

An Overview of Ecosystem Approach

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Abstract: Ecosystems are some of the components that constitute the biosphere – the complete assembly of the Earth’s ecosystems. Ecosystems also include habitats, places where the plants and animals of an ecosystem survive. Ecosystem-related problems are in most cases highly complex in character. They are multi-dimensional and interdisciplinary and often involve a number of uncertainties and risks. The Ecosystem Approach is a strategy for management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Within the overall concept of sustaining ecological integrity, specific goals, principles and steps to apply the ecosystem based approach deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning. The ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization, which include the structure, processes, functions and interactions among biotic and abiotic components. The ecosystem approach is essential in guiding action under the various programmes of work of the Convention on Biological Diversity (CBD).

IndexTerms – Ecosystem Management, Ecosystem Approach, Convention of Biological Diversity, Goals, Principles

I. Introduction

Self regulatory ecosystems are a basic requirement for sustainable development and biodiversity conservation. Ecosystem functions are the result of assemblages of biotic components interacting with each other and with the physical or abiotic components of their environment. Biological resources support human existence, and make it possible to adapt to changing needs and prevailing environmental conditions. However, present trends of economic development; undervalue the ecosystem processes and services leading to the overexploitation of valuable resources globally. Ecosystem degradation is usually caused by a variety of social, economic, cultural and economic forces, for instance, population pressure, urbanization, over-exploitation of natural resources, and developments that change ecosystem characteristics. Ecosystem-based approach attempts to regulate our ecosystems use so that we can benefit from them while at the same time modifying our impacts on them so that basic ecosystem functions are preserved. The ecosystem management approach tries to address these by influencing the ways in which local people (and others) use the natural resources and benefit from the ecosystem functions.

II. Concept of Ecosystem Approach

The Convention on Biological Diversity defines the ecosystem approach as “*a strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way. An ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompasses the essential structures, processes, functions and interactions among organisms and their environment. It recognizes that humans with their cultural diversity, are an integral component of many ecosystems*”. The ecosystem approach is a method for sustaining or restoring natural systems and their functions and values. It is goal driven, and is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic and social factors. It is applied within a geographic framework defined primarily by ecological boundaries (Interagency Task Force, 1995; Smith & Maltby, 2003).

The EA is the primary framework for delivering the three objectives of the CBD: conservation, sustainable use, and equitable sharing of benefits. The Ecosystem Approach is a strategy for management of land, water and living resources that promotes conservation and sustainable use in an equitable way (Smith & Maltby, 2003).

The ecosystem approach requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning.

III. Evolution of Ecosystem Approach

At its second meeting, held in Jakarta, November 1995, the Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) adopted the ecosystem approach as the primary framework for action under the Convention, and subsequently has referred to the ecosystem approach in the elaboration and implementation of the various thematic and cross-cutting issues work programmes under the Convention. The thematic and cross-cutting issues concerned include biological diversity of inland water ecosystems, marine and coastal biological diversity, agricultural biological diversity, forest biological diversity, indicators of biological diversity and incentive and environmental impact assessment. At its fourth meeting in Bratislava in May 1998, the COP acknowledged the need for a workable description and further elaboration of the ecosystems approach, and requested the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to develop principles and other guidance on the ecosystem approach. At the eighth meeting of the COP, decisions concerning the ecosystem approach can be found under other thematic programmes and cross cutting issues: on Island biodiversity, on Implications of the findings of the Millennium Ecosystem Assessment, on the Global Initiative on Communication, Education and Public Awareness: overview of implementation of the programme of work and options to advance future work, on Forest biological diversity: implementation of the programme of work, on Biological diversity of inland water ecosystems: reporting processes, improving the review of implementation and addressing threats, on Agricultural biodiversity, on Protected areas, on Incentive measures: preparation for the in-depth review of the programme of work on incentive measures, on Impact assessment: At COP 9, Parties agreed to strengthen and promote the use of the ecosystem approach more widely, and to increase capacity building activities (CBD, 2004).

IV. Guiding Principles

At the core of the ecosystem approach are its twelve guiding principles which are complementary and interlinked with one another (CBD, 2004). In applying the 12 principles, the ecosystem approach focuses on the functional relationships and processes within ecosystems with recognition that such processes and functions are complex and variable. EA seeks to enhance benefit-sharing, carry out management actions at the appropriate scale and decentralized to the lowest level, and to ensure inter-sectoral cooperation.

