

CONCEPT OF ESTUARINE MANAGEMENT

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Abstract

This paper discusses the concept of estuarine management in detail. Estuaries are considered as valuable natural resources. An estuary embraces two spheres of the earth-land and sea. The physical linkage between drainage areas of land (catchment) and coastal area, through the mobility of water from land to sea, makes an estuary a transition zone. Many definitions of natural resources and environmental management as well as coastal management have been proposed in literature; however, this study hardly found any definition for the concept of estuary management. Therefore, an attempt has been made in this paper to define estuary management in the context of environmental and coastal management theories. In doing this, the paper highlights different natural resources and environmental management theories. Integrated coastal zone management concepts are also included in this discussion because estuaries have always been regarded as part of the coastal area. Lastly, the paper outlines the concept of estuary management. This paper finds that the concept of estuary management has to be extended towards the inland boundary, because the major pressures that estuaries receive are inland based. The interrelated nature of catchment, estuary and marine processes need to be buttressed by an overarching system, which would provide a holistic approach for estuarine management.

Introduction

Estuaries are considered as valuable natural resources. An estuary embraces two spheres of the earth-land and sea. The physical linkage between drainage areas of land (catchment) and coastal area, through the mobility of water from land to sea, makes an estuary a transition zone. The main purpose of this paper is to explore the concept of estuarine management. In doing this, the paper discusses different natural resources and environmental management theories. Integrated coastal zone management concepts are also included in this discussion, because estuaries have always been regarded as part of the coastal area. Lastly, the paper outlines the concept of estuary management, followed by estuarine management goals and objectives.

Theories of Natural Resources and Environmental Management

There are many theories of natural resources and environmental management in literature (Lang, 1986; Woodley et al., 1993; Mitchell, 1986), for example: integrated resources management theory (Mitchell 1990; Hanna, 1998), adaptive management (Bormann et al., 1994; Risser, 1985), sustainable development (Cicin-Sain and Knecht, 1998; McManus, 1996), and ecosystem-based management (Karr, 1992; Grumbine, 1994; Imperial, 1999). This paper argues that the root of the estuary management concept is entrenched in those theories. It has been found that whatever concepts are applied for natural resources management, the basic principles of all are similar. Each concept has attempted to manage resources on the basis of coordinated approaches, to achieve

sustainable use, reduce conflict, improve economic efficiency and realize diverse social and political objectives.

This paper also argues that the theories and concepts discussed above are essential to understanding coastal and estuary management concept. Any study of estuarine management requires knowledge of their inter-related connection of nature. There are many definitions of coastal management in the literature (OECD, 1993; Kenchington and Crawford, 1993; World Bank, 1993; Clark, 1996; Sorensen 1997; Cicin-Sain and Knecht, 1998; FAO, 1998), however, hardly any definition of estuary management has been found. The definition of coastal area suggests that estuary has been synonymously used with coastal zone/area. Moreover, the emergence of coastal management initiatives has provided importance to estuaries as an integral part of coastal zone. Hence this study argues that the term estuary management has also been used with coastal zone/area management. Therefore, it is also important to understand the meaning of an integrated coastal management concept.

Concept of Estuarine Management

There appeared several characteristics that define the concept of environmental management or coastal management from the above discussions. On the basis of the several characteristics of environmental management and coastal management, this paper argues that estuary management should have the following characteristics: a) dynamic, b) coordinated, c) process orientated and d) holistic (Figure 1).

a) Dynamic

Estuary management is a dynamic process, in that decisions are continuously made based on the changing natural, social, political and economic context, including the outcomes of past decisions. Estuary management is responsive, capable of responding to both expected and unexpected events and changes.

b) Coordinated

Estuary management is vertically and horizontally coordinated. It requires the vertical coordination among various levels of government and non-government organizations, with management responsibilities. Horizontal coordination invokes cross-sectoral cooperation in which different aspects such as the land and water are considered simultaneously.

