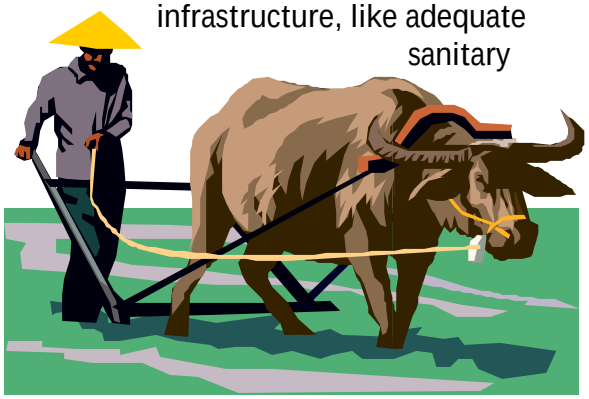
PRACTICAL IREM TOOLS

Applying the concept of sustainable development is difficult. It sets new environmental performance requirements for government and industry. Progress towards sustainable development will require continued profound change in the attitudes and aspirations that influence governments, industry and other resource developers. We have established that the environment must form a part of the social and economic development process if natural resources are to be protected. Both government and industry have vital roles if the sustainable use of natural resources is to become anything other than an ideal concept. Some practical tools available to governments and industry in helping achieve sustainable developments are examined in this lesson.

LAND USE PLANNING

Land use planning allows governments to plan for and avoid further degradation of landscapes that are degraded, unsustainable and, sometimes, even hard to look at. The more that governments can adopt ecologically-based land use planning, the better they can plan effective development and the accompanying infrastructure, like adequate sanitary sewerage and waste water treatment. Zoning ordinances can be written to limit or exclude certain types of developments near water bodies and ecologically sensitive areas. Environmental planning policy dictates where developments such as urban, industrial, rural and natural resource exploitation can occur and dictates the rules of the development. Planning policy tries to provide sustainable development by placing developments and supporting infrastructure in the most suitable areas, and applies strict rules to these developments to limit their environmental impacts.



Land use planning systems have been one of the major 'anticipatory controls' for environmental protection (i.e. a system designed to further the prevention of environmental degradation rather than deal with it after the event). Generally, permits are required under a land use planning system before any development can be undertaken. Unauthorized use of land would lead to the planning authority inviting the developer to submit a planning application requesting that such use be permitted. If the planning application is refused and the construction continues, a stop-work order is served. If the planning authority is of the opinion that there may have been a breach of planning regulations, it can require the project developer to supply specific information. In this way unforeseen environmental impacts can be prevented.

Planning consent is normally only given after an environmental impact assessment (EIA) has been carried out.

Usually in planning, developments are grouped so that industry and residential areas are separated. Licenses for resource exploitation projects are limited, so that resources in an area are not impacted to the detriment of the environment. Conditions can be attached to planning consents, which seek to reduce the environmental impact of the development. Such conditions can, for instance, require that a site be landscaped, or that a process be operated only during specific hours, or air emissions monitored daily.

ENVIRONMENTAL IMPACT ASSESSMENT

An EIA involves analysis of the potential impacts that a proposed project or activity, usually industrial, will have on the natural and social environment. It includes an assessment of long- and short-term effects on the physical environment, such as air, water and noise pollution, as well as effects on employment, living standards and local communities. EIA and how it applies to the Mekong River Basin (MRB) will be discussed in much greater detail in Courses D and E. For now, though, an introduction to EIA will be helpful in further understanding integrated management.