1. Management of land, water, and living resources are a matter of societal choice.
2. Management should be decentralized to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. There is a need to understand and manage the ecosystem in an economic context. Therefore, an ecosystem management programme should:
 - Reduce market distortions that adversely affect biological diversity
 - Align incentives to promote biodiversity conservation and sustainable use
 - Internalize costs and benefits in the given ecosystem to the extent feasible
5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

6. Ecosystems must be managed within the limits of their functioning.
7. EA should be undertaken at the appropriate spatial and temporal scales.
8. Objectives for ecosystem management should be set for the long term due to the varying temporal scales and lag-effects that characterize ecosystem processes.
9. Management must recognize that change is inevitable.
10. EA should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. EA should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. EA should involve all relevant sectors of society and scientific disciplines.

Ecosystems should be managed for their intrinsic values in a fair and equitable way. Different sectors of society view ecosystems in terms of their own economic, cultural and society needs. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Rights and interests of Indigenous peoples and other local communities should be recognized. The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation, and use of local knowledge. Management interventions in ecosystems often have unknown or unpredictable effects on other ecosystems; therefore, possible impacts need careful consideration and analysis. In considering the likelihood or ease of attaining the management objectives, attention should be given to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity. The ecosystem approach is based upon the hierarchical nature of biological diversity characterized by the interaction and integration of genes, species and ecosystems. Ecosystems change, including species composition and population abundance. Hence, management should adapt to the changes. Apart from their inherent dynamics of change, ecosystems are beset by a complex of uncertainties and potential "surprises" in the human, biological and environmental realms.

In applying the 12 principles of the ecosystem approach, the five points mentioned in Fig 1 are proposed as **operational guidance**.

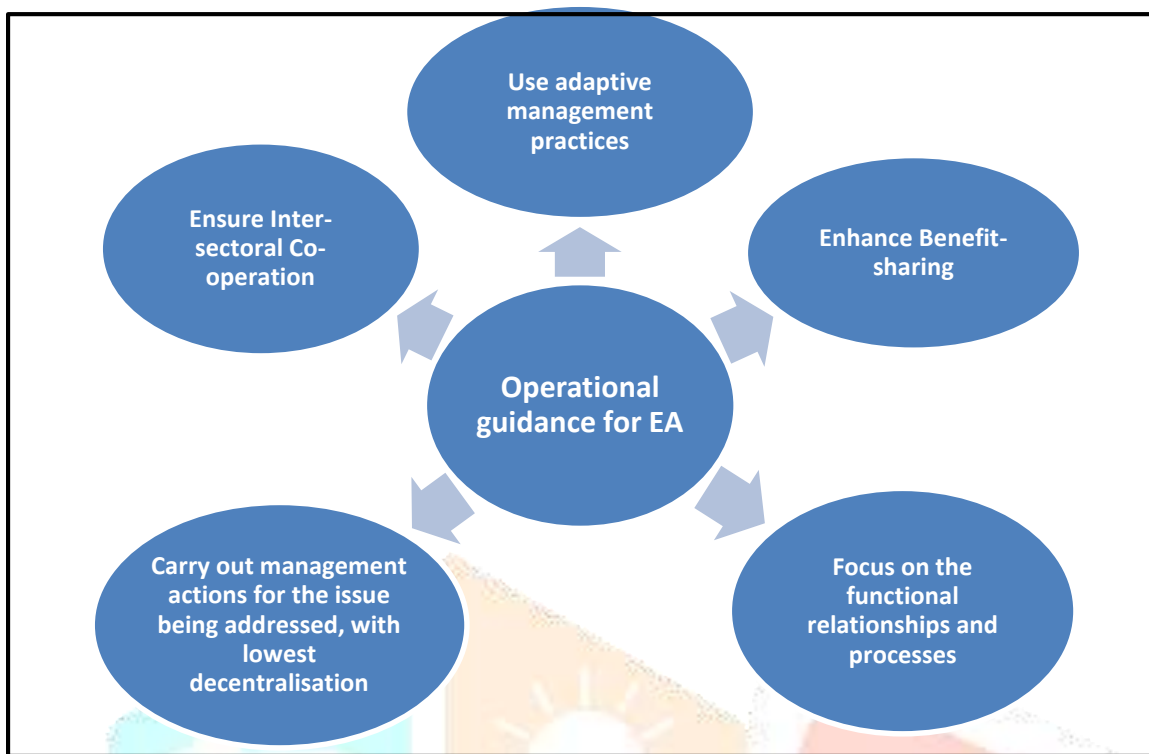


Figure 1: Operational Guidance for applying principles of ecosystem approach

Grumbine (1997) addressed the following specific goals for ecosystem management:

1. Maintain viable populations of all native species in situ.
2. Represent, within protected areas, all native ecosystem types across their natural range of variation.
3. Maintain evolutionary and ecological processes (i.e., disturbance regimes, hydrological processes, nutrient cycles, etc.)
4. Manage over periods of time long enough to maintain the evolutionary potential of species and ecosystems.
5. Accommodate human use and occupancy within these constraints.

