantify, and signify the potential consequences of a project.

Purpose: i) Anticipate potential env. & social changes
ii) Base for mitigation plan
iii) Transparency
iv) Identify good/bad impact

Example: Hydropower plant

i) Decrease fish pop → significant, long term
ii) Household displacement → resettlement, very significant
iii) Elec. gen. → good

Steps: Identification
Prediction
Evaluation
Mitigation
Communication



Potential impacts:

Upazilla road project:

Physio-chemical: Air quality
Noise
Natural drainage blockage
Roadside soil erosion
water & soil pollution

Ecological: Habitant separation
Aquatic life degradation
vegtation loss

Human-interest: connectivity (+)
Employment (+)
Displacement

Dams & embankment:

Physio-chemical: River current change
U/s water lvl increase
Internal waterlogging

Ecological: Fisheries migration disruption
wetland loss
Biodiversity loss

Human-interest: Flood protection
Agricultural product—
Fisheries' livelihood loss
Land acquisition
social conflict (fishories vs. farmers)

EIA — Environmental Impact Assessment

Defn: An assessment of the impacts of a planned activity or project on the environment.

Basic principles of EIA:

PSRI PRFEC PTC AE

1. Purposive
2. Systematic
3. Rigorous
4. Interdisciplinary
5. Practical
6. Relevant
7. Focused
8. Cost-effective
9. Efficient
10. Participative
11. Transparent
12. Credible
13. Adaptive
14. Integrated

Main functions:

1. To predict the problem
2. Find ways to avoid them
3. Enhance positive effects

Core values:

1. Integrity → fairness, objective, unbiased, balanced
2. Utility → support decision-making
3. Sustainability → protection & safeguards

L07 10/08

Economic Evaluation of EIA

Introduction

Purpose

Evaluation methods

Cost-Benefit analysis

Diff btwn CBA & CEA

Multi-criteria analysis

Lifecycle costing

env protection

economic growth

contradictory ?

complimentary can be?

L08

17/08

Mid: 1 ques; 15 marks
3 parts

Environmental regulation & legislation

Introduction

National Env. Policy – 1992

The National Env. Policy, 2018

Rough / Midterm 23/08

Lec 3 Methodologies

Why need EIA methodologies :

1. Procedure varies from country to country
2. Provides uniform standard
3. Ensure best possible info is available to public and decision makers.

Common methods :

1. Checklist : List of potential env. impacts to assess their impact type, duration, reversibility.

Three type → simple list
scaling list
Questionnaire checklist

Adv. :	Disadv. :
Easy to understand Good for site selection & priority listing	No action to impact link Don't distinguish direct vs. indirect impact.

2. Environmental Evaluation System:

$$EIV = \sum_{i=0}^{n} Vi \times Wi ;$$

V = change
W = weightage
} of param

(-) → adverse

(+) → net positive impact

3. Matrices: 2D grid crossing project action (hor. axis) with env. components (vert. axis).

Adv. Links action to impact Clear visual display of result.	Disad: Subject to scoring bias Doesn't separate direct/indirect

Env. component ↓ / Proj. activities →	Land clearing	Road cons.	waste disp
Air	dust (-2)	veh exhaust (-3)	toxicity (-5)
Job	temp (+1)	cons. job (+3)	+4

4. Network: Known as impact tree; maps primary, secondary and cumulative cause-effect linkage.

Adv.:	Disadv.:
Action to impact Direct / indirect separate	Can became complex easily Qualitative

Example: Dam construction

Action	Direct	Indirect	Cumulative Impact
Dam construction	Land submergence	Forest habitant loss	Biodiversity decline
Reservoir formation	Change in water lvl	sediment transport alteration	D/s erosion
Population migration	social disruption	Economic instability	Cultural loss

5. Cost Benefit Analysis: Systematic economic evaluation method that compares total project cost (capital + env. mitigation) with benefits (economic, env, social).

Adv.	Disadv.
Quantitative comparison of alts Economic efficiency with env. sustainability	Hard to monetize intangible benefits (e.g., biodiversity) Sensitive to choice of discount rates & assumptions.

