Topic 11

Implementation and follow up

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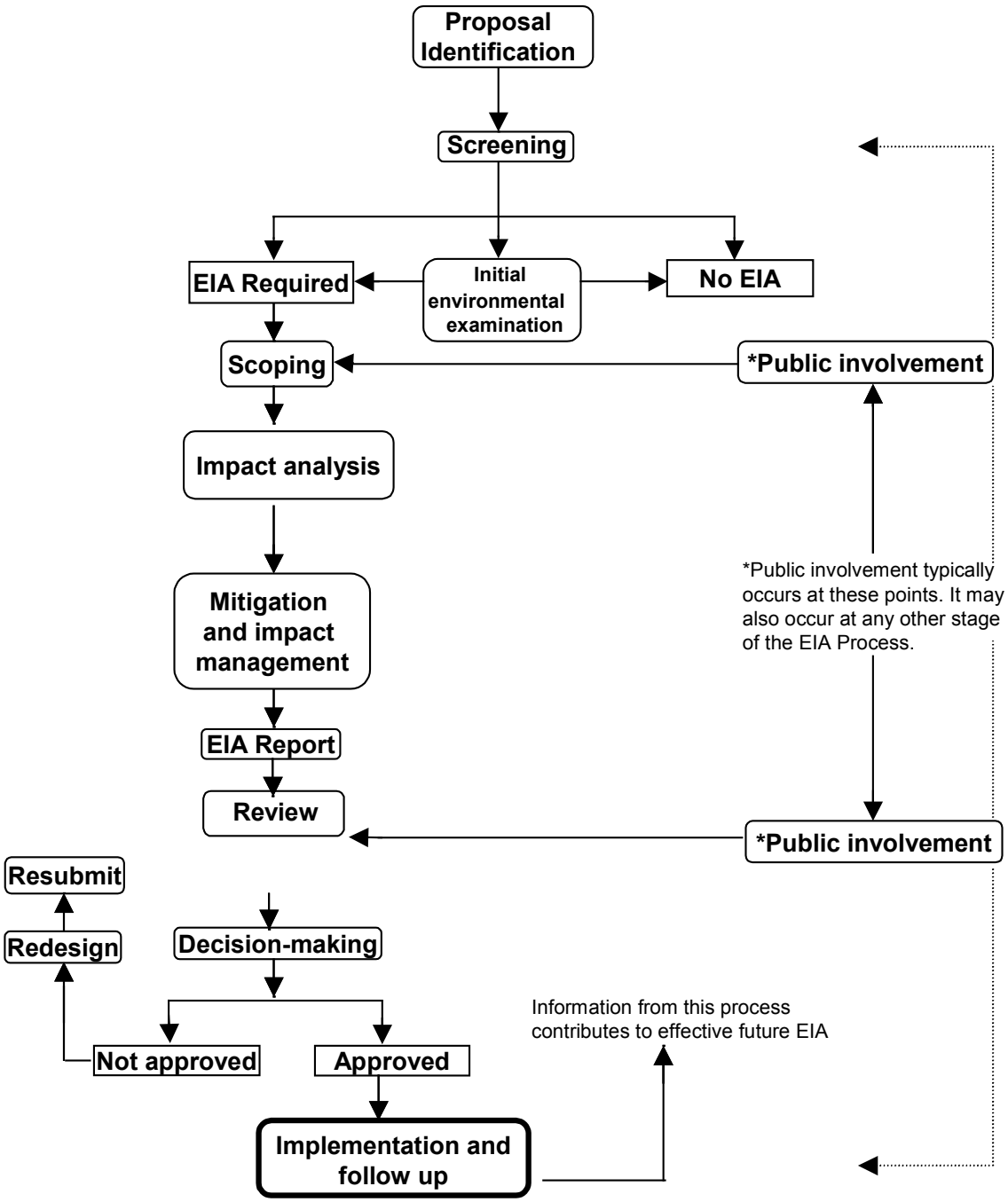
Implementation and follow up in the EIA process



Topic 11—Implementation and follow up

Objectives

To explain the role and contribution of implementation and follow up measures within the EIA process.

To understand the procedures and methods used, particularly monitoring and auditing.

Relevance

After project approval, implementation and follow up complete the EIA process. Monitoring, auditing and other tools are used to 'close the loop' of impact prediction and condition setting. They are important for several reasons: to identify the impacts that occur; to check that these are within the levels predicted and required by legislation; to determine that mitigation measures are properly implemented and work effectively; to ensure the environmental benefits expected are being achieved; and to provide feedback to improve future applications of the EIA process.

Timing

3 hours (not including training activity)

Important note to trainers

You should design your presentation with the needs and background of participants in mind, and concentrate on those sections most relevant to your audience. The session presentation timings are indicative only.

Time taken for the training activities can vary enormously depending on the depth of treatment, the existing skills and knowledge of participants and the size of the group.

☑ Information checklist

Obtain or develop the following materials, as appropriate:

- ❑ applicable requirements relating to implementation and follow up of proposals;
- ❑ applicable procedures and guidelines for surveillance, monitoring, auditing, etc.;
- ❑ local examples of the use and results of monitoring and auditing;
- ❑ local examples of the use of environmental management plans;
- ❑ local examples of post-project analysis, EIA performance review or similar exercises;
- ❑ copies of any research or studies on the monitoring, impact management and follow up activities;
- ❑ contact names and telephone numbers of people, agencies, organizations and environmental information/data resource centres able to provide assistance in relation to monitoring and auditing; and
- ❑ other resources that may be available such as videos, journal articles, lists of speakers, and case studies.

Session outline

Welcome participants to the session by introducing yourself and getting them to introduce themselves. Outline the overall coverage of the session, its objectives, and why they are important.

Implementation and follow up are critically important but relatively neglected stages of the EIA process. Surveillance, monitoring, auditing, evaluation and other tools allow for ongoing assessment and review of the effects of the proposal, following final approval. They are used to identify the impacts that occur; check that these are within the levels predicted and required by legislation; determine that mitigation measures are properly implemented and work effectively; ensure the environmental benefits expected are being achieved; and provide feedback to improve future applications of the EIA process.

Outline the need for and purpose of EIA implementation and follow up, emphasising their contribution to achieving good environmental outcomes. Ask the participants if key objectives are relevant to EIA practice locally.

Until recently, relatively little attention was paid to the actual impacts that occurred during project construction and operation. Without appropriate implementation and follow up to decision-making, EIA becomes a paper exercise to secure an approval, rather than a practical exercise to achieve environmental benefits (see Topic 7 – *Mitigation and impact management*). The purpose of EIA implementation and follow up is to ensure that the conditions attached to project approval are carried out and function effectively, and to gain information that can be used to improve EIA practice in the future.

By itself, this process cannot turn around an environmentally unsound project. However, it is critical to maximise the returns from the preparation of the EIA report and its consideration in decision-making. EIA implementation and follow up allow the measures and conditions attached to project approval to be fine tuned in the light of new information. When used systematically, they facilitate impact management, build continuity into the EIA process and help to optimise environmental benefits at each stage of project development.


1

Key objectives of EIA implementation and follow up are to:

- confirm that the conditions of project approval are implemented satisfactorily;
- verify that impacts are within predicted or permitted limits;
- take action to manage unanticipated impacts or other unforeseen changes;
- ensure that environmental benefits are maximised through good practice; and
- learn from experience in order to improve EIA process and practice.

