

“Capacity Building and Strengthening Institutional Arrangement”

Workshop: “Environmental Impact Assessment (EIA)
(for Assessors)”

Environmental Impact Report Assessment

Mitigation and Monitoring

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Mitigating Measures

Action taken to prevent, avoid or minimise the actual or potential adverse effects of a project.

The measure could include the abandoning or modifying of a proposal, substitution of techniques using BATNEEC (Best Available Technology Not Entailing Excessive Costs).

This would include the various pollution abatement techniques that would be required to reduce emissions to the legal limits.

Mitigating Measures

UE Directive include mitigation measures and environmental monitoring

Definition

Mitigation is defined as 'measures aimed at minimising or even cancelling the negative impact of a plan or project, during or after its completion'

Mitigating Measures

Approach to mitigation	Preference
Avoid impacts at source	Highest
Reduce impacts at source	
Abate impacts on site	
Abate impacts at receptor	
Lowest	

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

SECTION 5 DESCRIPTION OF MITIGATION				
No.	Review Question	Relevant?	Adequately Addressed?	What further information is needed?
5.1	Where there are significant adverse effects on any aspect of the environment is the potential for mitigation of these effects discussed?			
5.2	Are any measures which the developer proposes to implement to mitigate effects clearly described and their effect on the magnitude and significance of impacts clearly explained?			
5.3	If the effect of mitigation measures on the magnitude and significance of impacts is uncertain is this explained?			
5.4	Is it clear whether the Developer has made a binding commitment to implement the proposed mitigation or that the mitigation measures are just suggestions or recommendations?			

5.5	Are the Developer's reasons for choosing the proposed mitigation explained?			
5.6	Are responsibilities for implementation of mitigation including funding clearly defined?			
5.7	Where mitigation of significant adverse effects is not practicable or the developer has chosen not to propose any mitigation are the reasons for this clearly explained?			
5.8	Is it evident that the EIA Team and the Developer have considered the full range of possible approaches to mitigation including measures to reduce or avoid impacts by alternative strategies or locations, changes to the project design and layout, changes to methods and processes, "end of pipe" treatment, changes to implementation plans and management practices, measures to repair or remedy impacts and measures to compensate impacts?			
5.9	Are arrangements proposed to monitor and manage residual impacts?			
5.10	Are any negative effects of the proposed mitigation described?			

Post-decision monitoring and impact assessment

Some legislation does note the need for monitoring after a project receives its licence.

From Espoo

- (e) A description of mitigation measures to keep adverse environmental impact to a minimum;
- (h) Where appropriate, an outline for monitoring and management programmes and any plans for post-project analysis;

ESPOO

Article 7 POST-PROJECT ANALYSIS

1. The concerned Parties, at the request of any such Party, shall determine whether, and if so to what extent, a post-project analysis shall be carried out, taking into account the likely significant adverse transboundary impact of the activity for which an environmental impact assessment has been undertaken pursuant to this Convention. Any post-project analysis undertaken shall include, in particular, the surveillance of the activity and the determination of any adverse transboundary impact. Such surveillance and determination may be undertaken with a view to achieving the objectives listed in Appendix V.
2. When, as a result of post-project analysis, the Party of origin or the affected Party has reasonable grounds for concluding that there is a significant adverse transboundary impact or factors have been discovered which may result in such an impact, it shall immediately inform the other Party. The concerned Parties shall then consult on necessary measures to reduce or eliminate the impact.

ESPOO APPENDIX V POST-PROJECT ANALYSIS

Objectives include:

- (a) Monitoring compliance with the conditions as set out in the authorization or approval of the activity and the effectiveness of mitigation measures;
- (b) Review of an impact for proper management and in order to cope with uncertainties;
- (c) Verification of past predictions in order to transfer experience to future activities of the same type.