6. Simulation Model workshop: Help participants to understand how computer based solutions can be used to predict, eval, visualize env. impacts under diff. scenarios.

Model input → Simulation → output → Decision

Adv	Disadv.
Forecasting bfn implement Quantitative output (map, graph, ...)	Require large high-quality datasets Results depend heavily on assumptions & param settings

7. Overlay / GIS: Composite thematic spatial map covering physical, social, ecological, aesthetic aspects in matching scale.

Easy to understand	Address only direct impacts
Good visualization	Don't address duration/probability

Lec 4 Applications

Applicability — significant, alternatives, clarity

- Apply to all projects expected to have significant impact & address all impacts expected to be significant
- Compare alts (incl. no-go)
- Produce clear report understandable by both technical & non-technical person.

Key applications :

1. Infrastructure projects:

Linear → focuses on habitat fragmentation
overpasses on underpasses for wild life
→ madhupur National Highway expansion project
developed ropeways for monkeys to pass
→ on elephant corridors (underpasses)

Aviation & maritime → focuses on noise and turbidity / dredging

2. Energy sector:

Renewable energy → visual assessment, turbine flicker eff
Migratory birds' flight path

Hydro-electric dams → Balance u/s flooding and d/s erosion & siltation.
Resettlement and Rehabilitation plan.

Extractive industries → AMD (Acid mine Drainage) mitigation.
(Oil/mining) Long term land reclamation.

→ Bonskhali Coal Power Plant

3. Industrial & Urban applications:

Manufacturing cluster: focuses on point source pollution
Determines ht of stacks, CETP capacity

Urban mega-projects: micro-climate changes, traffic load modelling, integrated waste management

→ Brick fields

4. Transboundary application:

River system → dam on international water
d/s water security
→ Tipaimukh dam

Transboundary pollution → Air pollution that crosses borders.

5. No-Go decision:

Zero option → eval what happens if proj. not built
Site selection → compare site A vs. site B

Log

31/08

Environmental Policies & Legislature

For exam: how we perceive

L10 07/09

Env. Management System (EMS)

L11 14/09

Review

Compulsory — ESIA, EIA (first 2)

Lec 1
- Page 6, 25 figure, description, example
- Page 30; Bangladesh perspective
- what is ESIA> EIA tool to identify ...
  scoping, Baseline

Each ques 10, 15 marks

Lec 2

Page 20; figure
example

Scoping

Audit, IEE (where used, where not)

No math
All theories

Lec 3

What is methodology
description

Lec 4

similar to MT (forest ⇆ agriculture)

Lec 5

methods, what it does, extensions

Lec 6

How law can be used, sustainability
Page 8, (1992, ...)
P 23, 24, 25. ... forestry, wild life, noise pol

Lec 7

what, example

- - -

Framework

model

Rough / Final 30/10

Lec 1

ESIA : A comprehensive framework used to evaluate both env. & social consequences of a dev. proj. ensuring their sustainability, regulatory compliance, and social acceptance.

ESIA process :

Scoping
Baseline descr.
Alternative considerations
Impact prediction & evaluation
→ Mitigation & monitoring proposal
Present findings in ESIA report
Monitoring

Scoping :

Purpose : Identify key issues — pinpoint them
Set boundaries
Engage stakeholders
Guide methodologies — which baseline study, methods, tools
Prevent surprise & delays later

E.g. — key issues : fisheries migration, sediment; boundary : 5km; stakehold ...

Baseline study : Collection of background data
Characterize the pre-state of proj.
Reference point

Purpose : Identify current state
Provides quantitative & qualitative data for impact prediction
Identify key receptors
Foundation for mitigation & monitoring phase

E.g., flow data, population

Alternatives : - - -
Location alt, technology alt, design alt, no-project alt

mitigation : ...
Fish ladders
Rehabilitation

Monitoring: Continuous assessment of env. or social variable via systematic collection of specific data.

Baseline monitoring
Compliance "
Impact & mitigation monitoring

Purpose: measure effectiveness
Detect change
verify compliance
Build trust

Impact prediction & evaluation:

Stage where potential impacts are identified, forecasted, quantified, and judge for their significance.