Identify the components of EIA implementation and follow up, and define key terms. Ask the participants to indicate which ones are used in the EIA system locally, noting similarities and differences in terminology.


2

The main components and tools of EIA implementation and follow up include:

- surveillance and supervision – to oversee adherence to and implementation of the terms and conditions of project approval;
- effects or impact monitoring – to measure the environmental changes that can be attributed to project construction and/or operation and check the effectiveness of mitigation measures;
- compliance monitoring – to ensure that applicable regulatory standards and requirements are being met, e.g. for waste discharge and pollutant emissions;
- environmental auditing – to verify the implementation of terms and conditions, the accuracy of the EIA predictions, the effectiveness of mitigation measures, and the compliance with regulatory requirements and standards;
- ex-post evaluation – to review the effectiveness and performance of the EIA process as applied to a specific project; and
- post-project analysis – to evaluate the overall results of project development and to draw lessons for the future.

These components are variously defined and delineated in the institutional arrangements and procedures established for this purpose by different countries. However, their generic functions are reasonably well understood. Key terms are described in the accompanying box, and reference is made to the different types of monitoring, auditing and evaluation that may be undertaken as part of EIA implementation and follow up. The usage of these

tools will vary, depending on terms of project approval and circumstances (as discussed later).

A conceptual distinction can be drawn between the respective aims of impact management and review and feedback of experience. In practice, however, these control and learning functions are not clearly separable. Rather they form part of a continuum of implementation and follow up activities, which are concerned with optimising environmental protection through good practice at all stages of project development. This process, when integrated with other environmental management and review tools, can be extended over the whole life cycle of the project.

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Box 1: Terminology of EIA implementation and follow up

Implementation and follow up are the terms used here to refer to all EIA related activities that take place after an approval decision is made. The main functions include:

Surveillance and supervision

Surveillance of the implementation of EIA terms and conditions can be undertaken by regular or periodic site inspections to check on compliance, observe progress and discuss issues. Supervision implies a more intensive direction of the environmental performance of on-site activities, ensuring they are carried out in accordance with the environmental management plan and/or contract specifications.

Monitoring

Monitoring refers to the collection of data through a series of repetitive measurements of environmental parameters (or, more generally, to a process of systematic observation). The main types of EIA monitoring activities are:

- Baseline monitoring – the measurement of environmental parameters during a pre-project period for the purpose of determining the range of variation of the system and establishing reference points against which changes can be measured.
- Effects monitoring – the measurement of environmental parameters during project construction and implementation to detect changes which are attributable to the project.
- Compliance monitoring – the periodic sampling or continuous measurement of environmental parameters to ensure that regulatory requirements and standards are being met.

Auditing

Auditing is a term borrowed from accounting to describe a systematic process of examining, documenting and verifying that EIA procedures and outcomes correspond to objectives and requirements. This process can be undertaken during and/or after project construction, and draws upon surveillance reports and monitoring data. The main types of EIA related audits are:

- Implementation audits – to verify that EIA implementation met the conditions of project approval.
- Impact audits – to determine the impact of the project and the accuracy of EIA predictions.
- Compliance audits – to verify that project impacts complied with environmental standards and regulatory requirements.
- Effectiveness or policy audits – to check the feasibility of mitigation measures and the consistency of EIA practice.

Evaluation

Ex-post evaluation involves a policy-oriented review of the effectiveness and performance of the EIA process. It is concerned with the overall 'balance sheet' of an EIA, looking at what it achieved, which aspects were influential, and how the process could be improved. The guiding concepts are:

- Effectiveness – the extent to which the EIA process has achieved its purpose(s). Depending on how these are defined, an effectiveness review can be conducted against the terms of reference, the information provided to decision-makers or principles and criteria of EIA good practice (see Topic 1 – *Introduction and Overview of EIA*).
- Performance – the success of the EIA process as measured by its outcomes and results, e.g. the environmental benefits achieved or the effectiveness of mitigation in avoiding or reducing impacts. Surveillance, monitoring and auditing data are necessary for this purpose.

Post project analysis

Usually, a post-project analysis is undertaken once the project has been constructed and is about to enter the operational phase. The term implies a focus on project-specific EIA experience, e.g. in relation to dams, highways, waste disposal sites or power generation. In this context, post-project analysis can include aspects of effectiveness and performance review, using impact and mitigation data from surveillance, monitoring and auditing.

Sources: Au and Sanvicens (1997) and Sadler (1988, 1998).

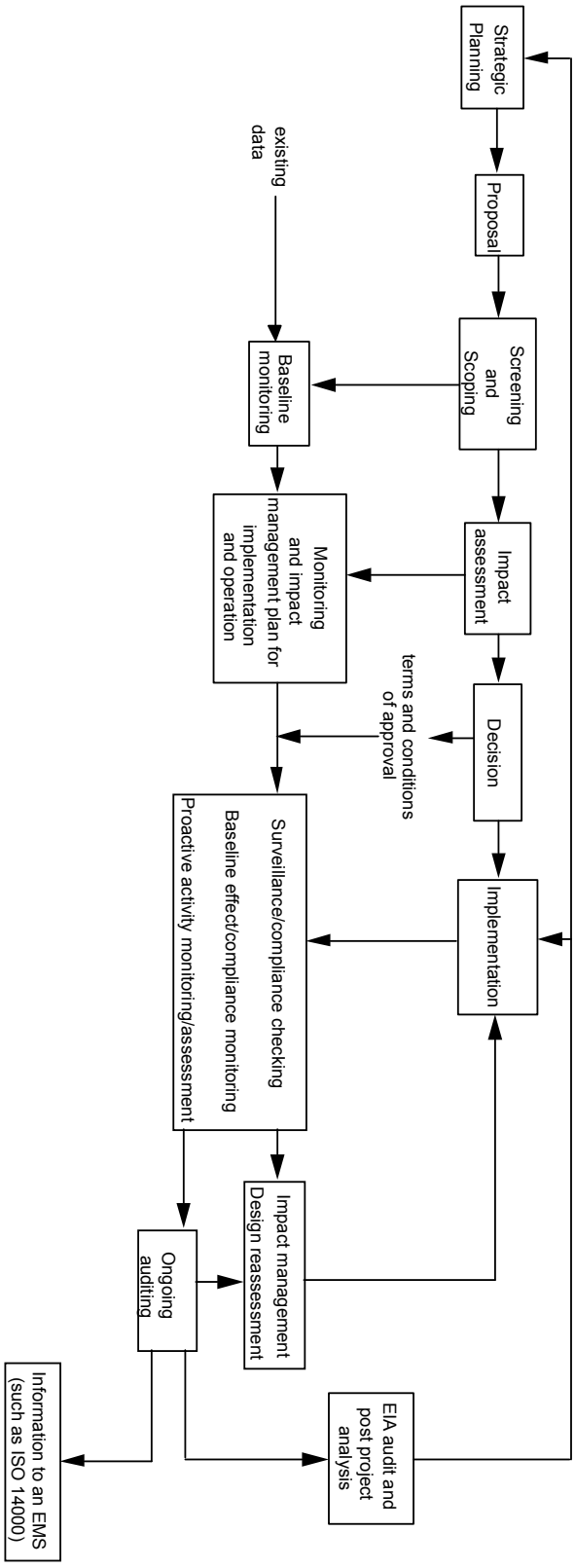

Figure 1:The role and position of monitoring and management in EIA

Adapted from Sadler (1988)

Briefly relate EIA implementation and follow up to the other stages of the EIA process and to the larger range of tools used in environmental management and review. Ask participants to identify which of these tools are used or relevant locally.

