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Principles of Environmental Mitigation and Monitoring

Definition of mitigation

Mitigation is. . .



The implementation of measures designed to reduce the undesirable effects of a proposed action on the environment

How does mitigation reduce adverse impacts?

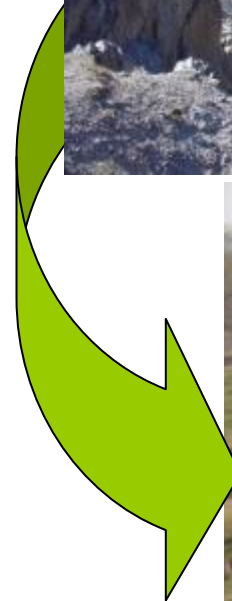
Type of mitig measure	How it works	Examples
Prevention & Control measures	<p>Fully or partially prevent an impact/reduce a risk by:</p> <ul style="list-style-type: none"> ▪ <i>Changing means or technique</i> ▪ <i>Changing the site</i> ▪ <i>Specifying operating practices</i> 	<p>PREVENT contamination of wells, by SITING wells a minimum distance from latrines.</p> <p>OPERATE wastewater treatment system for a coffee-washing station.</p>
Compensatory measures	<p>Offset adverse impacts impacts in one area with improvements elsewhere</p>	<p>Plant trees in a new location to COMPENSATE for clearing a construction site.</p>
Remediation measures	<p>Repair or restore the environment after damage is done.</p>	<p>Re-grade and replant a borrow pit after construction is finished</p>

Example of Mitigation:

Operating practices to prevent & control impacts

❖ Irrigation

- **Potential impact:** *salinization of soils*
- **Mitigation:** *avoid water-logging by using improved on-farm water management, including placement of drainage structures.*



Example of Mitigation:

Change of site to prevent & control impacts

❖ Rural road construction

- **Potential impact:** route traverses nesting area for a threatened species of bird
- **Mitigation:**
Re-route road to avoid nesting site.
Also, minimize construction noise and other disturbance during nesting season



Prevention is best



Where possible, PREVENT impacts by changes to site or technique.



CONTROL of impacts with operating practices is more difficult to monitor, sustain.

Do I mitigate EVERY impact?

NOT NECESSARILY.

Mitigation is directed at two targets.

1 serious impacts

First, the most serious impacts identified by the EIA process should **ALWAYS** be mitigated.

2 easily mitigated impacts

After addressing the most serious impacts, there may be small impacts for which mitigation is easy and low-cost.

Definition: Environmental monitoring is BOTH. . .



1. Systematic measurement of key environmental indicators over time

(is the mitigation measure sufficient, effective?)



2. Systematic verification of mitigation

(are the prescribed measures being implemented?)



Environmental monitoring is a necessary complement to mitigation.

It should be a normal part of monitoring project results.

Explaining monitoring, part I

Monitoring, part 1:

Systematic
measurement of
key **environmental**
indicators over
time, over the
potentially affected
area

Indicators are:

Signals of or proxies for
aspects of

- Environmental health &
- Ecosystem function

Indicators are chosen to:

- Measure the most serious/uncertain impacts of an activity

And/or

- Show whether mitigation measures are effect

Examples of indicators

Environmental components

Water *Quantity, quality, reliability, accessibility*

Soils *Erosion, crop productivity, fallow periods, salinity, nutrient concentrations*

Fauna *Populations, habitat*

Env Health *Disease vectors, pathogens*

Flora *Composition and density of natural vegetation, productivity, key species*

Special ecosystems *Key species*

Indicators: sometimes complex, often simple

- ❖ Indicators **may** require laboratory analysis or specialized equipment & techniques
 - *Water quality testing for fecal coliform, heavy metals*
 - *Automatic cameras on game paths for wildlife census*
 - *Etc.*
- ❖ **But indicators are often VERY SIMPLE . . .**
- ❖ **. . . especially for small-scale activities**



Simple indicators can be more useful and appropriate than more complicated ones!

For example

Examples of simple indicators

Erosion measurement.



Topsoil loss from slopes upstream in the watershed **(top)** is assessed with a visual turbidity monitor **(bottom).**



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Surface sewage contamination



Visual inspection behind the latrine **(top)** reveals a leaking septic tank **(bottom).**



What are the limitations of this indicator?

Examples of simple indicators



Soil depletion.

Visual inspections show fertility gradients within terraces. (Dark green cover indicates healthy soil; yellow cover indicates depletion)

Groundwater levels

Are measured at shallow wells with a rope and bucket.



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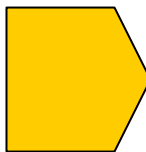
! Choose the simplest indicator that meets your needs!