Planning policy usually dictates the type of industry and other development that requires an EIA. These are generally activities that can potentially have a significant impact on the environment. Riparian governments in the MRB have already developed or are currently developing lists of project types that require an EIA as a development permit condition. The following are examples of some of the types of developments requiring impact assessments (i.e., an example list prepared by the U.S. Environmental Protection Agency is used to illustrate the wide variety of developments that can be covered):

1. Crude oil refineries and installations for the gasification and liquefaction of 500 tonnes or more of coal or bituminous shale per day
2. Thermal power stations and other combustion installations with a heat output of 300 megawatts or more and nuclear power stations and other nuclear reactors
3. Installations solely designed for the production or enrichment of nuclear fuels, for the reprocessing of irradiated nuclear fuels or for the storage, disposal and processing of radioactive waste
4. Major installations for the initial smelting of cast-iron and steel and for the production of non-ferrous metals
5. Integrated chemical installations
6. The construction of express roads, lines for long-distance railway traffic, and airports with a basic runway length of 2,100 m or more
7. Large-diameter oil and gas pipelines
8. Trading ports and also inland waterways and ports for inland-waterway traffic which permit the passage of vessels of over 1,350 tonnes
9. Waste disposal installations for the incineration, chemical treatment or landfill of dangerous wastes
10. Large dams and reservoirs, and groundwater abstraction activities in cases where the annual volume of water to be abstracted amounts to 10 million cubic meters or more

11. Pulp and paper manufacturing of 200 air-dried metric tonnes or more per day
12. Major mining, onsite extraction and processing of metal ores or coal and Offshore and on-shore hydrocarbon production
13. Major storage facilities for petroleum, petrochemical and chemical products
14. Deforestation of large forest areas.

Information normally contained in an EIA report includes:

- A description of the proposed activity and its purpose
- A description, where appropriate, of reasonable alternatives (for example, possible different locations or technologies) to the proposed activity
- A description of the environment likely to be significantly affected by the proposed activity and its alternatives
- A description of the potential environmental impacts of the proposed activity and its alternatives, and an estimation of the significance of those impacts
- A description of mitigation measures to eliminate or reduce environmental impacts
- A detailed indication of underlying assumptions and sampling design for the relevant environmental data needed
- An identification of uncertainties and gaps in knowledge encountered in compiling the required information
- Where appropriate, an outline for monitoring and management programs and any plans for post-project analysis
- A non-technical summary, including a visual presentation as appropriate.

Completion of an EIA generates important inputs for project planners and decision makers. Preparation of an environmental statement as part of the EIA process and in parallel with the project design provides a valuable framework within which environmental considerations and design development can interact. Analysis of a design or proposal using environmental criteria often reveals ways in which the project can be amended to avoid adverse effects (i.e., prevention being better and cheaper than a cure). It may also reveal better operating processes, or point to alternative processes, which are more cost-effective or allow environmental impacts to be reduced.

The EIA process has become an increasingly important management tool in the mid-to-late 1990s. One reason is that the findings of several early to mid-1990s state-of-practice studies of EIA identified cumulative effect issues as critical to effective and efficient project-level and long-term planning. Further, as the scope of impact studies expands toward larger scale issues such as biodiversity, sustainable development, global climate change, strategic and transboundary environmental assessment, the importance of more holistic approaches involving cumulative effects is being recognized.

Cumulative effects are impacts on the environment which result from the incremental impacts of a proposed project or activity added to other past, present, and reasonably foreseeable future projects or activities in the

vicinity of the proposed project or activity. It should be recognized that cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. Cumulative effects will be discussed in greater detail in Course G.

ENVIRONMENTAL MANAGEMENT SYSTEMS

Organizations of all kinds are increasingly trying to achieve and demonstrate sound environmental performance by controlling the impact of their activities on the environment. They do so in the context of increasingly stringent legislation, the development of economic policies and other measures to foster environmental protection, and an overall growing concern about environmental protection and sustainable development.