The role and contribution of EIA implementation and follow up are shown in Figure 1 above. It illustrates:

- the relationship of EIA implementation and follow up to other stages of the EIA process;
- the stages at which monitoring, auditing and evaluation are typically undertaken; and
- the results and benefits that can be gained from their use.

The figure also illustrates the importance of early identification of follow up requirements and measures, beginning at the stage of screening and scoping, and adding to them as new information becomes available. Increasingly, the preparation of an environmental management plan (EMP) provides the blueprint for carrying out EIA implementation and follow up (see Topic 7 – *Mitigation and impact management*). An EMP should include a schedule of actions for this purpose, identify protocols for impact management in the event of unforeseen events and specify the arrangements for the use of surveillance, monitoring, auditing and other procedures.

EIA implementation and follow up can occur throughout project construction and continue into the operational phase, becoming part of a larger process of environmental management and performance review. The tools for this purpose have developed rapidly. In particular, environmental management systems (EMS) are now widely used by industry and business to manage the impact of their activities on the environment. The ISO 14000 series provides a framework of EMS principles, guidance and procedure, including environmental auditing, performance review and life cycle assessment or analysis. In the box below, these are grouped according to their primary use and purpose.

Some of these tools are still under development, and their use and even terminology varies. Certain aspects of the ISO 14000 series have yet to be finalised. Already, however, there is an increasing recognition of the benefits to be gained by linking EIA preparation and implementation to EMS design and development; for example, initially through the transfer of information and subsequently through the use of standardised procedures. Looking ahead, EIA and EMS can be combined with other tools to take an integrated approach to the total environmental impact of the project cycle, along the lines indicated in Box 2.


3 & 4

Box 2: Tool box for environmental management and performance review

Purpose	Examples of available tools
Internalising the environment in policy and planning	SEA, technology assessment, comparative risk assessment
Planning and designing environmentally sound projects	EIA, SIA, risk assessment, environmental benefit cost assessment
Environmental management of the impacts of an operating facility or business enterprise	EMS (ISO 14000 series), total quality environmental management (TQEM), industrial codes of practice
Eco-design of processes and products	Environmental design, life cycle assessment, cleaner production
Monitoring, audit, and evaluation of performance	Effects and compliance monitoring, site, energy, waste, health and safety audits, benchmarking performance

Explore with the group guiding principles and elements of approach to EIA implementation and follow up. Ask participants whether and how these might be applicable locally, noting the arrangements made by different countries for this phase of the EIA process.


5

Guiding principles for carrying out the process of EIA implementation and follow up include the following:

- the project should be carried out in accordance with conditions of approval and the commitments made in the EIA report/EMP;
- surveillance and inspection should be a routine elements for this purpose;
- the scope of other follow up activities should be commensurate with the significance of the potential impacts; and
- monitoring, auditing and evaluation should be undertaken when
  – potential impacts are likely to be significant,
  – mitigation measures are untried or their outcome is uncertain, and/or
  – new aspects of EIA process and practice have been introduced.

A comprehensive approach to EIA implementation and follow up would include many or all of the following steps and elements:

- inspect and check the implementation of terms and conditions of project approval;

- review the environmental implications of any changes that are required;
- monitor the actual effects of project activities on the environment and the community;
- verify compliance with regulatory requirements and applicable standards or criteria;
- take action to reduce or rectify any unanticipated adverse impacts;
- adjust the EMP, project specifications and related schedules as necessary;
- audit the accuracy of the EIA predictions;
- evaluate the effectiveness of the mitigation measures; and
- provide feedback to improve EIA process and practice in the future.

The elements of approach to EIA implementation and follow up differ from country to country. A variety of arrangements, as well as instruments, are used. In some EIA systems, provision for monitoring and other follow up activities is made in legislation, although it may apply only to certain project categories or take place under the permitting and licensing processes of regulatory agencies. In other cases, EIA follow up is a discretionary process, which is carried out on a project-by-project basis by administrative, contractual or informal means.

Review the aspects and issues that need to be considered in designing and carrying out an EIA implementation and follow up programme. Discuss how to determine the scope and components of such a programme and ask participants to relate local experiences in this area.

EIA implementation and follow up can be time consuming and expensive, and not all projects warrant full attention. A disciplined approach should be taken to planning this phase of the EIA process. Surveillance to oversee EIA implementation and ensure compliance with conditions of approval and regulatory standards is usually the bare minimum requirement. Other follow up activities should be determined on the basis of the needs of environmental management and the potential pay off for improving EIA practice in the future.

The scope of follow up should be determined early in the EIA process. A decision should be made as part of the screening and scoping process, when requirements are established for baseline studies and monitoring. In part, these decisions determine what can be done in EIA follow up, for example by establishing the information that will be available for effects monitoring and audit. Later, the scope of the EIA follow up programme can be refocused as more detailed information on potential impacts becomes available.

Key criteria for determining the need for and scope of EIA implementation and follow up include:

- the degree of confidence or uncertainty attached to impact predictions;
- the level of risk and damage if unanticipated impacts occur;
- the significance of losses if controls are not properly implemented; and
- the opportunity to gain information that will add value to EIA practice.


6

Aspects and issues that need to be considered when designing and carrying out an EIA implementation and follow up programme include:

- *What is required?* – Identify the scope and components of the programme, and, if necessary, provide a justification and prioritise follow up actions.
- *Who will carry out the activities?* – Indicate the roles and responsibilities of key agencies and individuals, noting how these will be coordinated and emphasising any research aspects that may have been added subsequent to the project approval, EMP or other core documents.
- *How will the programme be carried out?* – Specify the resources, expertise and arrangements necessary to give effect to EIA follow up and to report the results.

Stress the importance of monitoring as a vital component of the EIA process, and describe its relationship to implementation and follow up in general, and impact management in particular. Ask participants to identify the monitoring methods and arrangements that are in place locally.

Monitoring is a cornerstone of EIA implementation and follow up. Other components are dependent on the scope and type of monitoring information that is provided. The primary aim of monitoring is to provide information that will aid impact management, and, secondarily, to achieve a better understanding of cause-effect relationships and to improve EIA prediction and mitigation methods. Both the immediate and long-term benefits from undertaking monitoring as part of EIA are widely recognised, although not always realised.


7

Monitoring is used to:

- establish baseline trends and conditions;
- measure the impacts that occur during project construction and operation;
- check their compliance with agreed conditions and standards;
- facilitate impact management, e.g. by warning of unanticipated impacts; and
- determine the accuracy of impact predictions and the effectiveness of mitigation measures.

A sound baseline is a critical reference point for the conduct of effects monitoring. In turn, effects monitoring establishes the basis for corrective action when actual impacts are unanticipated or worse than predicted. Compliance monitoring, carried out through repetitive or periodic measurement, also can be used for this purpose. This may suffice as a safety net for certain projects, for example, where the mitigation measures are well tried and known to be effective. However, compliance monitoring will trigger impact management only if regulatory standards or specified conditions are exceeded and, on its own, may be insufficient for large-scale, complex projects.

