Environmental Mitigation & Monitoring

Definitions

- Mitigation
  - the implementation of decisions or activities designed to reduce the undesirable impacts of a proposed action on the environment
  - includes:
    - ➔ prevention
    - ➔ remediation
    - ➔ ongoing maintenance and operating practices
    - ➔ offsetting actions

Definitions

- Environmental Monitoring
  - systematic measurement of *key environmental indicators* over time, and within a particular geographic area
    - ➔ geographic area=area in which environmental impacts of the project may be significant (a body of water, a watershed, an ecosystem, a country, a multi-country region)
    - ➔ indicators=signals of/proxies for environmental or ecosystem health (e.g., a key species)
  - Env. Monitoring is an aspect of overall monitoring of project results

Relation to environmentally sound design

- Both mitigation and monitoring are necessary elements of environmentally sound design
  - mitigation = minimizing adverse environmental impacts
  - monitoring = necessary complement to mitigation

Summary

- The process of environmentally sound project development does not stop when project or program environmental effects have been identified or decisions have been reached.

Mitigation and monitoring for conservation-based projects

- Monitoring of project results may equal environmental monitoring
- The project's activities may themselves be *environmental mitigation* measures designed to correct trends in the baseline situation

The mitigation plan

- Mitigation is planned and coordinated via a project's mitigation (or environmental management) plan.
- Mitigation plans include:
  - actual mitigation measures
  - specification of monitoring results that trigger mitigation
  - implementation details: *how*, *by whom*, and *with what funding* mitigation will occur

When are mitigation measures planned?

- **During design.** *Preferred.* Incorporating mitigation in design can result in:
  - prevention via changes to project or program configuration, content, implementation, timing, technology employed in some activities, material used, etc.; or
  - other mitigation, e.g. inclusion of operating practice specifications, corrective, rehabilitative or compensatory activities in bids and tenders.
- **During construction and implementation.** Monitoring uncovers adverse impacts that may jeopardize activities, the environment or the natural resource base.
- **After a project or program ends.** If there are results of adverse effects associated with the activities carried out, **the costs of mitigation may become significant**, e.g., toxic or radioactive waste cleanup, desalinization of soils, etc.

Mitigation Strategy by Activity Phase

Mitigation Strategy	Phase			
	Planning/ Design	Construction	Operation	Decommissioning
Avoid Impact				
Minimize or Diminish Effect				
Rectify by Repair or Rehabilitation				
Reduce or Eliminate over Time				
Provide Compensation				
Other				

Types of mitigation

See:

World Bank Sourcebook extract

Funding/Budgeting for mitigation

- The later mitigation is considered, the greater the costs may become.
- If mitigation costs appear too high, consider redesigning or rethinking interventions.
- Effective mitigation design should not significantly increase project or program costs.

Sustainability of mitigation

Sustainability of mitigation activities depends on:

- availability of funds
- rank in the priority scale of decision-makers
- effectiveness as a problem solving tool
- incorporation in tenders, implementation plans, and monitoring

Environmental monitoring

- Monitoring requirements
  - Reg 216 requires monitoring where EAs have been prepared
  - Monitoring strongly recommended in other cases where forecasted impacts are uncertain
  - Extent of monitoring based on severity of expected environmental impacts

- Categorical Exclusions (Category 1): typically **will not** require extensive monitoring, evaluation, or mitigation.

- **Activities with some foreseeable potential adverse impacts on the environment.**
  - ➔ Monitoring to some degree during life of activity to make sure adverse impacts on environment are minimized;
  - ➔ Mitigation measures likely required such as avoidance or changes in design.

- **Activities with potential for significant negative impacts.**
  - ➔ Responsible monitoring program that can be incorporated into the project; and
  - ➔ Comprehensive review and identification of mitigative measures.

Environmental monitoring plan

- Monitoring is planned and coordinated via the monitoring plan
  - should be integrated with the mitigation plan
- Monitoring plans should clearly identify
  - indicators used, level of detail, analysis performed, and dissemination
  - institutions responsible
  - funding mechanisms
  - triggering events

Gathering, analyzing, and disseminating data

- These are need-driven activities
  - focus on most significant impacts identified by the EIA process
- Cost of data collection and analysis is driven by:
  - temporal resolution: how often data is collected
  - spatial resolution: how widely (or closely) spaced data points are

Gathering data: example indicators

- **Water:**
  - quantity, quality, reliability, accessibility
- **Soils:**
  - erosion, productivity, land resources and their potential, fallow periods
- **Vegetation / Flora:**
  - permanent vegetation ratio, composition and density of natural vegetation, cleared zones, productivity, key species
- **Fauna:**
  - populations, habitat
- **unique zones & special ecosystems**

Gathering, analyzing, and disseminating data

- Objective:
  - least cost/simplest indicator set and level of detail that meets environmental objectives.
  - Key considerations:
    - ➔ data needs often overestimated.
    - ➔ time and cost required for data analysis usually underestimated
    - ➔ timing and frequency of data collection depends on project timetable and seasonal factors.
    - ➔ Requirements for baseline and close-out data often ignored

The problem of the counterfactual

- when monitoring reveals changes, the key question is: are they due to the project?
- Requires knowledge of the counterfactual--what would have happened in the absence of the project
- The problem: counterfactual is imaginary or hypothetical

The problem of the counterfactual

- Good monitoring strategies are designed to provide a *continuous benchmark* of "background" or "normal" change. E.g.:
  - monitor actual project, plus a similar non-project area (a "control")
  - multiple stations/sampling locations
  - good baseline data, establishing normal variability of indicators

Gathering, analyzing, and disseminating data

- Analysis and dissemination
  - analysis: raw environmental data not useful to decision makers
    - ➔ e.g., leaves of a indicator species turn yellow. What does this mean? Soil quality change? Water quality change? More mitigation?
  - dissemination: data is not useful unless it is in the hands of decision-makers in a timely manner

Gathering, analyzing, and disseminating data

- Dissemination:
  - List all potential users, and what they need the information for;
  - Determine format most suitable for their use;
  - Determine level of accuracy and reliability required;
  - Devise suitable reporting format and the dissemination mechanism.

Who conducts the monitoring?

- Environmental monitoring plan should specify
  - *who*, specifically, collects *which information*
  - who manages the information
- key considerations:
  - conflict of interest--need for an independent firm or institution?
  - local participation? (can be a way to stretch monitoring resources)

Funding

- Historically, funding has been inadequate
  - usually because monitoring requirements considered as an afterthought
  - monitoring plan development--not just the monitoring itself--requires resources and time.
  - Project/funding cycles are 5 yrs max; environmental impacts may occur over decades.

Funding

- Key questions for funding:
  - how long will the monitoring be needed
  - What human, financial and material resources will be required over the monitoring period?

Project management tactics

- Goal: avoid the situation in which "there's no time left to do it right"
  - problem: M&M plans can't be finalized until environmental impacts are assessed
  - some tactics:
    - ➔ TORs need to spell out clearly # days to be devoted to M&M workplan development
    - ➔ EIA team leader chosen in part on M&M qualifications
    - ➔ Involve field staff early in mitigation and monitoring plan development; field test the plans