Design of monitoring

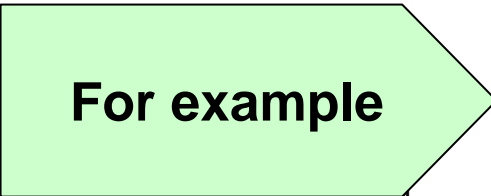
❖ Monitoring requires **SYSTEMATIC** measurement of indicators. This means. . .

 measurement designed to distinguish the impacts of the activity from other factors.

requires decisions about:



-  1 Location of measurement
-  2 Timing & frequency of measurement
- and often. . .
-  3 Other factors

 For example

Design of monitoring

Example: Water quality impacts of coffee-washing

1

Location

Water samples should be taken at the intake, and downstream of seepage pits.

2

Timing & frequency

Samples at different locations should be taken at the same time. Samples should be taken at **high & low flow** during the processing season

3

What else?

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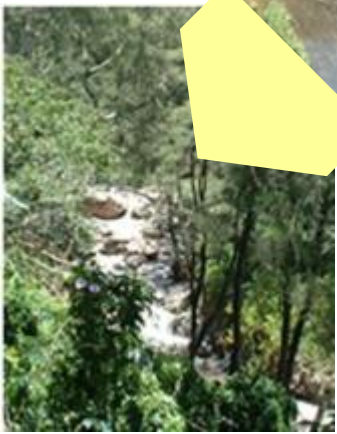
Water intake



Processing facility



Seepage pit



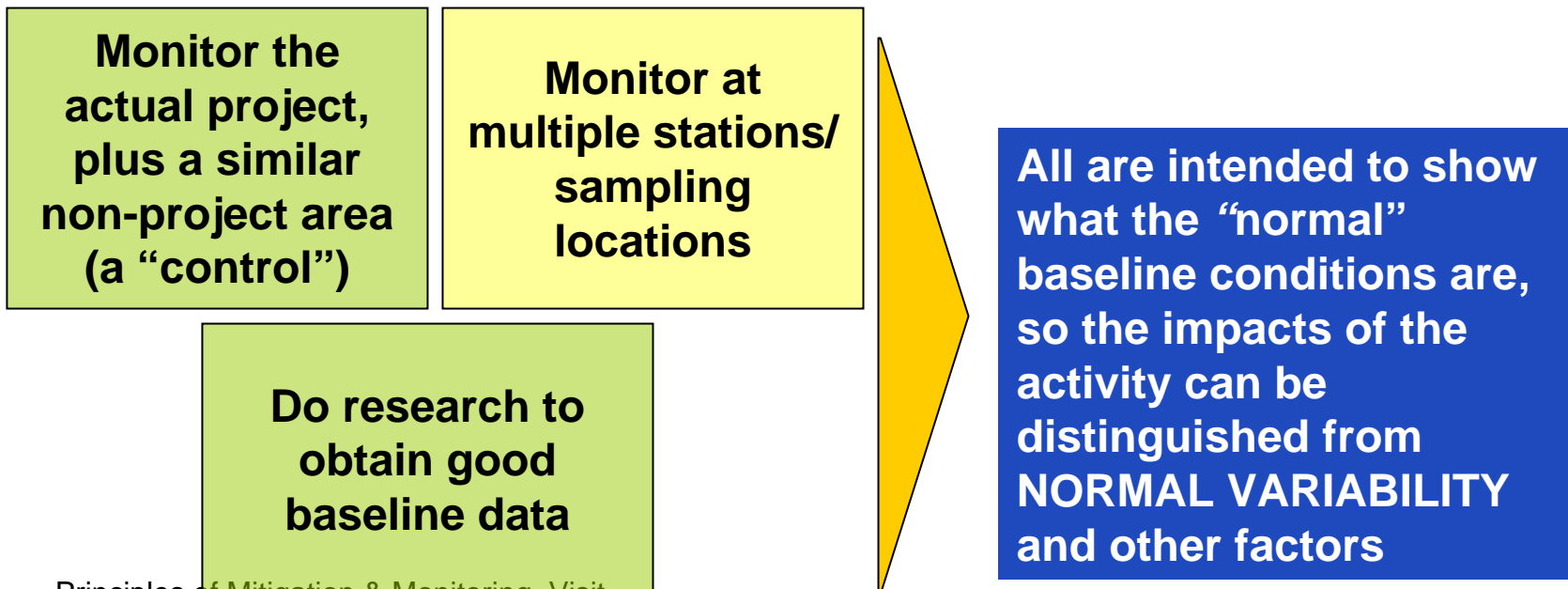
Downstream

Design of monitoring

Measuring water quality impacts from a point source of pollution (the previous example) is fairly straightforward

Often monitoring can be more complicated.

Some common monitoring strategies are:



Explaining monitoring, part 2

Monitoring, part 2:

Systematic verification of mitigation

Verification means. . .

ascertaining whether or not the measures have been implemented as specified by the EMMP.