By themselves, compliance and effects monitoring permit only reactive impact management, since they detect violations or adverse changes after the fact. In this context, it is important to tie the results of both types of monitoring to pre-determined actions (or emergency responses), which are triggered on a threshold basis. A more proactive, adaptive approach to impact management can be instituted by combining compliance or effects monitoring with supervision or regular inspection of site clearance, construction and mitigation activities. The use of the precautionary principle can facilitate early warning of emerging problems.

Emphasise the need for monitoring programmes to be carefully targeted and cost-effective. Ask the participants if there is any experience locally on this aspect of EIA follow up, and what resources might be available.

The collection of monitoring data is expensive. It needs to be targeted at the information necessary to manage the impacts that are significant or review the aspects of EIA practice that are of particular importance. These aspects should be identified as early as practicable in the EIA process to optimise the contribution of monitoring data to EIA implementation and follow up. Monitoring involves designing the programme, collecting and analysing the data, establishing their linkage to impact management, auditing and other components, and interpretation and reporting of data.

8

The following points need to be agreed as part of the EMP and conditions of project approval:

- major impacts to be monitored;
- objectives of monitoring and data requirements;
- arrangements for the conduct of monitoring;
- use of the information to be collected;
- response to unanticipated or greater than predicted impacts; and
- measures for public reporting and involvement.

Monitoring requirements should focus on the significant impacts predicted in the EIA report, taking account of:

- the environmental values to be safeguarded;
- the magnitude of each potential impact;
- the risk or probability of each impact occurring;
- the pathways and boundaries of each impact; and
- the confidence in the prediction of each impact.

Monitoring programmes need to be constantly reviewed to make sure that relevant information is being supplied, and to identify the time at which they can be stopped.

Outline the basis for a scientifically credible monitoring programme. Provide participants with general information about how data can be collected and analysed, and draw attention to the role of independent checks.

Each discipline has established methods for monitoring and data collection. For example, the design of a programme to monitor the impact of a large-scale project involving discharge of toxic waste or effluent into a water body may encompass different methods to measure change in water quality, food chains, fish reproduction, reduction in income from fisheries and its effect on the local community. Generally, monitoring to detect chemical and physical changes is more straightforward than for biological effects or ecological relationships. Socio-economic impacts present a special challenge of measuring changes in collective behaviour and response (see Topic 6 – *Impact analysis*).

The general approach to effects monitoring is to compare the pre- and post-project situation, measuring relevant environmental impacts against baseline conditions. A common issue in all situations is how to differentiate the change attributable to a project from the variability that characterises all biophysical or socio-economic systems. In the real world, as opposed to laboratory experiments, cause-effect relationships are difficult to separate from the interaction of other factors. Eliminating or correcting for these intervening variables is the key to the design and conduct of a scientifically defensible effects monitoring programme.

Typically, this problem is addressed by establishing impact and control monitoring stations. The impact or treatment site is selected to be a receptor of an emission, hazard, event or action from the project. An example would be a water sampling station downstream from an effluent discharge point. The control or reference site is located outside the impact zone, but chosen to be representative of the variability experienced by the impact site. 'With versus without' project comparisons then can be made to determine the change or impact that is attributable to the project.

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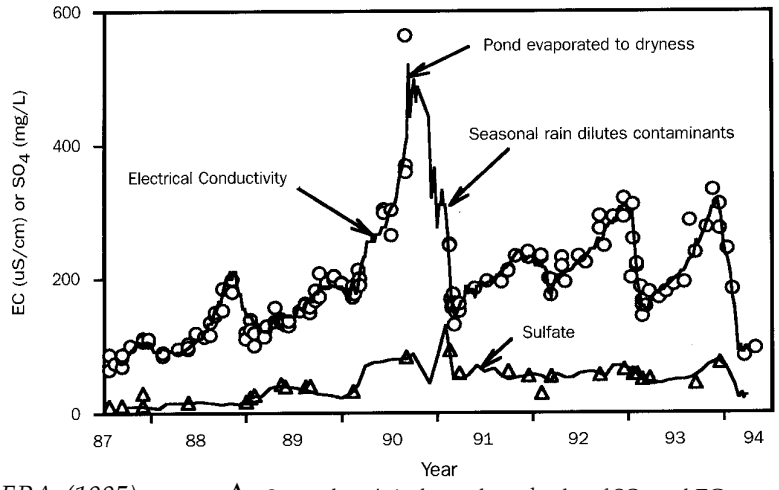
Monitoring programmes result in time series data, which can be analysed by:

- assembling the data in tabular or graphic format;
- testing for variations that are statistically valid;
- determining rates and directions of change; and
- checking these are within expected levels and comply with standards (e.g. water quality).

Some relational changes, such as in chemical constituents in water, can be presented graphically. Longitudinal studies based on numerical data or photographic or descriptive records also provide relevant information on changes and trends. The figure below is an example of monitoring data. It depicts the variation in contaminant levels and their relation to seasonal precipitation, including the effect of an extreme event (drought) on sulphate concentration. Also shown are the independent checks made by the regulatory agency on a proponent's data.

Monitoring data needs to be interpreted and reported to a non-scientific audience, including decision makers, the affected community and the general public. This may be the responsibility of a regulatory body, monitoring team or multi-stakeholder group, established specifically to bring a broad understanding and a range of views to EIA implementation and follow up. Where different types and methods of monitoring have been carried out, the comparability and quality of the data sets may need to be addressed and reported. Reports should be in plain language and to appropriate technical standards (see also Topic 8 – *EIA reporting*).



EPA, (1995) Δ, o regulator's independent checks of SO_4 and EC respectively

Figure 1:Proponent long-term monitoring showing seasonal variations

Using a local example or Handout 11–2, discuss the elements and steps in developing a credible and effective environmental monitoring programme.


11-2

Appropriate guidance should be sought when developing an environmental monitoring programme. Typically, some or all of the following issues will be addressed:

- representative impact and reference sites;
- methods for sampling and collection of data;
- independent checks for quality control and assurance of data;
- basis for statistical interpretation and inference of impacts;
- protocols for the conduct of environmental auditing; and
- mechanisms for reporting data and responding to issues that are raised.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Some elements of an effective environmental monitoring programme are listed in Box 3. The following steps can help to implement these elements:

- define the scope and objectives of monitoring for each impact;
- identify the sites for observation, measurement and sampling;
- select the key indicators for direct measurement or observation;
- determine the level of accuracy required in the data;
- consider how the data will be analysed in relation to baseline and other data;
- establish a system for recording, organising and reporting the data;
- specify thresholds of impact acceptability; and
- set requirements for management action if monitoring indicates these are exceeded.

When adapting these to scale and circumstances, those responsible for developing monitoring programmes should consider the value of simple observation and reporting, particularly by locally affected parties. Increasing attention is being given to public involvement in the EIA implementation and follow up. For example, stakeholder or citizen monitoring committees have been used in a number of cases. The terms of reference can be written into EIA documentation and include building a long-term relationship with an affected community or group of stakeholders when the project is complex and controversial.

