



Review

Total quantity control and intensive management system for reclamation in China



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ARTICLE INFO

Article history:

Received 9 June 2015

Received in revised form

21 November 2015

Accepted 28 November 2015

Available online xxx

Keywords:

Reclamation

Marine management

Total quantity control

Intensive

China

ABSTRACT

Over the last decade, China's annual average reclamation area has been approximately 100 km². Sea reclamation provides a space guarantee for industrialization and urbanization and is a motivating force for China's rapid economic growth. Meanwhile, the rapid expansion of sea reclamation has caused problems due to the oversized scale and extensive use of the sea, resulting in the loss of large quantities of coastal shoal wetlands and natural shorelines and leading to continued deterioration of marine ecological environment. China has attached great importance to sea reclamation management. In order to strengthen sea reclamation management and to protect the marine environment, China has developed seven management system measures. These measures include a sea reclamation plan, marine functional zoning, regional sea use planning, a plane design for sea reclamation, a control index of the sea area for projects, sea area use demonstration and environmental impact evaluations, as well as an examination and approval administration with the management philosophy of total amount control and intensive use. At present, China's economic development faces a "new normal", as industrial and urban demands on sea reclamation will gradually become more reasonable, and the primary application of sea reclamation will transition to coastal tourism, construction of the area close to sea, and recovery and repair of the coastal zone. In the future, China will continue to implement strict sea reclamation management based on ecological system recovery and public participation. In this essay, the system, experience and future development trends of sea reclamation management in China is comprehensively introduced in an effort to provide reference sea reclamation management plans to other countries around the world.

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1. Introduction

Coastal zones are areas with the densest populations in the world. Since ancient times, nations around the world have begun to develop and to utilize the sea through reclamation. During the past 100 years, along with global industrialization, the rapid advance of urbanization and the constraints of land resources, the world has witnessed the greatest upsurge in reclamation.

China is the largest developing country in the world. Over the last decade, sea reclamation, industrialization and urbanization has provided power and necessary space for the development of coastal economy in China. Meanwhile, large-scale sea reclamation occurs in wetlands and natural coastlines, which places enormous pressure on marine resources and the environment. Therefore, China has attached great importance to sea reclamation management and established a management system with the philosophy of total amount control and intensive management. In this essay, various measures of sea reclamation management in China will be introduced, beginning with China's sea reclamation status and existing issues. Combined with the latest national economic and social development strategies, the future of these sea reclamation management methods and philosophy will be predicted. Finally, recommendations for sea reclamation based on China's past experience will be presented.

2. Overview of reclamation in China

2.1. Coastal land reclamations in China 2002–2014

According to the *National Sea Area Use Management Bulletin* published by the State Oceanic Administration (SOA), total national confirmed and authorized sea reclamation area was 1207 km² from 2002 to the end of 2014, with an average of 100 km² every year. China's annual total sea reclamation rapidly increased from 2002 to 2009 with a steady decrease since 2009 (see Fig. 1). The change in China's annual sea reclamation is similar to the macro economic growth trend. Regionally, national reclamation is mainly concentrated in Zhejiang Province, Fujian Province, Jiangsu Province, Liaoning Province and Tianjin. These account for 68.89% of total reclamation area nationwide during the corresponding period with 16.57%, 15.63%, 14.05%, 14.00% and 12.64%, respectively (Fig. 2).

2.2. Major problems of Chinese reclamation

2.2.1. Excessive reclamation

Sea reclamation is an effective approach to create new land for construction. Both local government and businesses expect to solve the problem of insufficient construction land through sea reclamation. Thus, the sea reclamation area applied for during planning will exceed actual demand. Sea reclamation that exceeds actual demand will cause two types of issues: first, capital investment on sea reclamation will increase and thus increase financial risk, and second, not all of the land created after sea reclamation can be effectively used which wastes marine resources.

According to SOA's dynamic monitoring of sea area use, in the last five years, more than 70 approved sea reclamation programs in coastals area have progressed slowly, with the aggregate scheduling of sea reclamation being less than 60%. This finding is observed because the planned sea reclamation scale exceeded the actual demand when local coastal governments prepared the plan.

2.2.2. Unreasonable reclamation methods

In recent years, the quantity of, and the area for, the reclamation engineering of such projects as coastal towns, port and dock construction, industrial base construction, and land reclamation in large and medium coastal cities, as well as adjacent regions, has increased continuously. Major reclamation methods used are mostly seaward extension from shoreline, bay cutoff and straightening engineering or reclamation backed up by islands, all of which

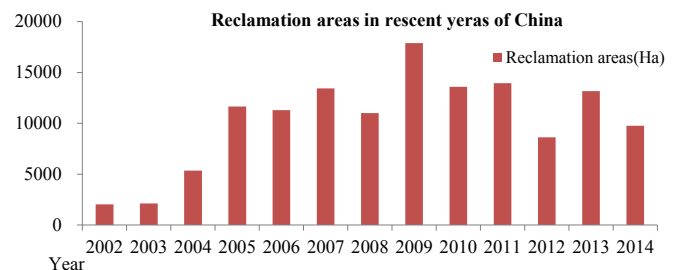


Fig. 1. Reclamation areas in China (2002–2014) (State Oceanic Administration National Bulletin on Sea Area Use Management, 2002–2013).

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