Many organizations have undertaken audits, EIAs, and technology reviews. However, these may not be sufficient to provide assurance that environmental performance not only meets, but will continue to meet, legal and policy requirements. The tools are individually powerful, but if brought together, they become a systematic and structured, or 'managed system' approach to environmental performance. By combining individual environmental management elements into an environmental management system (EMS) they become structured and integrated with overall management activity. The elements of an EMS are as follows:

- Commitment from the top of the organization is key to the success of the application of an EMS
- Preliminary review, or audit, which establishes the baseline of environmental performance, the primary areas of environmental effect, and the opportunities for improvement
- A statement of environmental policy that summarizes a commitment to and direction for environmental performance management within an organization
- Methods for understanding the environment, including tools to analyze the environmental impacts of an organization's activities or responsibilities, to ensure focus on the most significant areas
- A 'cradle-to-grave' analysis, which identifies the environmental issues related to a product, from the procurement or raw materials through the manufacturing or construction process and on to the use and disposal of the product
- An EIA approach to projects and other major decisions within an organization, prior to commitment to a course of action
- An environmental management communication process that identifies environmental issues throughout an organization, involving all business activities, and stakeholders
- A method for identifying the policy, regulatory and other interested parties' requirements to be met by the organization in its activities, leading to the setting of environmental objectives and targets throughout the organization.
- With all of these elements in place, adequately documented and

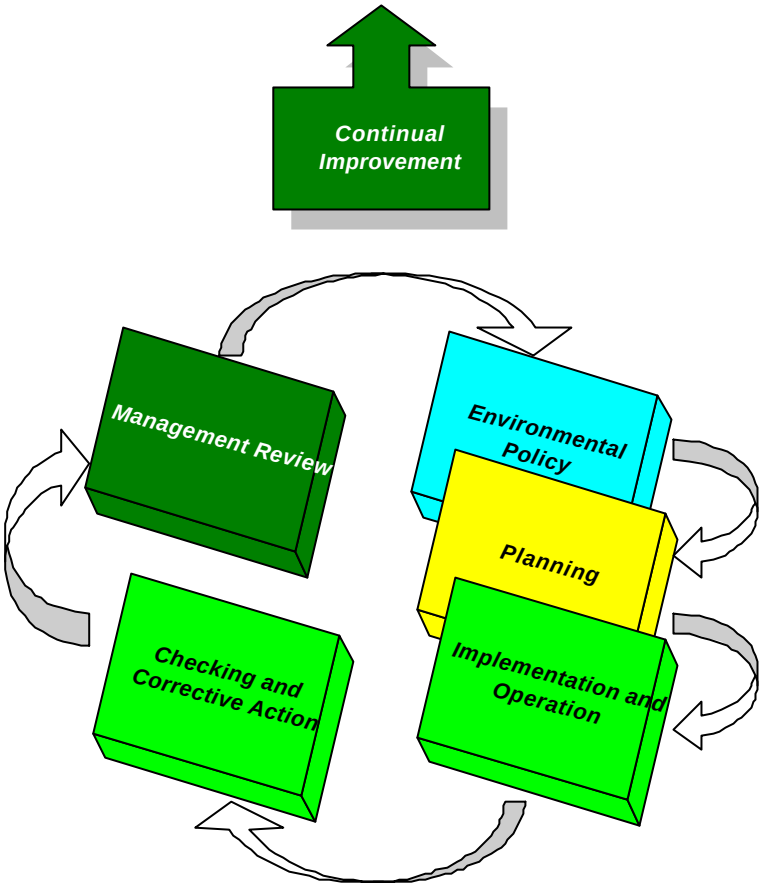


Figure 1 The elements of a basic environmental management system

implemented, the organization should be assured that the required environmental performance is being met.

Figure 1 is an illustration of the elements involved in an EMS.

ISO 14001

The International Organization for Standardization ISO 14001 Standard for EMS has been established to encourage a quality-assured approach to environmental management. Compliance with such standards is becoming increasingly valued in the international marketplace and ISO standards are now widely adopted and accepted in many countries. Some of the strengths and weaknesses of ISO 14001 are summarized in Table 1.