Box 3: Effective environmental monitoring programmes have:

- a realistic sampling programme (temporal and spatial)
- sampling methods relevant to source and/or type of impact
- a targeted approach to data collection
- comparability of data with baseline and other relevant data
- quality control in measurement and analysis
- systematic record keeping and database organisation
- reporting requirements for internal and external checks
- provision for input from and response to third parties
- presentation of results to the public


11–3

Discuss how to implement a monitoring programme. If there is a local case study available use this to explore the costs of monitoring and discuss how these might be offset by the benefits that can be derived from monitoring information. Where no detailed local costings are available, use the materials in Handout 11–3 to discuss possible costs of procedures.

A budget for the monitoring programme needs to be drawn up and the resources and personnel necessary to carry them out specified. Normally, this will be finalised as part of preparation of the EMP. Alternatively, this can be undertaken as a separate exercise, as part of detailed project specifications or incorporated into permitting, licensing or contracting. The latter instruments have advantages in ensuring compliance and enforcement of monitoring and other follow up requirements, but they are not in place in all EIA systems.

The costs of EIA related monitoring can vary greatly, depending on the project, the location, the environment affected and the potential significance of the impacts. Other things being equal, the greater the level of uncertainty about potentially significant impacts, the higher the cost of monitoring to obtain information that is relevant to impact management and improved understanding. However, the costs can be offset by the benefits which monitoring brings. These may include immediate savings gained by timely action to correct unanticipated impacts.


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Depending on the nature and severity of the impact, this might involve one or more of the following measures:

- stopping or modifying the activity causing an excessive impact;
- imposing penalties or prosecution where conditions and standards are breached; and

- scaling up or adding mitigation measures (in situations where this is possible).

Longer-term gains can also accrue from baseline and effects monitoring. For example the data can be used to establish a reference basis for managing environmental impacts throughout the life of the project. This information will be particularly helpful to the design of an EMS to address the environmental aspects and impacts of the operational phase of the project. Wherever possible, the inputs from monitoring, auditing and other components of EIA implementation and follow up should be integrated into this framework.

Now consider the role of auditing in EIA implementation and follow up, noting its relationship to other types of environmental audit undertaken as part of an EMS. Ask participants to discuss local experience with EIA and EMS auditing.

Environmental auditing is a review process similar to that carried out in financial accounting. Both result in a statement of facts, which certifies that practice is (or is not) in accordance with standard procedure. In the case of environmental auditing, there is an added level of interpretation, focusing on the factors of performance. The concern is to identify how the aspects, processes or systems under review can be improved.

The main techniques for conducting an environmental audit are:

- examination of records and documentation relating to impacts, actions taken to manage them and aspects of performance;
- interviews with management and line staff to corroborate factual information and probe areas of concern; and
- site inspection to check that environmental measures and controls are operating as described and intended.

A distinction can be made between environmental audits conducted as part of EIA and EMS implementation, respectively. EIA related audits, typically, are *ad hoc*, project-by-project in approach and use non-standardised methodology. EMS audits, typically, are conducted in accordance with ISO 14001 guidance and procedures, and oriented toward continuous improvement in managing the environmental impacts of an organisation, site, process, product, supply chain or input-output balances. However, both EIA and EMS audits have objectives, elements of approach and information sources in common.

EIA audits are used to:

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- identify the impacts of project implementation;
- verify whether or not the conditions of approval have been implemented;

- test the accuracy of impact predictions;
- check the effectiveness of mitigation measures; and
- improve compliance and performance of EIA practice.

EMS audits include:


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- site audits – to examine all aspects of environmental management of a facility or operation;
- compliance audits – to ensure an organisation or development meets pertinent legal, regulatory and voluntary or self imposed standards such as emission limits, discharge permits and operating licenses; and
- sector or issue-specific audits – to consider key aspects of environmental management and performance, such as waste disposal, energy use, cleaner production, health and safety and supply chains.

Describe the types of information that are gained from EIA auditing and their use in improving the EIA process. Point out the importance of a well-designed monitoring programme, noting the other options for the conduct of audits when the necessary monitoring data is not available.

Guidance on the conduct of EIA audits emphasises that a well-designed monitoring programme is an integral element of good practice. The 'before and after' data collected by baseline and effects monitoring lays down an audit 'trail', which allows key impacts to be tracked and statistically verified. The case example below, from Hong Kong, illustrates the results of an EIA audit of a major project. It emphasises both the use of monitoring and audit to remedy deficiencies in EIA implementation and the difficulties of gathering evidence to verify their cause.

When selecting projects for a full audit, Hong Kong and international experience indicates that priority should be given to those:

- with a high level of environmental, social, economic or political impact and visibility;
- that can yield usable results within the existing technical and budgetary constraints; and/or
- most at risk from deficiencies in the EIA implementation and follow up system, such as limited surveillance capability or lack of authority to enforce mitigation measures.

The case example also underlines some of the difficulties commonly experienced in the conduct of EIA monitoring and audit, including:


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- limited baseline information on variability and causal relationships;
- qualitative and non auditable impact predictions;

- late changes to project design and mitigation (thereby altering the basis on which predictions are made); and
- long lead times before certain trends and impacts can be identified, for example, large scale but infrequent impacts (such as oil spills) or low dose, repetitive effects (such as exposure to heavy metals).

Other more flexible, less data demanding approaches can be taken in cases where an auditable trail of monitoring data is unavailable or insufficient. For example, 'spot' audits concentrate on significant impacts or priority concerns about mitigation measures. These can be undertaken either as a series of 'rolling' audits or a post-project analysis. An 'impact-backwards' methodology can be used to compare EIA prediction and mitigation with environmental effects and outcomes. Impacts are verified iteratively by consultation and field checks and traced backwards to EIA practice (comparable to an effectiveness or policy audit).

Box 4: Environmental monitoring and audit of the Chek Lap Kok Airport, Hong Kong SAR

Background: A number of major projects in Hong Kong are the subject to environmental monitoring and audit (EMA) as part of EIA implementation and follow up. These programmes are carried out to ensure that the measures recommended in the EIA are actually implemented and appropriate actions are taken in cases where the impact exceeds the established limit.

Project: The Chek Lap Kok Airport was built between 1991 and 1997 at a total cost of US$ 20 billion. It involved the reclamation of approx. 1250 ha site and facility development and related projects and infrastructure, including a new town of 20,000 (Tung Chung), and a 34 km high speed rail and road expressway to the city centre (involving fixed and tunnel water crossings and new terminal facilities on reclaimed land). Major areas of concern in site construction and operation included air quality, noise, water quality, waste and ecological damage resulting from dredging, dumping and reclamation.

EMA programme: An EMA system was instituted to follow up on the implementation of EIA measures. The monitoring component focused on aspects of particular concern, including water quality, air emissions, noise and dust levels. At the airport reclamation site, the initial water quality monitoring network was inadequate and had to be relocated to provide a more realistic set of auditing criteria. The audit component compared actual and predicted impacts, and the effectiveness of environmental instruments, such as clauses included in licenses, contract specifications and planning and land lease conditions. The programme was carried out by developing a reference manual and database, monthly and quarterly reports on compliance and performance, respectively, and policies and procedures to be followed in the event of breaches and non-compliance.

