



Review article

Current status of coastal zone issues and management in China: A review

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Abstract

This paper identifies and examines social-economic and environmental issues recently emerged in China’s coastal zone. Evaluation of management scheme and progress in perspectives of coordinated legislation, institutional arrangement, public participation, capacity building, and scientific research (mainly coastal planning and functional zoning) in China’s coastal zone are made. The Chinese government has made a significant effort in developing legislation for the coastal zone. Jurisdictional and zoning boundaries, and allocating use rights for coastal and marine resources have been established. State Oceanic Administration is the leading agency responsible for China’s ocean policymaking and overall management of ocean and coastal affairs. A demonstrated project for integrated coastal management in Xiamen has been implemented, and is characterized as “decentralization” approach in decision-making process. In view of the above, comprehensive coastal management in China is a big challenge, facing with many difficulties. Finally, recommendations are raised for tackling these issues for China’s coastal zone management. © 2007 Elsevier Ltd. All rights reserved.

Keywords: Coastal reclamation; Ecosystem degradation; Pollution; Legislation

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1. Background

The coastal zone of China comprises an area of more than three million square kilometers, and possesses an 18000-km coastline stretching across tropical, subtropical and temperate zones. More than 70% of large Chinese cities are located in the coastal areas, and coastal development in China plays a leading role in the national economy, accounting for 55% of its gross domestic productivity (GDP) (Wang, 1992). The coastal areas are characterized by rapid economic growth, with an annual increase in GDP by around 10% over the last decade. China has a population of more than 1.2 billion, and its land area per capita is far lower than the world's average. The Chinese government has begun to recognize the crucial role that the ocean's living and nonliving resources in China's energy and food security. However, the continuing increase in population coupled with economic growth, rapid urbanization and infrastructure development have resulted in conflicts among multiple groups, especially among terrestrially and marine based industrial sectors, e.g. tideland reclamation and coastal aquaculture, seaport/shipping development and wetland resource uses, coastal mining and protection against erosion, waste disposal and maintaining ecosystem and human health, offshore oil development and fisheries, coastal groundwater extraction and land uses (Yu, 1994). The increase in conflicts also has led to environmental degradation, e.g. pollution, deterioration of ecosystem health, habitat losses, resource depletion, and invasion of exotic organisms. To balance anthropogenic activities and ecosystem health and environmental protection, a comprehensive management scheme is urgently required in the coastal zone on a sustainable basis. Therefore, the objectives of this paper are to: (1) compile baseline information on the current status of coastal zone issues and management in China, and (2) review a pilot project on integrated coastal zone management in China.

2. Main issues in the coastal zone

The coastal zone is an interface between the land and sea, which comprised of a continuum of coastal land, intertidal area, aquatic systems including the network of rivers and estuaries, islands, transitional and intertidal areas, salt marshes, wetlands, and beaches (Cicin-Sain and Knecht, 1998). A national programme of comprehensive coastal zone investigation has been carried out from 1980 to 86 throughout China, and the extent of coastal area, including the intertidal area, land area up to 10 km from the shoreline and landward water areas from the

10–15 m isobath was defined as coastal zone to build a baseline database towards better coastal zone management (Fujian coastal survey office, 1990). This scope is adopted in this study due to the fact that most of anthropogenic activities influencing both land and sea environment occurred in this area (Fig. 1). Research showed that coastal ecosystems and environmental quality were degraded and deteriorated, and conflicts among terrestrially and marine based industrial sectors in the areas were already very common (Yu, 1994). However, with rapid economic growth and urbanization in the China's coastal zone in the recent years, many new issues emerged, and coastal ecosystem degradation and environmental deterioration have been, to some extent, exacerbated.

2.1. Pollution

Pollution is one of the major challenges to sustainability of the coastal areas. Heavy pollution has been found very common in the Chinese river estuaries, bays and coastal areas, and this has resulted in a clear increase in both area and occurrence of red tides (Zhou and Zhu, 2006) in the China's coastal seas (Table 1). The sources of pollution mainly come from the land and also from coastal waters by mariculture and other marine activities and production. Land-based pollutants mainly include riverine exports of agricultural chemicals from coastal catchments, domestic wastes and industrial wastes.

2.1.1. Agricultural diffuse sources

Agricultural diffuse sources are becoming a significant contributor to water pollution in the coastal zone in China. The excessive uses of commercial inorganic fertilizer for raising crop yield and meeting the demand of population growth in China has resulted in increased nutrient additions and subsequent losses from adjacent coastal catchments. In some regions where agriculture is productive, nutrient content in coastal water bodies increased over 10 fold during last two decades, and over 50% of the nutrients were contributed by diffuse agricultural activities (Cao et al., 2003). In the Changjiang River estuary, Zhang (1996) attributed a significant increase in riverine nitrogen fluxes to the increase in chemical fertilizer uses within the river catchment (Table 2), comparing to the previous estimate (Edmond et al., 1985). The more recent research by Shen et al. (2003) showed that agricultural diffuse source in the Changjiang River catchment was the major source of the riverine nitrogen fluxes. In the Jiulong River region, some areas in the coastal water have been deteriorated by eutrophication and excessive growth of benthic algae since mid-1980s,

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