Organizations with ISO 14001 certification demonstrate their environmental commitment to an international audience. A number of industries in Thailand and Vietnam have attained ISO 14001 certification. At a minimum, these companies are accepting the responsibility to:

Table 1 Strengths and weaknesses of ISO 14001 EMS

STRENGTHS	WEAKNESSES
ISO 14001 fosters the involvement of top-level management. Top management is increasingly viewing ISO 14001 as a competitiveness edge, rather than as a compliance issue.	**ISO 14001 is an environmental management systems standard, not a performance or compliance standard.** It does not set any targets for improved environmental performance.
ISO 14001 takes a systematic, holistic approach to environmental management. Companies are encouraged to view their environmental performance holistically.	**ISO 14001 does not mandate compliance with environmental regulations, so it cannot remove an organization's responsibility to meet local or national pollution standards.** ISO 14001 requires a commitment from the organization to comply with relevant legislation, but the commitment is not well defined.
ISO 14001 establishes a framework for continual improvement in an organization's environmental management system. Periodic audits are required to assess procedural improvements and identify needed improvements in the organization's EMS.	**ISO 14001 leaves the level of public involvement to the discretion of the organization.** Public involvement is required, but the level of communication is left to the organization.
ISO 14001 encourages innovation at the facility level, among all employees. Environmental awareness is instilled in employees, enabling organizations to harness the technical skills of their employees to identify creative methods of reducing environmental impacts.	**ISO 14001 does not actively require pollution prevention technologies.** Compliance with pollution standards is an excellent first step in responsible environmental management, but adoption of technologies that eliminate or reduce the overall amount of pollution created would be of even greater environmental benefit.
ISO 14001 is encouraging international awareness about environmental performance. The introduction of the standard is prompting organizations around the world to consider their environmental performance. Also, ISO 14001 may become a requirement of many customer/supplier business transactions.	

- Adopt a written environmental policy
- Identify all environmental aspects and impacts of their operations
- Set priorities, goals and targets for ongoing improvement in their environmental performance
- Assign clear responsibilities for implementation, training, monitoring and corrective actions
- Document their procedures and results
- Evaluate and refine their implementation over time, so as to achieve continual improvement both in their attainment of their environmental goals and in the EMS itself.

Environmental Auditing

The ISO 14001 definition of an audit is "a systematic and documented verification process of objectively obtaining and evaluating audit evidence to determine whether an organization's EMS conforms with the EMS audit criteria set by the organization (i.e., ISO 14001), and communicating the results of this process to management."

There are two broad categories of environmental audit. First, there are audits where the objective is primarily to gather information. Commonly used terms are environmental review, environmental issues audit and site audit. In these cases, management requires information as a basis for decision making. Secondly, there are audits where the objective is to verify compliance with a defined set of requirements and conditions. Examples include regulatory compliance audits and due-diligence audits.

An understanding of technology and processes is vital if sound environmental management is to be achieved. Audits and impact assessments are very effective tools for identifying issues, but in many instances technological solutions are required to improve the quality of air emissions or waste water emissions.

Liquid, solid and gaseous waste materials are inevitably generated during the manufacture of a product or other activities such as the construction of a highway. Apart from creating environmental problems, wastes not only represent losses from production or construction process of valuable raw materials, but also require significant investment in pollution control practices.

In this brief introduction it is not possible to discuss all the technological options available to manage environmental impacts from industry and other development activities. However, we can look at a framework for choosing methods and technology options when dealing with the production of waste as indicated below:

- Waste minimization
- Waste reduction
- Clean technologies/clean engineering/clean processing
- Pollution prevention/reduction
- Pollution control technologies
- Low and non-waste technologies.

All traditional and modern technologies and technical approaches fall within, and can be described, using the hierarchy of waste management outlined in Table 2.

STATE OF THE ENVIRONMENT REPORTING

Sustainable development requires that informed choices be based on good environmental information. An understanding of the present status and trends of environmental conditions is a necessary component of sound environmental decision making. A good understanding of environmental conditions enables society to make better decisions and more responsible choices, ultimately for the benefit of the environment and future generations. State of the environment (SoE) reporting is an important information tool for increasing understanding of the ecological consequences of human activities

SoE reporting provides a vehicle for assessing all aspects of the environment at one time and allows society to monitor progress towards defined goals. It seeks to answer several questions:

- What is happening in the environment?
- Why is it happening?
- Why is it significant?