Summary of results: *The implementation of EIA measures* was largely dependent on the environmental awareness of the proponent's resident site staff, and hampered by

the lack of legal authority of the regulatory agency. *Impact predictions* were reasonably accurate (except for cumulative effects) but there were cases where the impact exceeded the worst-case scenario (e.g. mud dumping rates). *The audit of the effectiveness of environmental instruments* concluded that not all EIA recommendations were included in contracts, many specifications were too general, and means of enforcing or inducing compliance were insufficient. An underlying issue was the variance between the project as designed and as constructed, compromising many EIA measures and requiring renegotiation of mitigation.

Key lessons: EIA documents must be prepared with the EMA requirements in mind, for example, auditable predictions and well-defined mitigation measures, with provision for their renegotiation if design and construction vary. In addition, these measures should be translated into practicable, enforceable specifications. The regulatory agency should have the necessary legal authorities for this purpose.

Source: Sanvicens 1995.

Introduce the concept of evaluation of EIA effectiveness and performance. Ask participants whether there is any experience locally with this type of review.

Ex-post evaluation of EIA effectiveness and performance can be undertaken at a number of levels. In this topic, the emphasis is on a 'before and after' review of a specific EIA process, focusing on what was achieved and which elements of approach contributed to good environmental outcomes. This type of evaluation can be undertaken as an integral component of EIA implementation and follow up, for example to identify the results and lessons of the experience and feed them back into policy action. However, examples of this approach are limited, and fewer still are based on a systematic review of surveillance, monitoring and auditing data.

Other evaluations of aspects of EIA effectiveness and performance that can provide relevant information include:

- annual or periodic reports on the implementation and performance of EIA systems, e.g. three year review of World Bank experience;
- national and comparative reviews of the quality of EIA reports, e.g. as undertaken in Australia, Canada and the USA;
- reviews of the relationship of the EIA process and decision-making; and
- post-project analyses focusing on the results of EIA inputs and activities.

Despite recent progress, however, there is a lack of widely agreed frameworks for conducting reviews of EIA effectiveness and performance in the above areas. By contrast, in the EMS cycle, review and reporting are integral procedures for improving environmental performance. In leading

companies, these are combined with monitoring, audit and other tools to address all impacts of their operations. A review of EIA effectiveness and performance can replicate this approach to document and disseminate the lessons of experience and build the knowledge base on project-specific impacts.

Briefly summarise agency responsibilities for EIA implementation and follow up activities, and note how these apply locally.

Typically, the responsibility for EIA implementation and follow up activities will be divided among different agencies and individuals. For example:

- *the competent authority* usually oversees the implementation of the terms and conditions of approval;
- *the proponent* (often through sub-contractors) normally carries out the scheduled activities, such as site clearance and preparation, construction and environmental management;
- *the environmental or regulatory agency* usually inspects mitigation measures, reviews monitoring data and verifies compliance and effectiveness; and
- *the public* can have a formal role in environmental monitoring and audit, e.g. where a stakeholder or community review committee is in place. In other cases, there may be provision for public disclosure of monitoring and audit reports and opportunities for informal review and comment.

Include a training activity to reinforce the topic (if desired).

Conclude by summarising the presentation, emphasising the key aspects of the topic that apply locally.

Reference list

The following references have been quoted directly, adapted or used as a primary source for major parts of this topic.

Au E and Sanvicens G (1997) EIA Follow up and Monitoring in *Report of the EIA Process Strengthening Workshop* (pp. 91-107). Environment Protection Agency, Canberra.

Environment Protection Agency (1995). *Best Practice in Environmental Management in Mining. Environmental Monitoring and Performance*. Environment Protection Agency, Canberra.

Industry and Environment (1995) 18: 2&3. Special issue on environmental management tools.

Sadler B (1998) Ex Post Evaluation of the Effectiveness of Environmental Assessment (pp.30-40). In Porter A and Fittipaldi J (eds) *Environmental Methods Review: Retooling Impact Assessment for the New Century*. The Press Club, Fargo, USA.

Sanvicens G (1995) *Environmental Monitoring and Audit of the Airport Core Programme Projects in Hong Kong*. Environmental Protection Department, Hong Kong.

Scott Wilson Ltd. (1996) *Environmental Impact Assessment: Issues, Trends and Practice.* Environment and Economics Unit, UNEP, Nairobi.

UNECE (1990) *Post Project Analysis in Environmental Impact Assessment.* United Nations, New York.

Further reading

Arts J and Noteboom S (1999) Environmental Impact Assessment Monitoring and Auditing. In Hillary R and Jolly A (eds) (2000) *The CBI Environmental Management Handbook*. Earthscan, London, UK.

Petts J (ed) *Handbook of Environmental Impact Assessment.* Vol. 2 (pp.229-251). Blackwell Science Ltd, Oxford, UK.

World Bank (1995) Environmental Auditing. *Update. Environmental Assessment Sourcebook.* World Bank, Washington, DC.

World Bank (1997) Environmental Performance Monitoring and Supervision. *Update. Environmental Assessment Sourcebook.* World Bank, Washington, DC.

Training activities

Training activities will be more instructive if they are framed around a local proposal. Consider inviting prospective course participants to make a presentation if they have expertise in this area of EIA.

Discussion themes

11-1 Why is EIA implementation and follow up important? Do all projects need to be monitored during construction and after they have begun operation?

11-2 Who should be responsible for implementation and follow up activities?

11-3 How can decision-making agencies best link conditions of approval to the implementation and follow up of a proposal?

- What steps and measures are necessary to ensure there is an appropriate response to unanticipated impacts and unforeseen events?
- Is there a role for the public in these stages of the EIA process?

11-6 How might an EIA audit be conducted when there is no or insufficient monitoring data?

Speaker themes

11–1 Invite a speaker with experience in monitoring local projects to outline how the monitoring plans were developed, how often they have been adopted and how successful they have been in practice.

11–2 Invite an expert speaker with specific monitoring expertise of relevance to the participants to provide detailed coverage of the planning, implementation and review of monitoring programmes.

11–3 Invite a speaker with experience in the audit of local EIAs to address the participants, present the findings of the audit and make suggestions for the future improvement of EIAs in the area.

Group Activity 11–1: Monitoring, implementing and auditing

Title: **Preparing environmental monitoring programmes**

Aim: To use an EIA report as the basis for planning an environmental monitoring programme.

Group size: Four or five people, reporting to whole group at end of session.

Duration: Half-day to one day depending on the level of detail required.

Resources required:

- ❑ An EIA report for each group.
- ❑ Local case study for reference (or use Handout 11–3 if none is available locally).
- ❑ Support references such as the World Bank *Environmental Assessment Sourcebook* to provide the participants with technical and social information about the monitoring of different impacts (see reading list for details). Also search for something less technical to be representative of local monitoring.

Description of activity:

Using the EIA report each group is to:

- ❑ Plan an environmental monitoring programme noting:
  - the scope of the monitoring;
  - the objectives of monitoring the impacts;
  - how the information can be collected;
  - the boundaries of the proposed measurement and observation;
  - key indicators to be used for measurement or observation;
  - how the data can be analysed;
  - the level of accuracy required in the data;
  - how the plan can be reviewed;
  - what action is to be taken in the case of problems; and
  - who is responsible for monitoring, paying, checking (auditing).
- ❑ Present the results to the whole group.
- ❑ Finish with a discussion of the adequacy of the EIA report for supporting the production of monitoring programmes.
- ❑ Discuss how EIA reports could be improved in this regard.