Includes — direct
indirect
cumulative impacts

Purpose: Anticipate env. & social change
Identify pos & neg impacts
Basis for monitoring & mitigation
support decision making

Impact identification
↓
Prediction
↓
Evaluation
↓
Mitigation measures
↓
Communication
↓
Decision makers
↓
Decision

Public

Example: Hydropower project

Impacts: fisheries, siltation, displacement
Prediction: decline fish pop
displace 200 household
Evaluation: fish — significant, long-term, (-)
displacement — highly sig, neg resettlement

Impact evaluation:

Spatial dim — nearby (odor), distant (acid rain)
Temporal dim — immediately (noise), later (bioaccumulation)
Benefit / adverse — (+) jobs, (−) displacement
Reversibility — perma (loss of agro-land), temp (noise construction)

Lec 2 EIA

main functions:

Predict problems
Find ways to avoid them
Enhance positive effects

Core values:

Integrity : fair, unbiased, obj., balanced
Utility : credible info for decision making
sustainability : env. safeguards

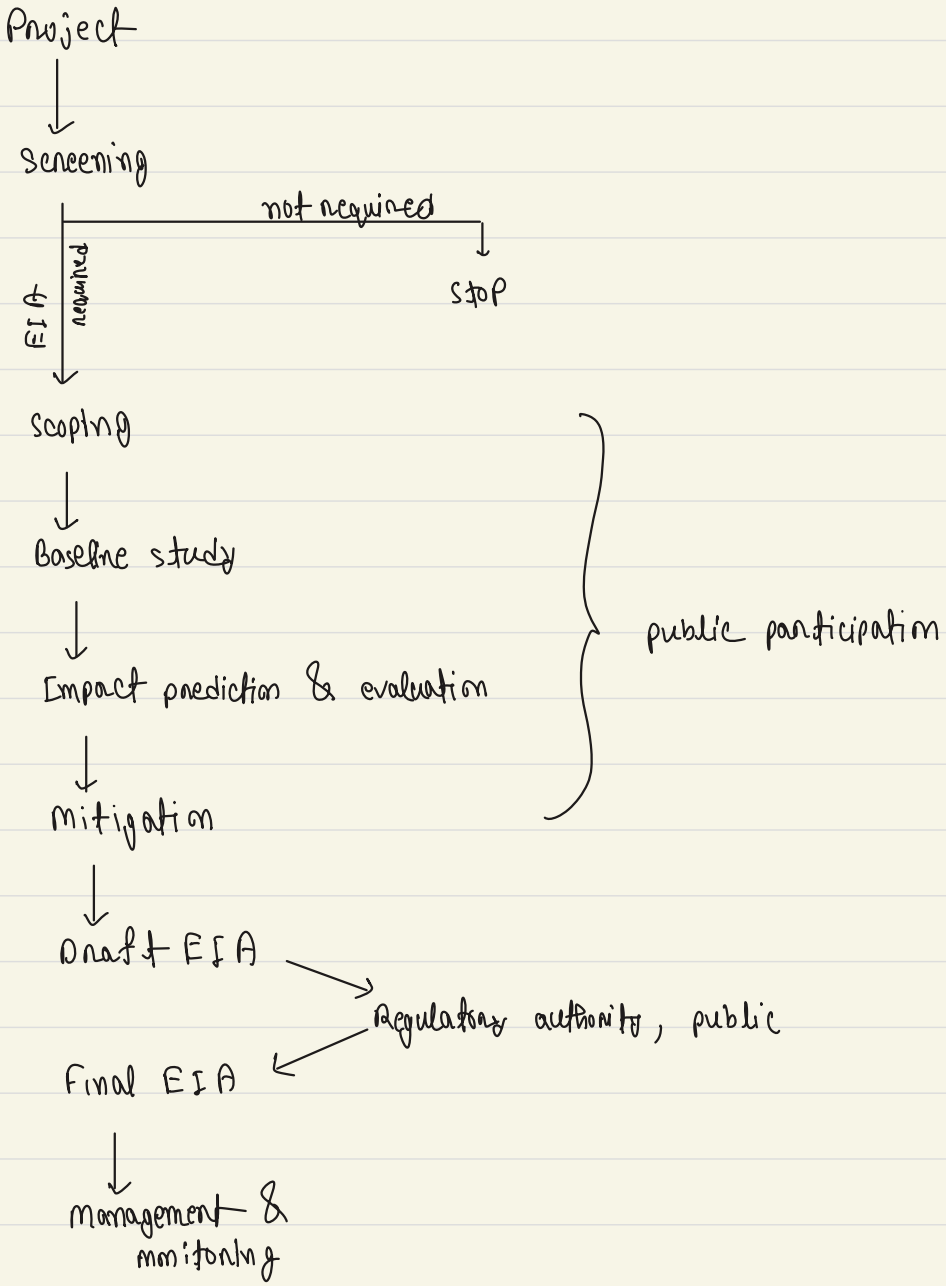
Example:

Integrity : eval. ecological, fish migration, human displacement impacts
ensures public voices are heared by public hearing

Utility : Compare three alt sites and provide comparative info to decision makers
Decisions to site with acquiring obj w/ least social cost

sustainability : Project integrates fish ladders for fish migration,
alt site required no human resettlement

Stages of EIA:



Screening :

Determines whether EIA is req and what level of EIA req

→ Full

→ IEE

→ No EIA

IEE ; Rapid & preliminary assessment of a proposed project or activity (usually of orange A or orange B) to identify potential impacts within a short time & budget

Scoping ; Identifies key env. & social attributes of public concerns upon which ESIA is to be performed.

Importance : identifies problem early so mitigation design can be adjusted before expensive work

Ensures detailed work is carried out only for impo issues.

methods of scoping ;

Make plan for public involvement
Assemble existing docs
Notify affected public
Identify key issues
Prioritize
Drop irrelevant issues
Make strategy for priority issues

Prediction & mitigation :

. . .

Management & monitoring :

Purpose: Compare predicted vs. actual

E.g.; monitor via remotely sensed data (satellite)

Auditing :

Last stage; done by independent team of specialists.
Checks adequacy on technical, procedural & decision making aspect
Technical aspect: adequacy of baseline study, accuracy of prediction, sustainability of mitigation measures
Determines whether recommendations were incorporated into implementation

EIA study techniques :

Baseline studies
Checklist
Network diagram
overlays
Expert devices
Economic technics
mathematical modelling

Lec 3 EIA methodologies

Checklist — listing of potential impacts
assess their nature
adverse/beneficial, short/long term, reversibility, significance

Three types — Simple List (qualitative)
Scaling checklist (quantitative)
Questionnaire checklist (qualitative)

Adv. simple, quick to understand
good for site selection, priority setting

Disad. doesn't link action-impact
doesn't distinguish direct-indirect

Environmental Evaluation System (EES)

$$EIV = \sum_{i=1}^{n} w_i v_i$$

w_i ← significance
v_i ← change, relative

matrix: action on x-axis, env. component on y

	Land clearing	Road constn.	Plant op.	Waste dip.
Air	Dust (-2)	Vehicle exhaust (-3)	Smoke (-4)	Toxic gas (-4)
Employment	Temp job (+2)	Temp (+2)	Perma job (+5)	Job (+2)

Adv. links action - impact
good to display

Disad. no direct - indirect
magnitude is judgemental

Network!

Extended matrix method that takes into account primary / secondary impacts.

Adv. action – impact linkage
direct – indirect distinction

Disadv. can become overly complex beyond simplified ver.
qualitative

Ex. Dam construction:

Action	Direct impact	Indirect impact	Cumulative impact
Dam constr.	Land submergence	terrestrial habitat loss	biodiversity loss
Reservoir	water stage change	altered sediment transport	erosion d/s
Population displacement	Social disrupt.	Economic instability	Cultural loss

Cost Benefit Analysis:

Systematic eval. in terms of economic adv.
compares benefits w/ cost of mitigation

Adv. Integrates env. impacts into financial decision makings
Systematic eval of alts
most efficient mitigation

Disadv. Hard to put economic val to intangible benefits
subjective

Simulation model workshop:

Use of computer models to predict, analyse, visualize env. impacts under diff conditions.

