Study on Safety to a Storm Surge at Sangchan Beach

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ABSTRACT

In the Sangchan beach, coastal erosion had occurred due to human’s development till ten years ago. However, since many countermeasures (Y-type groins and detached breakwaters) were constructed, although this coastal erosion came to an end, the recovery of the beach is insufficient. Therefore, in this paper, the safety at the Sangchan beach by existing countermeasures is confirmed and some improvement plans for raising the safety to coastal disaster are examined. The numerical model of Ca et al. (2002) is used to evaluate the difference of coastal erosion between those plans to the present condition, and some famous equations are used to evaluate the difference of wave run-up heights and wave overtopping rates between those. As conclusion, the comprehensive comparison of examination results makes it clear that sand nourishment is the most proper countermeasure.

KEY WORDS: Topographical change; sand nourishment; storm surge; wave overtopping rate; wave run-up height; Y-type groins and detached breakwaters.

INTRODUCTION

The loss of coastal area due to coastal erosion is now the critical issue that has occurred in the near-shore area of many countries. The loss has been occurring in the coastal areas adjacent to the seas in the Gulf of Thailand and the Andaman sea where cover 23 provinces with a total length of 3148.23 kilometers. We should recognize the importance of the coastal area protection. The characteristic of coastal erosion varies due to the climate and geomorphology of a target coastal area. For 40 years ago, the government wanted to develop the coastal areas of the Gulf of Thailand so that it would become an economic center. This became the focus of the development for the industry and the tourism. Thus, many construction projects were built in coastal areas, such as the industrial port, the industrial estate, infrastructures and the transportation routes along the coast as well as coastal facilities. Moreover, coastal areas were also influenced by storms occurring during the monsoon seasons. As a result of these dramatic changes to the physical conditions of the coast, imbalance has been occurring in the environmental conditions along the coast, and promotes coastal erosion easily and intensely. Under the status of disaster that occurred, detached breakwaters and groins had been utilized as countermeasures to protect the coast of this area. However, nowadays, it has been found that the coastal facilities along the coast have not fully played the role of coastal protection from storm surges.

Many researchers mentioned coastal erosion and countermeasures for protection and safety of the coasts as follows: Noble (1978) analyzed the behavior of diverse coastal protection structures and their effects on the beaches, reaching the conclusion that an off-shore breakwater has virtually no influence on the coast when its distance from the coast is over six times its length. Rosen and Vajda (1982) deduced that the stability of a tombolo is achieved when the bathymetric lines are such that the diffracted waves have a component of movement quantity opposite to the gradient of average level induced by the radiation stress. De Waal and Van der Meer (1992) reported an overall view of the design formulas and design graphs of coastal structures which the irregular wave run-up height had been measured on smooth slopes, including the influence of berms, roughness on the slope, shallow water, short crested waves and oblique (long and short crested) waves. Yamamoto and Horikawa (1992) presented new equations for the calculation of wave run-up heights and wave overtopping rates to coasts with complicated profiles. Calculation values using their equations (included both of regular waves and irregular waves) were favorably good agreement with available data. Van der Meer & Janssen (1995) proposed the new formulae of irregular wave overtopping rate in which better description of the influence of diverse berms and varying roughness was considered. Ca, Yamamoto, Tanimoto, and Arimura (2002) developed the numerical model can simulate the near-shore wave dynamics, including wave breaking, wave run-up, the generation-transport-dissipation of Turbulent Kinetic Energy, and the associated transport of a suspended load and a bed load for calculating topographical change. The numerical model is efficient in simulating wave induced scouring near coastal structures with acceptable accuracy and relatively short computational time. Charusrojthanadech et al. (2013a) studied on the assessment of the effect of coastal erosion prevention by Y-Type Groyne/Detached Breakwater and proposed some countermeasures for the study area. Charusrojthanadech et al. (2013b) presented evaluation methods of wave dissipation by a bamboo-pile breakwater and a geotextile bag, and predicted the erosion prevention effect by these. The authors’ feasible research result of model calculation was capable for applying. Araujo (2014) presented a study on the impact of two detached breakwaters on the study area by using numerical simulation. The