Group Activity 11–2: Monitoring, implementing and auditing

Title: **Reviewing an environmental monitoring programme**

Aim: To critically evaluate the adequacy of a monitoring programme.

Group size: Four or five people

Duration: Half-day

Resources required :

- ❑ A copy of an environmental monitoring programme for each group member.
- ❑ The EIA report associated with the programme.
- ❑ Support references such as the World Bank *Environmental Assessment Sourcebook* to provide the participants with technical and social information about the monitoring of different impacts (see Reading list in Section A of the manual for details).

Description of activity:

- ❑ The adequacy of the monitoring programme is to be reviewed against the impacts (and their severity) highlighted in the EIA report.
- ❑ Suggestions should be made about how the programme (timing, completeness, allocation of responsibility etc) can be improved.
- ❑ The findings of the small groups should be reported to the whole group for final discussion.


1

Aims of EIA implementation and follow up are to:

- carry out conditions of approval
- ensure they work effectively
- verify impacts are as predicted or permitted
- take action to manage unforeseen changes
- optimise environmental benefits
- improve EIA practice in the future.


2

Key components of EIA implementation and follow up include:

- surveillance and supervision
- effects or impact monitoring
- compliance monitoring
- environmental auditing
- evaluation of EIA effectiveness and performance
- post-project analysis


3

Tool box for environmental management and performance review

- Internalising the environment in policy and planning – use SEA, technology assessment, comparative risk assessment
- Planning and designing environmentally sound projects – use EIA, SIA, risk assessment, environmental benefit cost assessment
- Environmental management of the impacts of an operating facility or business enterprise – use EMS (ISO 14000 series), total quality environmental management (TQEM), industrial codes of practice

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Tool box for environmental management and performance review (cont.)


4

- Eco-design of processes and products – use environmental design, life cycle assessment, cleaner production
- Monitoring, audit, and evaluation of performance – use effects and compliance monitoring, site, energy, waste, health and safety audits, benchmarking, performance review, environmental auditing

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5

Guiding principles of EIA implementation and follow up:

- carry out conditions of approval
- undertake routine surveillance and inspection
- other activities should be commensurate with significance
- monitoring and auditing should be undertaken when
  - potential impacts are potentially significant
  - mitigation measures are untried/ outcomes uncertain
  - new aspects of EIA introduced


6

Aspects to consider in design of EIA implementation and follow up:

what is required?

– identify the scope and components

who will carry out the activities?

– specify roles & responsibilities

how will these be implemented?

– allocate resources, define procedures & arrangements


7

Monitoring is used to:

establish baseline conditions

measure actual impacts and trends

verify they comply with agreed conditions

facilitate impact management

determine the accuracy of impact prediction

review the effectiveness of mitigation measures


8

Monitoring requirements in the EIA/EMP:

impacts to be monitored

objectives and data requirements

arrangements for conduct of monitoring

use of the information collected

response to unanticipated impacts

measures for public reporting and involvement


9

For scientifically credible monitoring:

use methods of a relevant discipline

establish impact and reference sites

result in time series data which can be analysed by

– assembling the data in tabular or graphic format

– testing for variations that are statistically valid

– determining rates and directions of change


10

Steps to develop an effective monitoring programme:

define the scope and objectives (for each impact)
identify the boundaries and select sites
choose the key indicators
determine the level of accuracy required in the data
consider how the data will be analysed
establish a data and reporting system
specify thresholds of impact acceptability
set requirements for action on exceedences


11

Actions to address excessive impacts or unanticipated changes:

stop or modify the causal activity
impose penalties if legal standards are breached
add or scale up mitigation measures (if feasible)


12

EIA audits are used to:

identify impacts and results
verify conditions of approval are being met
test the accuracy of impact predictions
check the effectiveness of mitigation measures
improve compliance and performance


13

EMS audits include:

site audits
compliance audits
sector & issue audits, e.g.
– waste
– energy
– health and safety
– supply chains


14

Difficulties commonly experienced in EIA Audits

- limited baseline information
- qualitative and non auditable predictions
- changes to project design and mitigation
- long lead times for some types of impact

Terminologies relating to EIA follow-up

Post decision analysis

Post decision analysis is a generic term for a wide-range for activities that can occur after a decision is made. It refers to environmental studies (ie. data collection and evaluation) undertaken during and following the implementation phases of an activity.

Environmental monitoring

Environmental monitoring refers to the systematic collection of environmental data through a series of repetitive measurements. A number of different monitoring activities are identified below:-

- *Baseline monitoring* refers to the measurement of environmental parameters during a pre-project period for the purpose of determining the nature and ranges of natural variation and to establish, where appropriate, the nature of change;
- *Effects monitoring* involves the measurement of environmental parameters during project construction and implementation so as to detect changes in these parameters which can be attributed to the project; and
- *Compliance monitoring* unlike the previous monitoring activities, takes the form of periodic sampling and/or continuous measurement of environmental parameters, levels of waste discharge or process emissions to ensure that regulatory requirements are observed and standards met. (Surveillance and inspection may also form a part of this activity but need not necessarily involve measurement of a repetitive activity).

Environmental audit

Audit is the term, taken from financial accounting, to infer the notion of verification of practice and certification of data. In terms of environmental management, the objectives of audit include:-

- the organisation and interpretation of the environmental monitoring data to establish a record of change associated with the implementation of a project or the operation of an organisation;
- the process of verification that all or selected parameters measured by an environmental monitoring programme are in compliance with regulatory requirements, internal policies and standards, and established environmental quality performance limits;
- the comparison of project impact predictions with actual impacts for the purpose of assessing the accuracy of predictions;
- the assessment of the effectiveness of the environmental management systems, practices and procedures; and
- the determination of the degree and scope of any necessary remedial or control measures in case of non-compliance or in the event that the organisation's environmental objectives are not achieved.

Two audit documents normally required are a *compliance audit,* prepared during the implementation and operation of a project; and a *post-project audit,* prepared after implementation and commissioning of a project.

Post project analysis

This is a general term used to refer to research and supporting activities which take place after a project has been built.

Taken from Elvis Au (1995) *EIA Follow up and Monitoring*

The process of environmental monitoring and performance assessment

GOAL	Demonstrate to governments and the community that the operation complies with environmental quality objectives determined through the EIA process and achieves good environmental performance
Specific Objectives	▪ detect short and long-term trends ▪ recognise environmental changes and analyse causes ▪ measure impacts and compare with predicted impacts ▪ improve the monitoring system ▪ improve practices and procedures for environmental assessment

↓

MONITORING

MONITORING REQUIREMENTS	**ENVIRONMENTAL ISSUES**
Specific monitoring requirements are developed in the process of preparing an Environmental Management Plan. They include:	The following issues, identified during the EIA process, should be specified:
▪ what to measure	▪ environmental values to be protected
▪ where to measure	▪ potential hazards
▪ when to measure	▪ potential impacts
▪ how to measure	▪ level of acceptable change
▪ evaluation methods to be used	▪ level of risk
▪ additional information required	▪ pathways and impact sites

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PERFORMANCE ASSESSMENT

From the monitoring program:	From the assessment:
▪ identify trends, causes and impacts	▪ modify practices and procedures for environmental protection
▪ assess performance and compliance	▪ modify monitoring program

Monitoring Case Study — ERA Ranger Mine Environmental Monitoring Program and Performance Assessment

BEST PRACTICE ENVIRONMENTAL MANAGEMENT IN MINING ' ENVIRONMENTAL MONITORING AND PERFORMANCE' EPA JUNE 1995

Note: The Ranger Uranium mine located in the Kakadu National Park in the Northern Territory of Australia, has monitoring costs of approximately $A 1 000 000 each year due to the sensitivities associated with uranium mining adjacent to the Kakadu wetlands.