Source: www.iene.info
(If no specificate)

Traffic Tunnel

The photo shows an old and a new way of building motorways
 in Norway



Effects on habitats

Barrier Canals with a bank construction of sheetpiles of steel are an absolute barrier for crossing animals



Bank fauna passage

Canals with a bank construction of sheetpiles of steel are an absolute barrier for crossing animals



Environmental friendly river banks



Fauna-exit at waterside of sheetpiling



Fauna-exit at waterside of sheetpiling



Fauna-exit at landside of sheetpiling



Fauna-exit



Mitigation measures - Fauna passages - Small wildlife tunnels



Small wildlife tunnel under A1 small passages motorway, tunnel, small wildlife

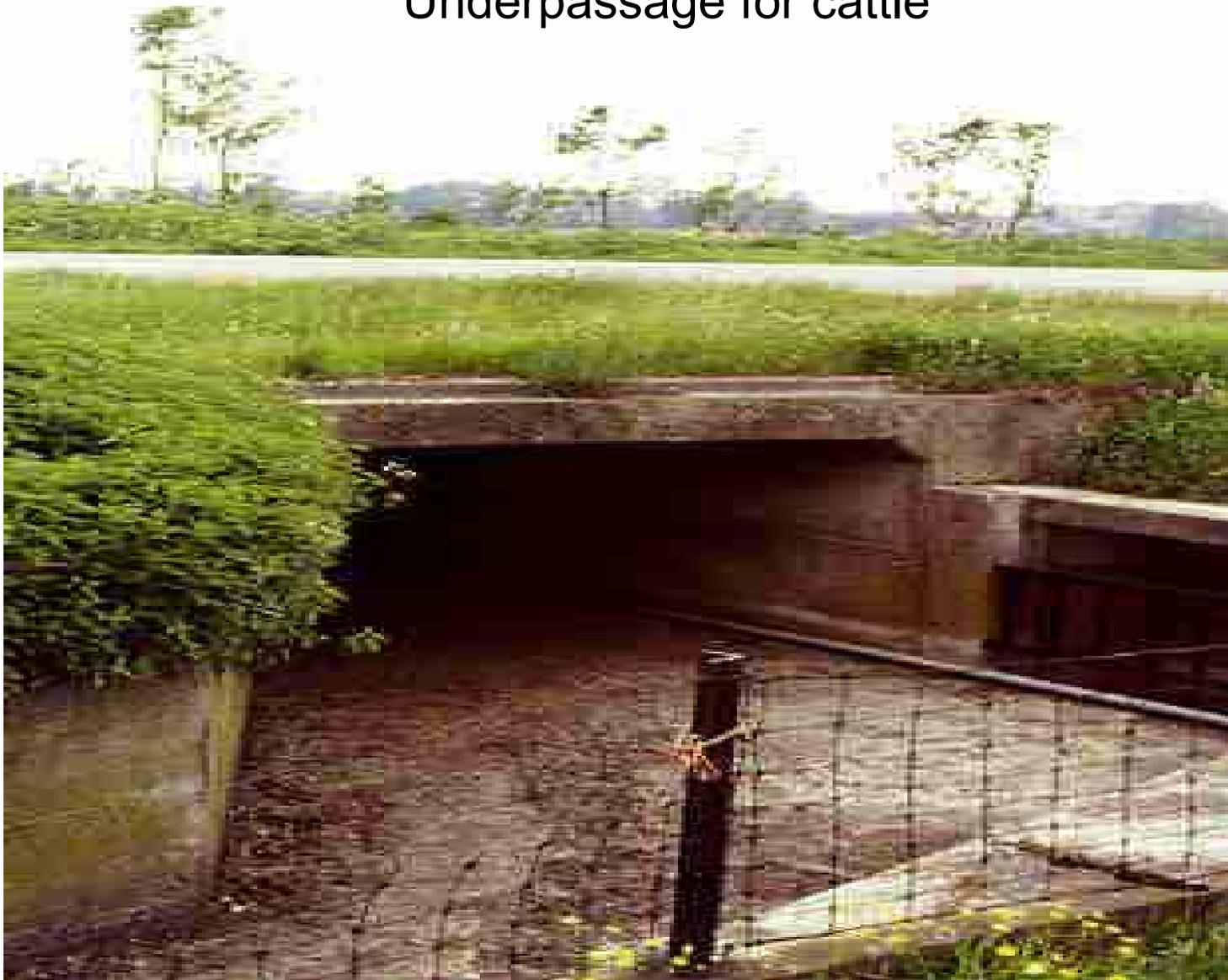


Badger tunnel fence, badger tunnel



Large mammals tunnel

Underpassage for cattle



Ecoduct Woestehoeve overpassage



Ecoduct
www.iene.info

Adaptation of existing infrastructure: Bridges

Fauna passage under bridge



Fauna passage under bridge over river



Viaducts



Adaptation of new infrastructure

Eco-culverts Culvert adapted for fish - The culvert is equipped with lamellae to prevent the culvert from drying out at low water. Salmon trout is spawning in the brook



