

## DREDGING AND DREDGED MATERIAL: A potential solution in the case of Subic Bay, Philippines

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### 1. INTRODUCTION

The Subic Bay is a bay in the part of Luzon Sea on the west coast of the island of Luzon in Zambales Philippines, about 100 kilometers northwest of Manila Bay. After serving as a naval station for the Spanish armada and later to the Seventh Fleet of US Navy, the Bay was converted into industrial and commercial area known as Subic Bay Freeport Zone under the Subic Bay Metropolitan Authority (SBMA).

In order to serve the needs of investors and port activities, SBMA is required to be expanded and its facilities need to be upgraded continuously. First, a land expansion to the sea is one of the options which requires huge amount of reclamation fill to accommodate new development in the port. Second, in order to maintain the deep water of the bay and to attract many larger ships to berth, maintenance dredging is required. Dredging produces a large amount of dredged material that can be used as reclamation fill for land expansion. Dredged material as a reclamation fill was used commonly in other countries in engineering and environmental enhancement. However, dredging and reclamation activity requires environmental consideration to minimize the impact to the ecological system.

### 2. SUBIC BAY PORT DEVELOPMENT PROJECT AND THE EFFECTIVE USAGE OF DREDGED MATERIAL

The dredged material in the Subic Bay is used effectively for the construction of new container terminal phase 1 and 2 as parts of the Subic Bay Port Development Project (SBPDP). *see* Table 1 and Fig. 1.

The project is a part of the short term development plan which maximizes the potential of the port through Official Development Assistance (ODA) from Japan International Cooperation Agency (JICA). During the detailed design, it was decided that the materials as reclamation fill was from the Maritan Hill quarry inside SBMA due to engineering properties of the soil and logistical advantage (SBPDP Detailed Design Report, May 2002). However, the work was not able to go on the approved schedule due to environmental issue along the proposed access road and reclamation area. The hauling of reclamation fill from the quarry was slow because of the presence of hard strata (SBPDP Completion Report, November 2010). Dredged material from river mouths (which was generated from Mt. Pinatubo eruption last June 1991), turning basin and berthing area was considered as reclamation fill after series of tests. However, a small amount of dredged material had been used in the reclamation project and compared to other countries they effectively use large amount of dredged material in engineering and environmental enhancement.

Keywords : Effective usage of dredged material, Reclamation, Bay

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Table 1. Description of the New Container Terminal (SBPDP)

Length	280 m x 2 berths
Area	28 hectares
Reclamation Fill	2.0 million m <sup>3</sup>
Design Seabed Elevation	-13.7 m (from M.S.L)
Volume to be Dredged	250,000 m <sup>3</sup>

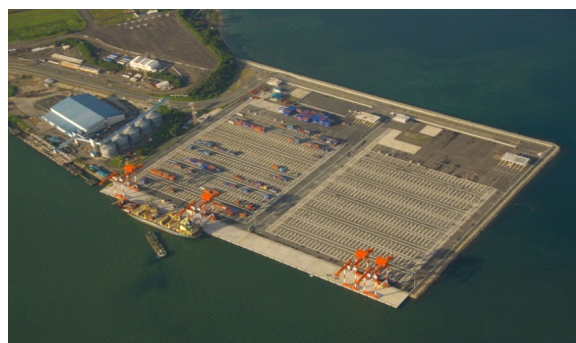


Figure 1. Aerial photo of New Container Terminal (SBPDP)

### ***Effective usage of dredged material in Japan***

Not all dredged material is suitable as a resource, but in some countries, like Japan, more than 90 percent of dredged material is ultimately put to good use (IADC 2009) in engineering and environmental enhancement. CHUBU CENTRAIR International Airport in Nagoya was designed as a reclaimed island in the middle island of Ise Bay. Since the construction term was short (2001-2003), an economic and efficient way for construction of the island was required. About 8.6 million m<sup>3</sup> of dredged material treated by Pneumatic Flow Method was used for the construction of the island.

### **3. EVALUATING THE SUCCESS FACTORS**

After checking and evaluating the data of SBPDP and the effective usage of dredged material in Japan and other countries, reclamation using a huge amount of dredged material is possible as being practiced internationally. On the other hand, based on the experiences and case studies of several countries, the following factors (PIANC Envicom WG 14) are of major importance for dredged material to be used successfully:

- Communication
- Economics
- Legislation
- Technical and management aspects
- Environmental aspects

### **4. DISCUSSION**

It is necessary to use dredged material for the development of new land and to maintain the deep water of Subic Bay at the same time. Maintenance dredging requires a lot of money; it will be justified by the effective usage of the dredged material as reclamation fill. Also, difficulties in acquiring reclamation fill from quarry are quite common due to environmental impact. Even, other countries like Singapore (Philippine Daily Inquirer, October 2011) had an interest in acquiring dredged material from nearby area of Subic Bay to reclamation fill for development of land. In addition to this, there are studies which show that the material generated from the eruption of Mt. Pinatubo (the dredged material and sediments from river mouth) had good engineering properties.

Possible pilot project is the phase 3 of SBPDP for the construction of new container terminal which requires an elevation of -13.70 m (from M.S.L.) in the berthing area and 1 million m<sup>3</sup> of reclamation fill to create 14 hectares of land. In preparation to this project, continuous studies on the technical properties of dredged material to be used effectively as a geo-material, research on environmental impact and cost benefit analysis of using dredged material as a resource.

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