Area	Frequency	Procedure	Analysis And Review Of Results	Compliance Requirements	Other Details
Surface water: • retention ponds • creeks • billabongs • sumps • wetland filters	weekly* monthly* monthly* monthly* as required for research purposes. *daily & weekly during a release	Water samples taken and chemistry analyses completed. Water levels checked via gauge boards and stream gauging.	Results graphed and tabulated for inclusion in reports. Comparisons made with previous reporting period. Collated in quarterly/six monthly water management and annual environmental reports.	Limits established for receiving waters during release of water from retention ponds.	Hydrology and chemistry combined for load calculations during release. Results used in research on wetland filtration, seepage management etc.
Groundwater: • monitoring bores • piezometers • dewatering bores • land application bores	monthly bi-monthly six-monthly some more frequently weekly during irrigation.	Water level in bores measured using dip-meter and piezometer level read. Water samples taken using bore pump.	As above.	Tailings bores and piezometers needed to monitor stability and seepage aspects of tailings dam. Land application (Irrigation) area monitored for mobility of salts and other elements.	Data included in research projects on seepage modelling.
Biological screening: • retention ponds • creeks • billabongs • wetland filter	During wet season prior to and during release of retention pond water. As required for wetland filter research.	Control water obtained from creek. Pond water at a range of dilutions prepared and microscopic aquatic organisms (hydra, cladoceran and fish embryos) used to assess toxicity.	Results tabulated, statistically analysed and included in reports. Internal and external review by government authorities.	Used as part of process to determine dilution rate of release water.	Government standards and safety factor (x10 to x100) before applying the results of toxicity tests.
Soils	Three-yearly.	Collection, preparation, digestion and analysis according to standard methods.	Reported three-yearly and in annual report.	Results compared to historical data.	Monitoring sites are located along drainage channels around the lease area.

Monitoring Case Study — ERA Ranger Mine Environmental Monitoring Program and Performance Assessment

Area	Frequency	Procedure	Analysis And Review Of Results	Compliance Requirements	Other Details
Uptake of contaminants by biota: • mussels in creeks • vegetation in land application area.	Annually and on non-regular occasions (eg. for retention pond 2 release).	Mussels sampled from down-stream billabong. Mussel tissue ashed and analysed for contaminant uptake. Vegetation sampled and analysed for contaminant uptake.	Internal and external review by government authorities in the annual report.	Results compared to previous data. Also judged on relevant ANZECC standards for edible criteria.	
Sediment control	Annual.	Annual erosion survey undertaken and wet season plan prepared for remediation.	Written report/photos, recommendations and budget requirements. Internal review.	Minimise soil loss from mine area and surrounding lease due to disturbance.	Comprehensive pond systems ensures runoff contained in ponds/sediment control structures prior to overflow to creek system.
Weeds	Bi-annual.	Visual inspection to assess success of previous weed control efforts and plan future control of these areas or new outbreaks.	Sketch map prepared and weed control methods planned in liaison with government authorities (Department of Primary Industry & Fisheries) and neighbours in National Park (Australian Nature Conservation Agency). Mission grass main weed problem. Internal review and reporting.	N/A	Encourage use of native species by residents in gardens in Jabiru township via education and supply of plants from Ranger nursery during establishment of town.
Fire	As required.	Control of wildfires during dry season and planned burns conducted late wet season/early dry season.	Research on fires helping to refine timing and nature of burn. Internal review and external review during research field days on site.	N/A	Protection of mine assets and monitoring equipment in surrounding woodland, a key requirement for fire monitoring/management.
Area dust and personal dust	Weekly Daily dependent on level of dust found.	High volume dust samplers and personal samplers are used to collect the sample on a filter paper. Radiometric and gravimetric analyses are undertaken.	Results are reported on a quarterly and annual basis. On an annual basis the results are compared with the previous period results.	Results are compared with the allowable limits as per the Authorisation to Operate.	The results from the personal air sampling and the consequent radiological analysis are used to assess radiation exposure due to inhalation of radioactive particles.

Monitoring Case Study — ERA Ranger Mine Environmental Monitoring Program and Performance Assessment

Area	Frequency	Procedure	Analysis And Review Of Results	Compliance Requirements	Other Details
Stack emissions	Emissions are measured from the calciner and product packing stacks. Calciner and product packing: monthly. Acid plant: Sulphur dioxide and acid mist emissions are measured from the acid plant stack every three months.	The USA EPA methods for stationary sources are used. A representative sample over a four-hour period is collected from each stack.	Results are reported on a quarterly and annual basis. On an annual basis the results are compared with the previous period results.	Results are compared with the allowable limits as per the Authorisation to Operate.	The results are used as inputs for some atmospheric modelling work.
Radon-222 Progeny Exposure	Weekly and monthly depending on areas monitored.	Automatic area monitors are used to measure average concentrations of ambient radon progeny (decay product of Radon-222 gas). Samples are collected in the immediate operations area and the surrounding environment. Areas are usually monitored for a minimum of 24 hours and up to seven days continuously. Average concentrations are measured every hour at various locations.	Results are reported on a quarterly and annual basis. On an annual basis the results are compared with the previous period results.	Results are compared with the allowable limits as per the Authorisation to Operate.	Results from area measurements of radon progeny concentrations are used to calculate employees' radiation dose due to the inhalation of radon progeny.
Gamma Exposure	Personal monitors are used to measure individual employee exposure to gamma radiation. These are worn every day by employees working in the process plant. The monitors are analysed on a quarterly basis.	Worn by employees who are likely to receive the highest exposure to gamma radiation, eg employees who work in the process plant and the mine.	Results are reported on a quarterly and annual basis. On an annual basis the results are compared with the previous period results.	Results are compared with the allowable limits as per the Authorisation to Operate.	The monitors are analysed by the Australian Radiation Laboratory and the results combined with the radiation doses from dust and radon progeny to get the total radiation dose to individual employees.
Blasting	Every blast (daily for six months of the year)	A blast vibration monitor is located adjacent to the pit on the southern side to measure the magnitude of each blast.	Chart records from the monitoring device are forwarded to the supervising authority monthly.	All blasting operations shall be conducted so that Mt Brockman and the aboriginal sacred sites in the environs are not damaged.	Mine blasting operations have taken place within the limits set for ground vibration magnitude.

Monitoring Case Study — ERA Ranger Mine Environmental Monitoring Program and Performance Assessment

Area	Frequency	Procedure	Analysis And Review Of Results	Compliance Requirements	Other Details
Ore and waste dumping (Restricted Release Zone - RRZ)	Daily during mining phase.	Grade control prior to blasting plus discriminator reading of each truck load for uranium content. Scintillometer measurements over surface of waste and ore stockpiles are made to check only <0.02% uranium is on waste stockpile (outside RRZ boundary).	Grade control plus discriminator records plus calibration. Notebook records of surface checks of radioactivity.	All material with >0.02% uranium must be contained in RRZ for water management purposes.	