Ecoduct for fish nearby ENEL's
 (National Agency for Electric Energy)
 artificial dam sited in the village of
 Soverzene (Italy)

Author: Dr. Mauro Ferri,
Aquaprogram (consultant)



Bridges in Switzerland

Underpassage for big mammals



Bridge crossing a wetland

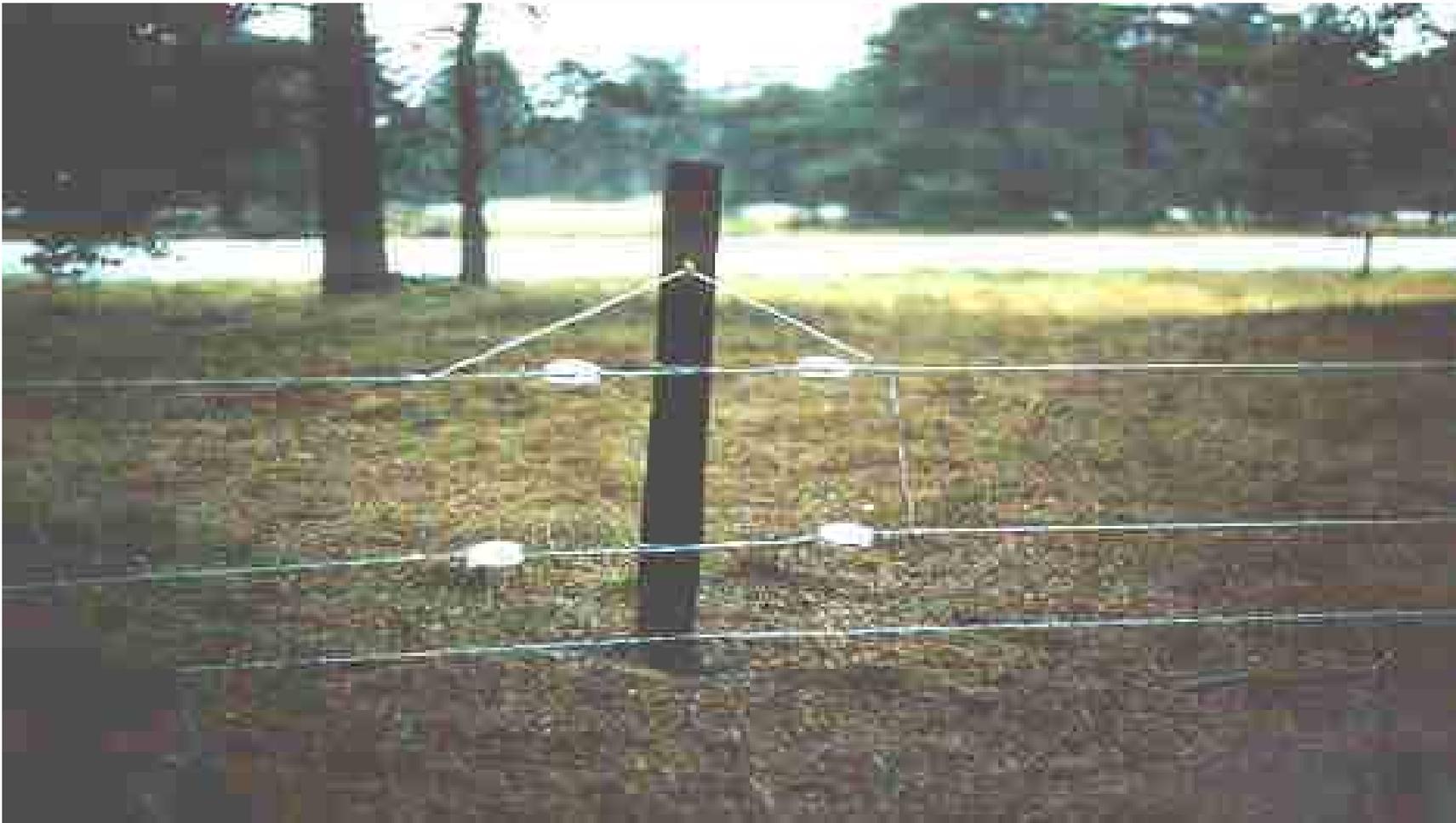


Other methods

Passage under road



Electric fencing



Combined fencing

One-way exit gate for small mammals



Conducting amphibians along the road- amphibian protection



Amphibian passage



Noise reducing measures Light and view reducing measures

Warning mirrors for fauna



Joint use measure: water, cyclists, fauna



Examples of compensation



Compensation measure implemented for the construction of RW 35



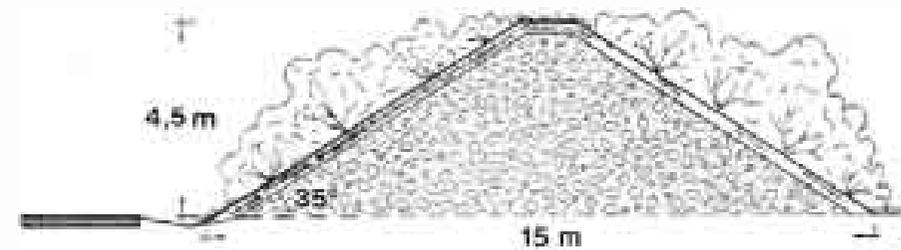
Mitigative measure against noise and prevent bird collision



Anti-noise barriers with no-crash silhouette

Italian Ministry of the Environment, Territory and Sea Protection - EIA Commission - "X - guidelines with graphical and photo documentation - Proposal of technical directive on mitigation and environmental compensation interventions, by means of green works, of great infrastructural projects submitted to EIA procedure", 2003

Mitigative measure against noise



Vegetative Embankment with Natural Inclination

Italian Ministry of the Environment, Territory and Sea Protection - EIA Commission - "X - guidelines with graphical and photo documentation - Proposal of technical directive on mitigation and environmental compensation interventions, by means of green works, of great infrastructural projects submitted to EIA procedure", 2003

Remediation for Mineral extraction Project



Italian Ministry of the Environment, Territory and Sea Protection - EIA Commission - "X - guidelines with graphical and photo documentation - Proposal of technical directive on mitigation and environmental compensation interventions, by means of green works, of great infrastructural projects submitted to EIA procedure", 2003

Mitigative measure for operational area



Italian Ministry of the Environment, Territory and Sea Protection - EIA Commission - "X - guidelines with graphical and photo documentation - Proposal of technical directive on mitigation and environmental compensation interventions, by means of green works, of great infrastructural projects submitted to EIA procedure", 2003

Ripristino cave



Quarry reclamation 1

Italian Ministry of the Environment, Territory and Sea Protection - EIA Commission - "X - guidelines with graphical and photo documentation - Proposal of technical directive on mitigation and environmental compensation interventions, by means of green works, of great infrastructural projects submitted to EIA procedure", 2003

Ripristino cave



Quarry reclamation 2