Table 2 A hierarchy of waste management priorities (possible actions are listed from highest to lowest priority)

ACTION	OUTCOME
SOURCE REDUCTION	The avoidance, reduction or elimination of waste, generally within the confines of the production unit, through changes in industrial processes or procedures.
RECYCLING	The use, re-use and recycling of wastes for the original or some other purpose such as input material, materials recovery or energy production.
TREATMENT	The destruction, detoxification, neutralization of wastes into less harmful substances.
DISPOSAL	The discharge of wastes to air water or land in properly controlled or safe ways such that compliance with legislation is achieved; secure land disposal may involve volume reduction, encapsulation, leachate containment and monitoring techniques.

- What are we doing about it?
- What environmental trends are occurring?

SoE reporting is also an effective tool for indicating priority areas and guiding policy development. Perhaps most significantly, SoE reporting encourages discussion and agreement on what conditions are valued, what conditions are acceptable and what trends are worrisome.

SoE reporting is a circular process involving six steps:

1. Identification of issues and areas of concerns
2. Definition of indicators
3. Assembly of available information
4. Evaluation of results; determine benchmarks and targets
5. Reporting and presentation of material
6. Monitoring to address important data gaps and conduct future assessments.

The concept of environmental indicators – sometimes called biological indicators or sustainability indicators – was introduced in Course B. Indicators are essential components in the overall assessment of how well environmental management goals are being fulfilled. To be effective, indicators should be:

- Relevant to an issue of concern
- Scientifically credible
- Responsive to change
- Can be expressed as 'below' or 'above' a target
- Representative and supported by sufficient data to show both regional patterns and trends over time
- Based on cost-efficient data
- Easy to communicate and understand
- Comparable with other regions.

Indicators can be measures of:

- Stress (e.g., carbon dioxide emissions, waste loadings)
- Conditions (e.g., air temperature, metal concentrations in sediments)

- Response of the environment (e.g., fish production, abundance of a wildlife species, percentage of water unsuitable for drinking)
- Response of society (e.g., amount of protected areas).

It is generally advisable to select a balance between the various types of indicators.

The preparation of a SoE report is a challenging task. Considerable information and data needs to be gathered and presented in a manner that is accurate and meaningful. SoE reporting cannot be done effectively without some agreement on what conditions and trends are worthy of attention. Similarly, there must also be agreement on what to use as measuring sticks, what assessment levels constitute concern and what is considered to be a significant change. Reaching agreement on these aspects can pose a major obstacle in producing SoE reports.

A common obstacle of SoE reporting in the MRB is insufficient data and inadequate levels of understanding of social and ecological processes. In most of the riparian countries in the Basin, desirable indicators are understood but the necessary monitoring data to assess conditions and evaluate trends does not exist. Where data has been collected, differences in methodologies, definitions, and standards can prevent comparative analysis among countries. Lack of consistent monitoring often makes assessments of whether conditions are improving or deteriorated difficult. In other cases, science and ecological assessment hasn't evolved to the point of knowing what the relevant parameters are or how to measure them.

There is often a shortage of background information available to establish appropriate environmental benchmarks. This is particularly the case with efforts to assess ecosystem connections and the overall health of the environment. Often, an understanding of ecological interconnections and linkages in the biophysical and social dimensions of the environment is fairly limited. As a result, meaningful indicators and measurement benchmarks for assessing ecosystem health have yet to be developed.

Regardless of the formidable challenges, SoE reporting is an essential step for revealing current conditions and indicating past and future trends. While there is still much to learn and document, SoE reporting is a good beginning. It is important that the process of environmental reporting in the MRB be maintained and viewed as a building block for improving reporting in the future.