Principles of Environmental Monitoring

GEMS Environmental Compliance-ESDM Training Series
Senegal, February, 2014

Definition of monitoring

Environmental monitoring is BOTH. . .

✓ 1. **Systematic observation of key environmental conditions**

✓ 2. **Systematic verification of mitigation measure implementation**

! **Purpose:**
to tell you clearly and cost-effectively if mitigation is sufficient and effective

Env. Monitoring should be a normal part of project M&E.

Monitoring environmental conditions

1. **Systematic observation of <u>key environmental conditions</u>**

= **Environmental conditions that:**

- **correspond to impacts & mitigation measures**
- **Upon which the project depends for its success**

Example: an irrigation project may contaminate groundwater. **Ground-water quality** is monitored.

Example: A water supply project depends on clean source water. **Source water quality** is monitored.

Monitoring environmental conditions

1. Systematic observation of key environmental conditions

Means that environmental indicators are chosen and assessed systematically.

For example. . .

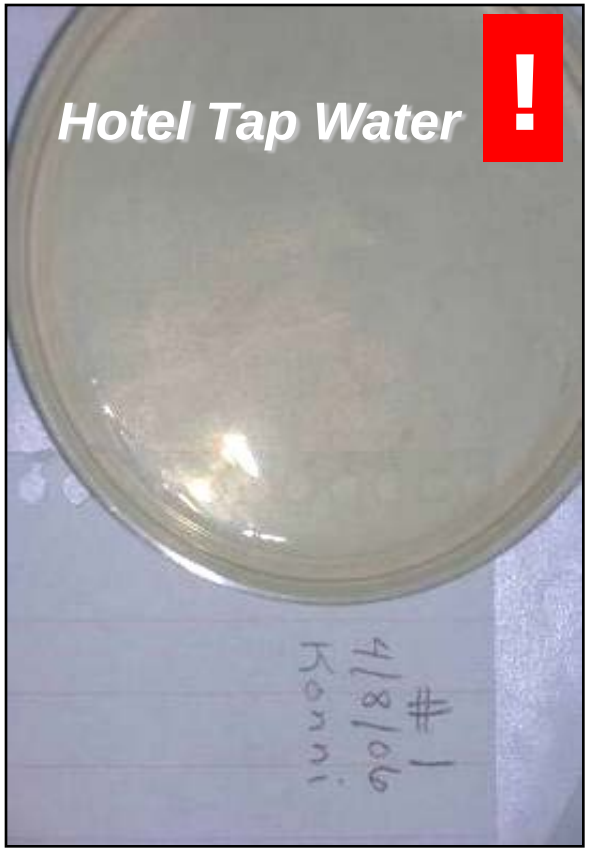
indicators are

Signals of
or proxies for

- Environmental health
- Ecosystem function

Example Indicator: coliform contamination

Water quality tests with simple, inexpensive test kit . . .



Purple Color = Fecal Coliforms
Pink Color = Non-Fecal Coliforms

Examples of indicators

Environmental components that may be adversely affected by small-scale activities

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

Environmental Indicators: sometimes complicated, often simple

- **Environmental Indicators may require laboratory analysis or specialized equipment & techniques**
  - *Testing water for pesticide residues*
  - *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 environmental indicators

Erosion measurement.

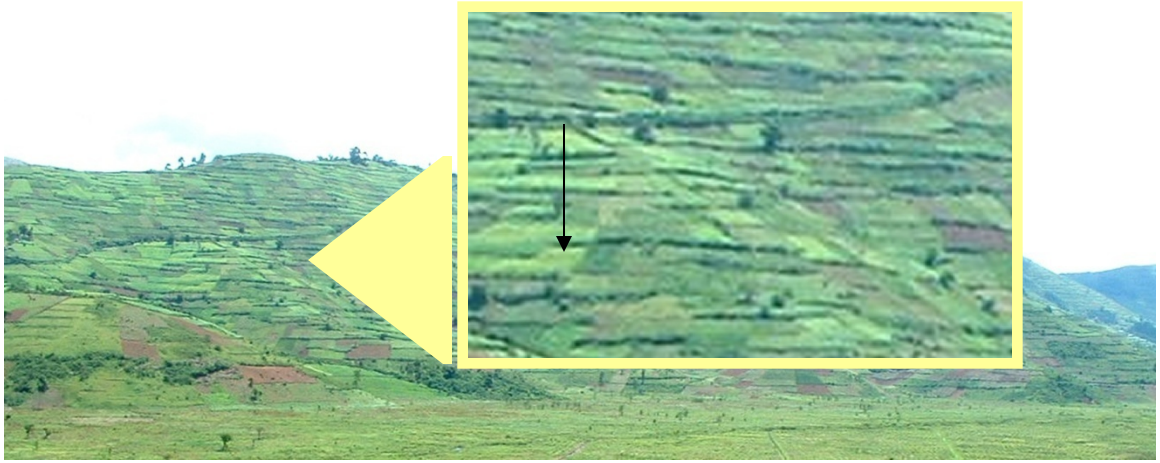
Topsoil loss from slopes upstream in the watershed **(top)** is assessed with a visual turbidity monitor **(bottom).**