Italian Ministry of the Environment, Territory and Sea Protection - EIA Commission - "X - guidelines with graphical and photo documentation - Proposal of technical directive on mitigation and environmental compensation interventions, by means of green works, of great infrastructural projects submitted to EIA procedure", 2003

Environmental monitoring

Environmental monitoring assures the effectiveness of the EIA process. Strengthened monitoring is thus integral to the process of improving EIA formulation, decision-making, and implementation.

Several measures would be conducive to more effective monitoring:

- (a) There is an urgent need for stronger legislative and regulatory frameworks that require postproject decision-making and impact management;
- (b) Monitoring should be applied to all projects, regardless of size or ownership (public and private);
- (c) Private monitoring companies could be established, licensed and contracted by the Government to overcome the problem of inadequate human and technical resources;
- (d) There could be recourse to various financial instruments to secure adequate funds for monitoring.

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
<i>Avoid Impact</i>				
<i>Minimize or Diminish Effect</i>				
<i>Rectify by Repair or Rehabilitation</i>				
<i>Reduce or Eliminate over Time</i>				
<i>Provide Compensation</i>				
<i>Other</i>				

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

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

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

Environmental monitoring

The financial burden of monitoring imposed on a project should be correlated to the following variables:

- (i) Size of the project;
- (ii) Significance of the project's environmental impacts;
- (iii) Human and environmental risks attached to the project's potential (and actual) impacts;
- (iv) Technology adopted for protecting the environment, including end-of-pipe technologies vs. environmentally clean production technologies;
- (v) The project's environmental compliance record.

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

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

Categorical Exclusions: 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:
- **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

Gathering, analyzing, and disseminating data

When monitoring reveals changes, the key question is: are they due to the project?

- Requires knowledge of what would have happened in the absence of the project
- 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)

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.

–how long will the monitoring be needed

–What human, financial and material resources will be required over the monitoring period?