Adv. quantitative
forecast env. change before prop. implement

Disadv. req large, high-quality dataset
depend on assumption & params

Ex. groundwater contamination

input: eff. discharge rate, soil perm., rainfall

simulation: contaminant plume over 10 y

output: zone of conc.

decision: treatment units change loc, ...

input
↓
simulation
↓
output
↓
decision

Overlay / GIS:

stack of project area's map covering various aspects chars

↖ forest cover
soil erosion zone
human settlement

Adv. easy to understand
simple

Disadv. only direct
not prediction on impact duration

Lec 4 Application of EIA

Apply to all project expected to have significant impacts
address all impacts expected to be significant

Key applications:

Infrastructure proj
Energy "
mining & oil extraction "
Industrial & manufacturing "
Urban dev proj.
Agricultural & forestry proj.

Infrastructure proj. :

2. Linear proj (roads / railways) : focuses on habitat fragmentation.
Design involves overpass underpass for wild lives.

2. Maritime & aviation : noise contouring, dredging impact.

E.g, Padma Bridge

involved fisheries migration, human resettlement, hydrology

Energy proj. :

1. Renewable energy (solar wind): Focuses on visual impact. wind flickering, migratory birds path.
2. Hydro electric dam: wind range of focus — stage changes d/s silt ation, fisheries migration, displacement
3. Extractive: Focuses on Acid Mine Drainage and long term land reclaimation.

E.g; Barsikhali Coal power plant impact on air pollution, coastal ecosys damage, resettlement

Industrial & urban:

Manufacturing units: focuses on point source pollution
Mega proj.: micro-climate impact traffic modelling, waste management

E.g; Konabori brickfield a source of air pollution.

Transboundary application :

Used on pollution crosses regional boundaries ; one country affecting other.

River system: Construction of dams. D/s region can use EIA as a diplomatic tool to assess water security

Pollution: Used in EU regions to assess air pollution crossing boundaries; acid rain

E.g; Tipaimukh dam; Bangladesh raised concern via EIA about flooding, fishery decline, ...

The No-Go :

The "zero option": Eval what happens if proj. not built

Site selection: If site A contains "critical habitat"; relocation must.

E.g; Rampal Coal Power Plant

Lec 5 Economic eval

Assessment of financial cost & benefits for conducting EIA and implementing its recommendation.

Direct cost — consultancy, surveys
Indirect — delays, administrative processes
Mitigation cost — pollution control, safety measures

Ex. Textile industry

Direct cost: consultancy fee — feasibility study
Indirect: Delays due to govt. approval process
Mitigation cost: Installation of ETP
Benefits: Compliance w/ international standards allow export to EU market → revenue ↑

Purpose:

Cost saving
Risk reduction
Long term sustainability
Economic sustainability
Resource efficiency

Methods: Cost Benefit Analysis
Cost Eff Analysis
Multi-criterion Analysis
Life cycle costing

Cost Utility Analysis
Cost Minimization Analysis
Cost consequence Analysis
Social Cost Benefit Analysis

Cost-Benefit Analysis:

Evaluates total monetary costing (incl. mitigation) against total monetary benefit (economic, social, env).

Project is viable if NPV > 0 & B/C > 1

Application: Install ETP to prevent regulatory fines and gain access to broader market

Cost Effective Analysis:

Identifies the least cost option to reach a specific env. objective when benefits are hard to monetize.
E.g., benefits are intangible;

Cost Eff. Ratio (CER); cost/physical unit (output)

E.g., Choosing btwn diff water treatment methods based on cost/unit removed

Multi-criteria Analysis:

Evaluate project using multiple criteria — economic, env., social.
Both quantitative & qualitative
when impacts are multi-dimensional & can't all be reduced to monetary fig.

→ Economic 30%
Env. 40%
Social 30%

→ Elevated expressway — ↑cost + ↑env. sustainable
Bus Rapid Transit — ↓cost + ↑ "

Lifetime costing:

Assesses a projects entire lifetime costs from construction, operation to decomissioning

Shifts focus from short-term affordability to long-term sustainability

Capital + op + maintenance + EOL cost

E.g., hydropower proj. where decommissioning and resettlement costs are factored into total eco eval.