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 environmental 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.

! Choose the simplest indicator that meets your needs!

Assessing environmental indicators systematically

- **Monitoring often requires SYSTEMATIC measurement of indicators to <u>distinguish the impacts of the activity from other factors</u>**

This requires decisions about:

1. **Location of measurement**
2. **Timing & frequency of measurement**

and often. . .

3. **Other factors**

For example

Assessing environmental indicators systematically

Example:
Water quality impacts of agric. processing

1

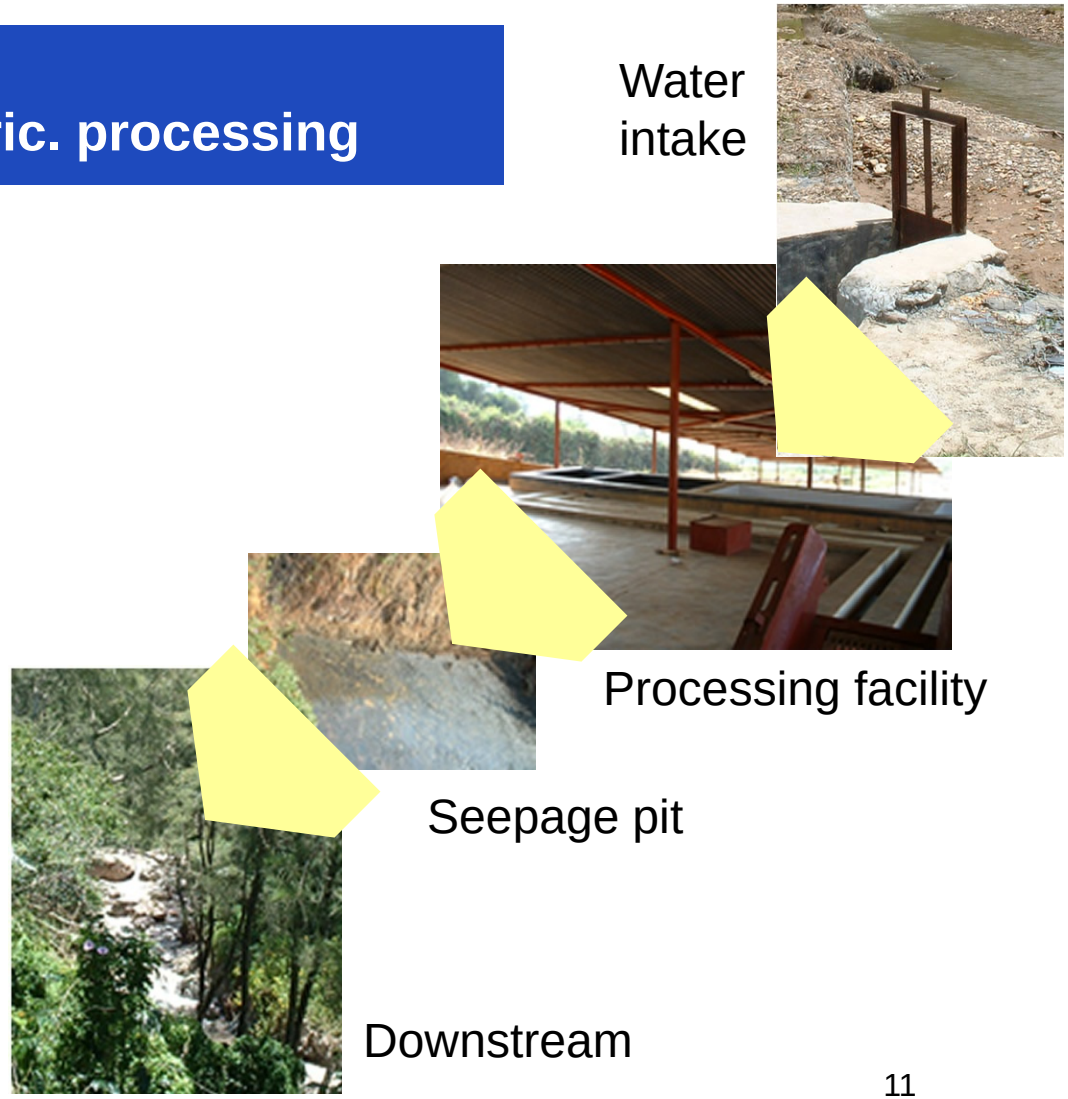
Location
Water samples should be taken at the intake, and downstream of seepage pits.

