Appendix | 4

Key Principles and Concepts Underlying Integrated Watershed Management

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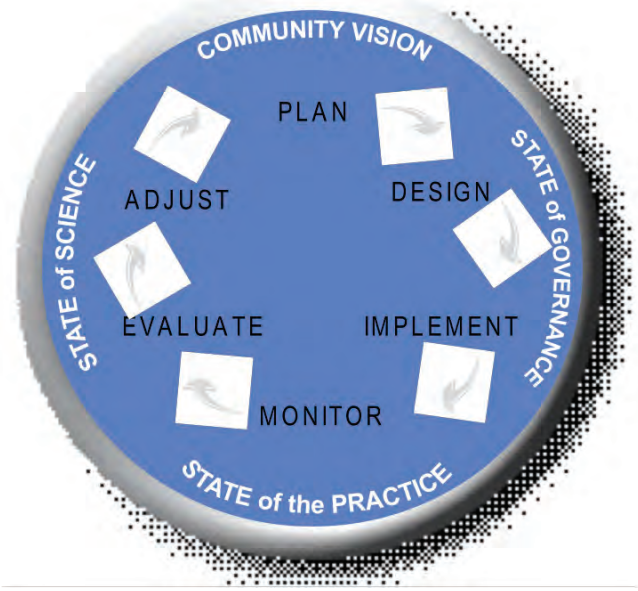
Adaptive Environmental Management

Adaptive Environmental Management (AEM) can be defined as an approach to environmental management aimed at improving understanding of the ecosystems being managed, the institutions charged with their management, and IWM since it recognizes that ecosystems are by their nature complex and in a state of constant evolution. We start by learning about the functional relationships between key environmental features (characterizing the system), develop predictions on the response of these features to management interventions, while recognizing the uncertainty that underlies resource management issues and develop a plan that best meets the goals, objectives and targets set for the local watershed.

AEM is a learning tool, and is just what it claims to be - adaptive. Although there are principles and guidelines that are common in the field of environmental management, they must be altered, or adapted to each specific scenario. The premise of AEM is that goals must be clearly defined, and a model developed, such as a watershed/subwatershed framework, in order for the system to be understood.
The selection of indicators of health that are simply, cheaply and easily measured is necessary if this approach is to be successful in these times of dwindling resources. As a matter of fact, external influencing factors to the specific application of AEM include consideration of governance and community vision in addition to the technical factors such as state of the science and state of the practice.

ADAPTIVE ENVIRONMENTAL MANAGEMENT



Precautionary Principle

The precautionary principle is a moral and political principle which states that if an action or policy might cause severe or irreversible harm to the public or to the environment, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action. The principle implies that there is a responsibility to intervene and protect the public from exposure to harm where scientific investigation discovers a plausible risk in the course of having screened for other suspected causes. The protections that mitigate suspected risks can be relaxed only if further scientific findings emerge that more robustly support an alternative explanation.

There are many definitions of the precautionary principle. Precaution may be defined as "*caution in advance*," "*caution practiced in the context of uncertainty*," or *informed prudence*. All definitions have two key elements.

1. an expression of a need by decision-makers to anticipate harm before it occurs. Within this element lies an implicit reversal of the onus of proof: under the precautionary principle it is the responsibility of an activity proponent to establish that the proposed activity will not (or is very unlikely to) result in significant harm.
2. the establishment of an obligation, if the level of harm may be high, for action to prevent or minimize such harm even when the absence of scientific certainty makes it difficult to predict the likelihood of harm occurring, or the level of harm should it occur. The need for control

measures increases with both the level of possible harm and the degree of uncertainty.

One of the primary foundations of the precautionary principle, and globally accepted definitions, results from the work of the Rio Conference, or "Earth Summit" in 1992. Principle #15 of the Rio Declaration notes:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

This definition is important for several reasons. First, it explains the idea that scientific uncertainty should not preclude preventative measures to protect the environment. Second, the use of "cost-effective" measures indicates that costs can be considered. This is different from a "no-regrets" approach, which ignores the costs of preventative action.

Fields typically concerned by the precautionary principle are the possibility of:

- Global warming or other abrupt climate change
- Extinction of species
- Introduction of new and potentially harmful products into the environment, threatening biodiversity (e.g., genetically modified organisms)
- Threats to public health, due to new diseases and techniques (e.g., AIDS transmitted through blood transfusion)
- Persistent or acute pollution (asbestos, endocrine disruptors...)
- Food safety (e.g., Creutzfeldt-Jakob disease)
- Other new biosafety issues (e.g., artificial life, new molecules)

Risk

Risk can be defined as the threat or probability that an action or event will adversely or beneficially affect the ability to achieve objectives. In simple terms risk is ‘Uncertainty of Outcome’, either from pursuing a future positive opportunity, or an existing negative threat in trying to achieve a current objective.

Uncertainty

Uncertainty can be defined as the lack of complete certainty, that is, the existence of more than one possibility. The "true" outcome/state/result/value is not known.

Sustainability

Sustainability in its broadest terms is concerned with the optimization of human well-being, ever mindful of a simultaneous need to minimize ecological damage and resource depletion. Sustainability in this sense is at the heart of human existence. One approach can be to use sustainability analysis as a tool for building results- based sense of common purpose in environmental governance in the future. What this means is that sustainability analysis can model how societies and economies function in environmental and quality of life terms, rather than in economic terms alone.

There is little agreement on how the ecological, economic and social systems are related to one another. However, “sustainable development” is seen as an attempt to reconcile the respective imperatives of each of the three systems. These imperatives can be stated as:

- The ecological imperative is to remain within planetary biophysical carrying capacity;
- The economic imperative is to ensure adequate and equitable material standards of living for all people; and
- The social imperative is to provide social structures, including systems of governance that effectively propagate and sustain the values that people wish to live by.

In this context, governance is understood to be three-dimensional: to minimize extractions and impositions on the environment as a sink, to maximize well-being, and to improve the efficient conversion of environmental capacities to social well-being. Economic output is optimized rather than maximized.

Integration

Integration is an approach to management through which multiple stakeholders collaborate and share risk in defining, analyzing and resolving social-ecological challenges for the common good. This approach moves beyond conventional single-species management to consider the implications of species interactions, habitat and ecosystem linkages, and cumulative effects. In other words there are many dimensions to integration:

- integration means managing benefits to diverse watershed-level components, including water, flora and fauna etc. so that no one particular component is given greater value over other components;
- Integration also means integrating diverse solutions through a multi-disciplinary or multi-sectoral approach. This form of integration is required not only given the “systems” thinking in a biophysical sense, but to support technical solutions with social, policy and market interventions; and
- A third form of integration can be seen in the need to manage interactions among diverse tenure systems, so that investment in individual and private “goods” can be balanced with investment in common and public goods.