Lec 6 Laws & Regulation

National Env Policy 1992:

Approved in 1992 as the founding document of Bangladesh's overall env. protection and resource management framework.

It assigned responsibilities to the DoE and created the National Env. Council chaired by Head of Govt.

Aimed to prevent irreversible natural/env. resources exploitation & explicitely required EIA for all dev. projects.

Coverage:

- Agriculture
- Industry
- Health
- Energy
- Land
- Food
- Population
- Housing
- Fisheries
- Education
- Forest
- Science
- water dev
- Coastal
- Communication

National Env. Policy 2018: Polluter-Pays principle

An updated comprehensive framework of sustainable development focused on pollution control, resource management, biodiversity, climate chng adaptation

Key obj.: sustainable dev
pollution cont.
res management
climate chng adaptation
public awareness

Focus area: Land & water res
Food & Public Health
Air pollution
Energy & Industry
Urbanization
Coastal & marine
Disaster management
Forest & Biodiversity

Key subject matters:

1. Polluter - Pays Principle
2. Sustainable dev through reduction of human pressure on nat.
3. Preventive measure over curative
4. 3 Rs
5. Prioritize rights & access of underprivileged communities dependent

Noise pollution: section 20 of BECA

1. No motor honking 100 m rad of hospital, school office
2. No brick crusher 500 m rad of residential zone
3. Prior permission before using mega phones or loudspeakers in public
4. Prescribed decibal threshold for others.

Forestry protection:

1. Protection of remaining forests in the country & restoration of 20% land through afforestration programs.
2. Protect representative flora & fauna in one area of forest, not parks, ...
3. Sustained multi-use management of forests fisheries

Fisheries protection:

1. Conserve inland and marine aquatic ecosystem to safeguard primary source of animal protein of population
2. Applies to all waterbodies capable of fisheries production e.g.. canal, lake, haor, baor, floodplains, ...

Wild life conservation :

Enacted specifically for the conservation, protection of wild animals, and fauna, under the purview of forestry Dept.

critical terrestrial & aquatic ecosys for protection & conservation.

Lecture 7 EMS ISO 14001: 2015

System of managing env. risk within daily org. activities
Based on Plan-Do-check-Act model
focused on continual improvement of system.

Example:

A textile company adopts ISO 14001: 2015

Policy: Reduce env. impacts
Planning: Identifies wastewater disch, chemical use, energy consumption.
Implementation:

ETP for wastewater
eco-friendly chemicals
energy eff. machineries

Why: Reduce liability & risk — identify hazardous env. problems early

→ use of energy eff. lights cuts electricity cost
gets recog as env. concerned company

Core elements of EMS:

1. Env policy
2. Env. Action Plan
3. Org struct
4. Implementation & op.
5. Monitoring & measurement
6. Review & cont. impn.
7. Integration of env. concern

Framework of EMS:

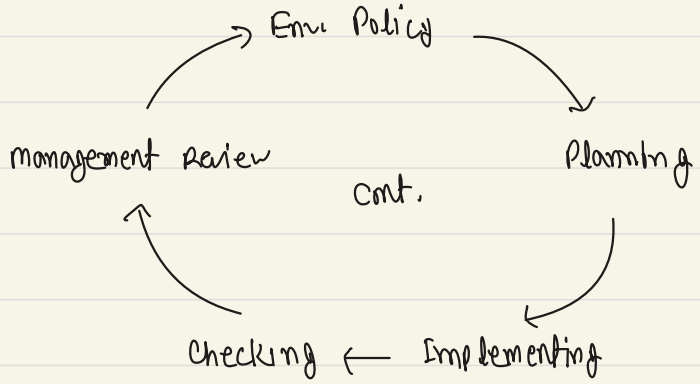
Plan: Establish the objective and processes necessary to output result in accordance w/ org env. policy

Do: Implement the processes

Check: monitor & check results against env. policy, obj., targets, etc conduct audit & report the result

Act: Review EMS and take action to continually improve.

Ems model :



Steps :

1. Identify env. aspects & undertake risk assessment
2. Develop env. policy
3. Env. objective
4. Key perf. indices
5. Plan
6. Implement
7. Check / correct
8. Cont. improvements