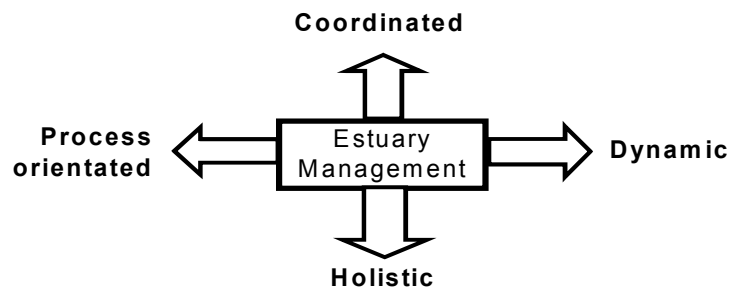


Figure .1. Characteristics of Estuary management

c) Process orientated

Estuary management is process orientated which involves a course of action involving natural and human resources in an ecosystem, taking into account the societal, political, economic and institutional factors operating within the system in order to achieve specific objectives.

d) Holistic

Holistic approach examines all the aspects of an issue taking into account the linkages within and between natural, social and economic systems. Estuary management is a holistic process, similar to ecosystem management, in that management needs attention in more broadly defined systems rather than focusing upon specific resource sectors. It aims to integrate biological, physical and socio-economic needs while conserving resources.

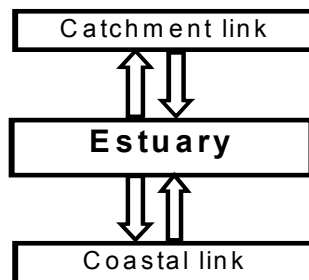


Figure .2. Estuarine environmental links

On the basis of above characteristics, estuary management should hold the promise of ensuring that all influences are considered in management decisions without forgetting ecological principles. Estuaries are the end points of many detrimental catchment activities. On the other hand, they are a fringe part of the marine environment. Any activity in a catchment has a potential impact on estuaries and ultimately on the coastal seas. Similarly, the marine environment has impact on estuaries. Estuaries have an important functional interrelationship with the sea and land. They have two links- coastal and marine and catchment (Figure 2). For estuarine management it is important to understand both links of the estuarine environment.

The whole of the catchment of rivers enters a particular coastline through an estuary, receiving all its carried loads. The estuary acts as receiving zone; it gathers surface run-off from upstream catchment areas and delivers it to coastal waters. Therefore, Clark (1996) has stated that the catchment should be considered as part of the estuarine ecosystem, because many of the forces that can detrimentally alter an estuarine environment have their origin outside the estuarine system itself.

The water in estuaries reflects the influence of human activities in the catchment. For example, agricultural run-off promotes erosion of tons of soil, with substantial concentrations of fertilizers, herbicides and pesticides, trace metal and other chemical contaminants. Similarly, elevated nutrient levels, suspended solids, chemicals, toxicants and pathogens often cause urban run-off.

Estuarine conservation and utilization can benefit greatly from estuarine planning and management programs that are properly linked. Therefore, in conclusion it can be said that estuary management is a dynamic, coordinated, process orientated and holistic process used to address the problems derived from all the sources, for sustainable use, and for development and protection of estuaries and their resources. This concept of estuarine management should be supported by the following goals and objectives.

Estuarine Management Goals

Management of estuaries involves multiple problems, multiple desired outputs and uses of estuarine resources, substantive linkages to catchment areas, multiple constituencies and multiple institutions with varying responsibilities for aspects of management (Bowler et al., 1994).

Therefore, the estuary to be managed is comprised of a complex, dynamic web of interrelationships among human activities, societal demand, natural resources and extended natural and human inputs. The management should be dynamic, continuous and holistic and comprised of a set of related tasks, all of which must be carried out to achieve a desired set of goals and objectives. The objectives of estuaries management should be to protect the estuarine environment and its resources first to achieve sustainable management. In doing this, the estuary management should adopt the major objectives such as protection of estuarine waters, biodiversity and habitat conservation, and work towards ESD principles.

Conclusion

An understanding of the key interactions between systems is required to manage all natural resources. This is particularly true for estuaries, which do not exist in isolation but instead are intimately linked to adjoining catchments and nearby coastal zones. It is true that estuaries have been regarded as an integral part of the coastal zone. Therefore, the concept of integrated management can be synonymously applied for estuary management. However, the concept of estuary management must be extended towards the inland boundary because the major pressures on estuaries are inland based. The interrelated nature of catchment, estuary and marine processes needs to be buttressed by an overarching system that would provide a holistic approach for estuarine management. Therefore, it is important for estuary management to understand all the impacts that are causing problems in estuaries. Effective estuarine management must address all the impacts from both catchment and coastal links that are causing problems in estuaries.

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