*This will often not show whether the measures are **effective**. This is the role of **environmental indicators**.*

**Verification may
be “from the
desk”
or by field visit**

Information sources to evaluate implementation of mitigation

Mitigation measure is:

“Clinic staff shall be trained to and shall at all times segregate and properly incinerate infectious waste.”

Desk assessment:

You might ask the partner to report:

- Percentage of staff trained?
- Spot inspections of waste disposal locations carried out? The result of these inspections?



In the field. . .

Inspection shows clearly that segregation and incineration is NOT implemented at facility B.



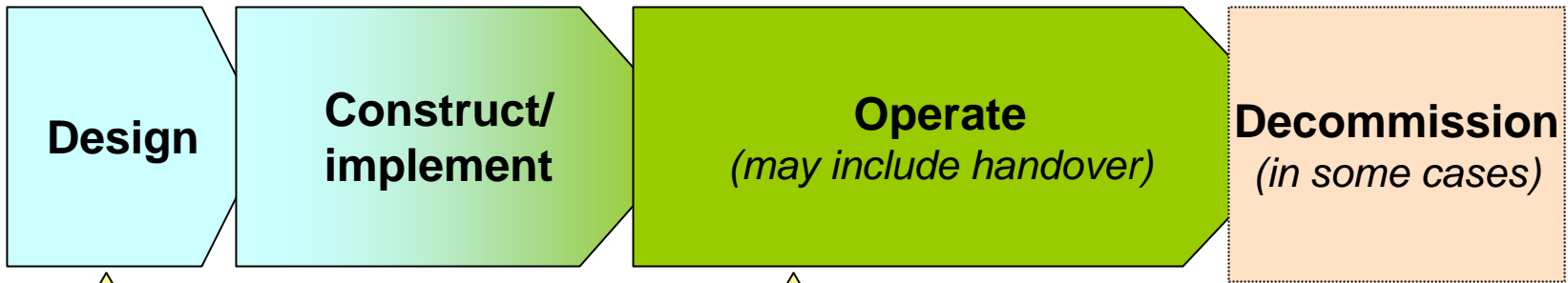
Monitoring: analysis and dissemination

- ❖ **Analysis is an essential element of monitoring**
 - *Raw or unprocessed environmental data is not useful to decision makers or project managers*
- ❖ **Dissemination of monitoring results is critical**

Mitigation & monitoring in the project lifecycle

Mitigation and monitoring is a part of each stage of any activity.

- 1. Implementation of design decisions.
Monitoring of construction
- 2. Where required, **capacity-building** for proper operation



- 1. Decisions made regarding site and technique to minimize impacts
- 2. Operating practices designed

- 1. Operating practices implemented
- 2. Monitoring of:
 - Operating practices
 - Environmental conditions

EMMPs

- ❖ **Mitigation and monitoring is set out in Environmental Mitigation and Monitoring Plans (EMMPs)**

(also called an *Environmental Management Plan, or Mitigation and Monitoring Plan*)

- ❖ **EMMPs are the topic of an upcoming session and field visit**

Making Mitigation & Monitoring effective

For mitigation and monitoring to be effective, it must be:

Realistic.

M&M must be achievable within time, resources & capabilities.

Targeted.

Mitigation measures & indicators must correspond to impacts.

Funded.

Funding for M&M must be adequate over the life of the activity

Considered early.

Preventive mitigation is usually cheapest and most effective. Prevention must be built in at the design stage.

Considered early.

If M&M budgets are not programmed at the design stage, they are almost always inadequate!

Making Mitigation & Monitoring effective

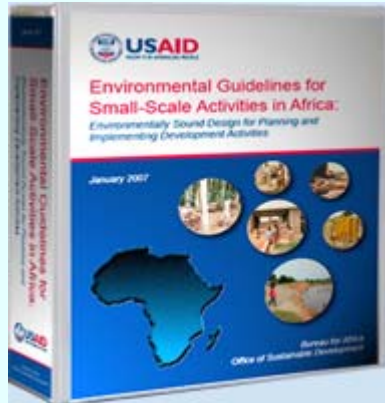


But most of all, it must be:

IMPLEMENTED.

Effective mitigation and monitoring
requires implementing the EMMP.

AFR's key resource for Mitigation & Monitoring



Environmental Guidelines for Small-Scale Activities in Africa



Each sectoral write-up presents **mitigation options matched to impacts**.

The **annotated bibliographies** provide links to key additional resources

Available on the ENCAP website at

www.encapafrika.org

Coming next: getting acquainted with the ***Small-Scale Guidelines***

Summing up

Mitigation & Monitoring are a critical part of environmentally sound design:



Mitigation minimizes adverse environmental impacts



Monitoring tells you if your mitigation measures are sufficient & effective.