V. Steps to Apply Ecosystem Approach

The ecosystem approach is a tool; it provides a framework that can be used to implement the objectives of the Convention on Biological Diversity, including the work on, inter alia, protected areas and ecological networks. There is no single correct way to apply the ecosystem approach to management of land, water, and living resources. The principles that underlie the ecosystem approach can be translated flexibly to address management issues in different social, economic and environmental contexts. There are a number of options for implementing the ecosystem approach. For example, the principles can be included in national and regional policies, planning processes and sectoral plans. The principles can also be applied at a local level to smaller projects (<https://www.cbd.int/ecosystem/>).

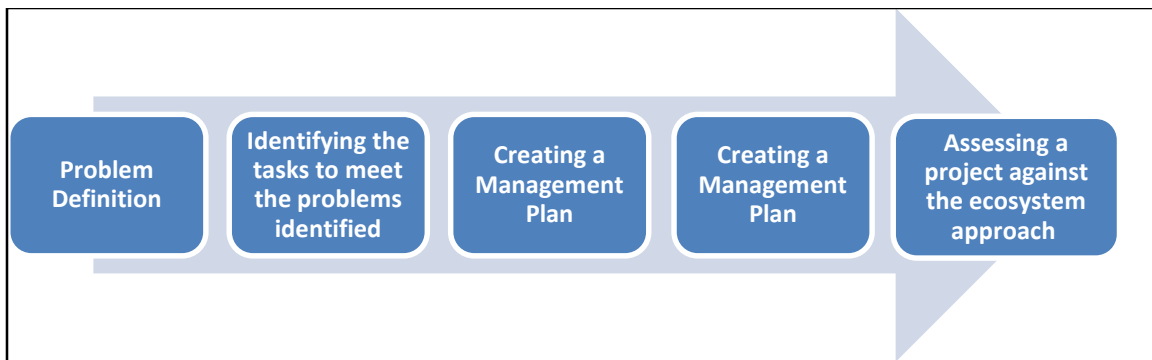


Figure 2: Steps for applying Ecosystem based approach

Ecosystem management differs from prior management concepts in several important ways (Christensen et al. 1996):

- Its emphasis is on sustainability and future generations.
- Non-commodity values are included, and managers are asked to manage for the well-being of many life forms and the integrity of ecological processes.
- It takes a landscape perspective, moving beyond boundaries set by ownership and recognizing the reciprocal influence of neighbouring ecosystems on the system being managed.
- It places management in the context of natural disturbance.
- It requires broad participation throughout the project with scientists participating in the initial design and subsequent monitoring, analysis, and adaptation of management options.

As per Lackey (1998), the seven core principles, or pillars, of ecosystem management define and bound the concept and provide operational meaning:

1. Ecosystem management reflects a stage in the continuing evolution of social values and priorities; it is neither a beginning nor an end;
2. Ecosystem management is place-based and the boundaries of the place must be clearly and formally defined;
3. Ecosystem management should maintain ecosystems in the appropriate condition to achieve desired social benefits;
4. Ecosystem management should take advantage of the ability of ecosystems to respond to a variety of stressors, natural and man-made, but all ecosystems have limited ability to accommodate stressors and maintain a desired state;
5. Ecosystem management may or may not result in emphasis on biological diversity;
6. the term sustainability, if used at all in ecosystem management, should be clearly defined--specifically, the time frame of concern, the benefits and costs of concern, and the relative priority of the benefits and costs; and
7. Scientific information is important for effective ecosystem management, but is only one element in a decision-making process that is fundamentally one of public and private choice.

VI. Conclusion

Ecosystems are constituents of the biosphere – the complete assembly of the Earth’s ecosystems. Ecosystems include habitats, places where the living components of an ecosystem survive. The ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organisation which encompasses the essential processes and interactions among organisations and their environment. There is no single or unique ecosystem approach. The final goals of the approach acknowledge human participation and interests, emphasising on maintenance of the interactions within and functioning of natural systems and can be applied over wide range of scales. Ecosystem approach is a holistic way of dealing with natural resource management in an approach that recognizes the inter-connectivity between ecological, social-cultural, economic and institutional structures.

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