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?



Assessing environmental indicators systematically

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:

Monitor the actual project, plus a similar non-project area (a "control")

Monitor at multiple stations/ sampling locations

Do research to obtain good baseline data

All are intended to help distinguish impacts from NORMAL VARIABILITY and other factors

Monitoring: Part 2

2. Systematic verification of mitigation measure implementation

=

Verifying whether or not the mitigation measures specified by the EMMP have been implemented. This includes quantifying mitigation: how may staff trained? How many trees planted?

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

There are two basic ways to get the information required: paper reports & field inspection

For example

Ways to quantify 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:
Clinics are asked to report:

Percentage of staff trained?

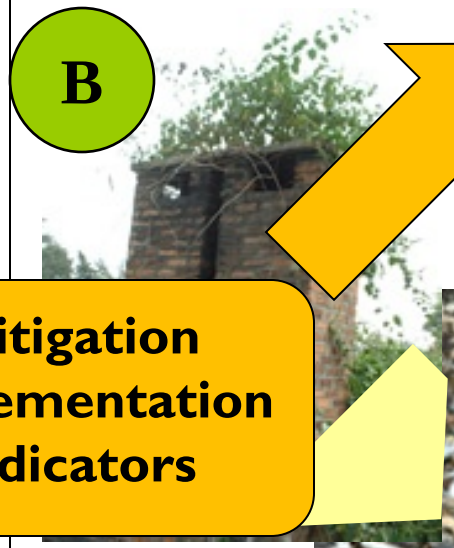
Spot inspections of waste disposal locations carried

The result of these inspections?

Mitigation implementation indicators

Field inspection. . .

shows waste is segregated at point A, but not incinerated at point B.

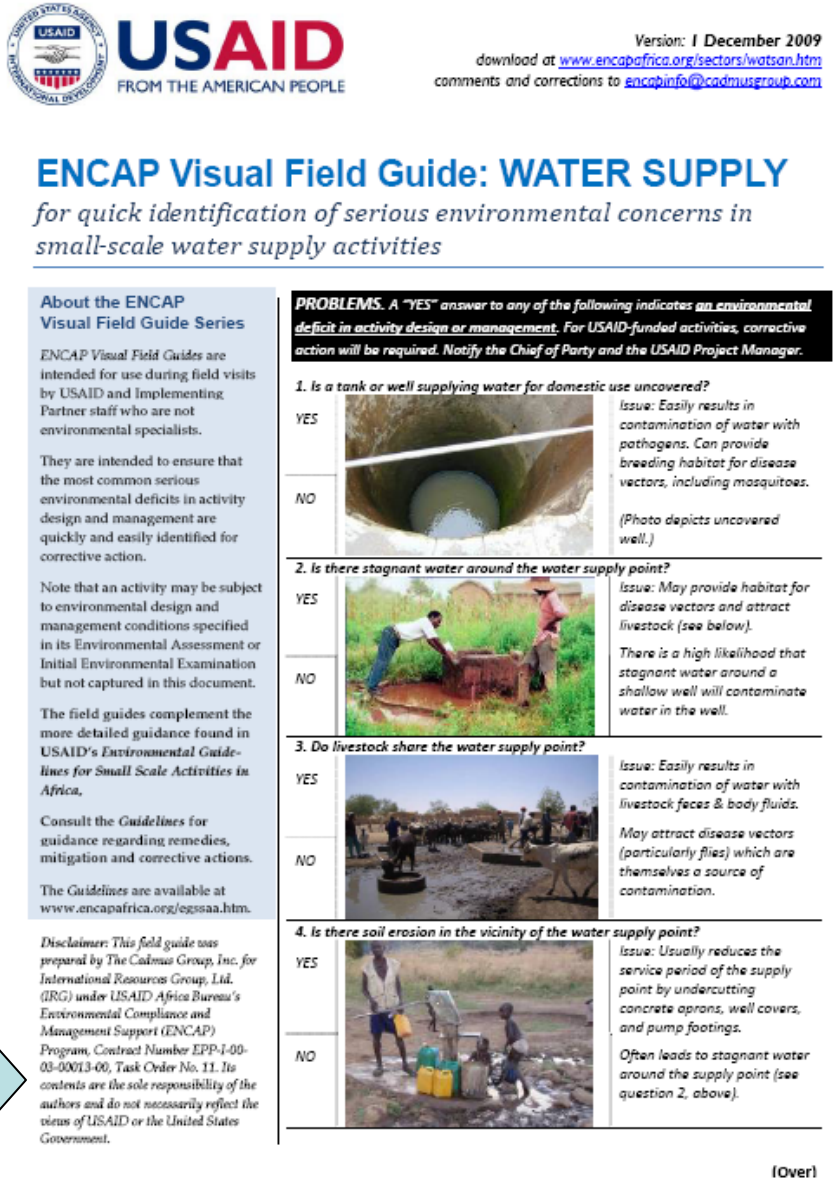


Good environmental monitoring. . .

. . .tell you <u>clearly</u> and <u>cost-effectively</u> if **mitigation is sufficient and effective**

- **Do no more than needed. Prioritize the most serious impacts & issues**
- **Usually requires a combination of:**
  - *Environmental conditions indicators*
  - *Mitigation implementation indicators*

Example:
ENCAP visual field guides



USAID FROM THE AMERICAN PEOPLE

Version: 1 December 2009
download at www.encapafrica.org/sectors/watsan.htm
comments and corrections to encapinfo@cadmusgroup.com

ENCAP Visual Field Guide: WATER SUPPLY

for quick identification of serious environmental concerns in small-scale water supply activities

About the ENCAP Visual Field Guide Series

ENCAP Visual Field Guides are intended for use during field visits by USAID and Implementing Partner staff who are not environmental specialists.

They are intended to ensure that the most common serious environmental deficits in activity design and management are quickly and easily identified for corrective action.

Note that an activity may be subject to environmental design and management conditions specified in its Environmental Assessment or Initial Environmental Examination but not captured in this document.

The field guides complement the more detailed guidance found in USAID's *Environmental Guidelines for Small Scale Activities in Africa*.

Consult the *Guidelines* for guidance regarding remedies, mitigation and corrective actions.

The *Guidelines* are available at www.encapafrica.org/egssaa.htm.

Disclaimer: This field guide was prepared by The Cadmus Group, Inc. for International Resources Group, Ltd. (IRG) under USAID Africa Bureau's Environmental Compliance and Management Support (ENCAP) Program, Contract Number EPP-I-00-03-00013-00, Task Order No. 11. Its contents are the sole responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government.

***PROBLEMS.** A "YES" answer to any of the following indicates an environmental deficit in activity design or management. For USAID-funded activities, corrective action will be required. Notify the Chief of Party and the USAID Project Manager.*

1. Is a tank or well supplying water for domestic use uncovered?

YES / NO

Issue: Easily results in contamination of water with pathogens. Can provide breeding habitat for disease vectors, including mosquitoes.

(Photo depicts uncovered well.)

2. Is there stagnant water around the water supply point?

YES / NO

Issue: May provide habitat for disease vectors and attract livestock (see below).

There is a high likelihood that stagnant water around a shallow well will contaminate water in the well.

3. Do livestock share the water supply point?

YES / NO

Issue: Easily results in contamination of water with livestock feces & body fluids.

May attract disease vectors (particularly flies) which are themselves a source of contamination.

4. Is there soil erosion in the vicinity of the water supply point?

YES / NO

Issue: Usually reduces the service period of the supply point by undercutting concrete aprons, well covers, and pump footings.

Often leads to stagnant water around the supply point (see question 2, above).

(Over)

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!

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*

Design → **Construct/ implement** → **Operate** *(may include handover)* → **Decommission** *(in some cases)*

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*