# GRAIN-SIZE ANALYSIS OF SEDIMENTS AT BANGSAEN BEACH, SAENSUK SUBDISTRICT, MUEANG CHONBURI DISTRICT, CHONBURI PROVINCE

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## Abstract

Coastal erosion has long been a major problem affecting the Bangsaen Beach. The objective is to establish sediment compatibility criteria for future beach nourishment projects in response to increasing coastal erosion. This study analyzed 18 sediment samples using the Folk & Ward (1957) method, revealing that native sediments are primarily Gravelly sand (13.40% gravel, 86.58% sand and 0.02% mud). These sediments are characterized as coarse sand with moderate sorting, sub-rounded shapes, symmetrical skewness, and a mesokurtic distribution. To determine optimal borrow material, the intertidal zone representing the beach's natural equilibrium was evaluated. With a baseline of very coarse sand, the study recommends using very fine pebble as fill material to minimize sediment loss. Integrating Overfill Factor (Ra) and Equilibrium Beach Profile (EBP) models, the results indicate that selecting coarser, moderately sorted material ensures high compatibility and a 1:1 fill ratio. This material allows the beach profile to reach equilibrium with reduce sediment loss, resulting in a steeper slope and increased beach width. This approach effectively mitigates shoreline retreat, enhances coastal stability, and ensures the long-term ecological sustainability of the nourishment project.

## Introduction

**Study Area :** Bangsaen Beach is a prominent tourist landmark with a shoreline length of approximately 2 km. **Geological Characteristics :** Quaternary beach sand deposits (Qb), fine to very coarse grained, brown, loose with amount of shell fragments.

**Oceanographic Influence :** Upper Gulf of Thailand, this area is strongly driven by the Southwest Monsoon. This generates longshore currents, the primary factor causing sediment transport, coastal erosion, shoreline retreat

## Objectives

- To analyzed the sediment characteristics and grain-size distribution of Bangsaen Beach.
- To evaluate sediment compatibility criteria for potential borrow material using grain-size statistical parameters.

## Methodology

**1. Field Study :** Grid Sampling across 6 survey lines parallel to the shoreline, spaced 400 m Each survey line was divided into 3 zones spaced 5 m apart, totaling 18 samples.

**2. Lab work :** Sieve analysis to determine the grain-size distribution.

**3. Data Analysis :** Sediment statistical parameters, including Mean, Sorting, Skewness, and Kurtosis, Folk and Ward (1957) method.

**4. Borrow Material Selection :** Compatibility was evaluated using the Overfill Factor (Ra) and the Equilibrium Beach Profile (EBP) model to ensure optimal nourishment results.

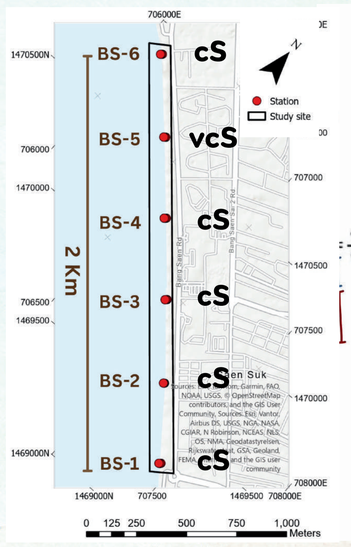



Fig.1 Sampling Stations

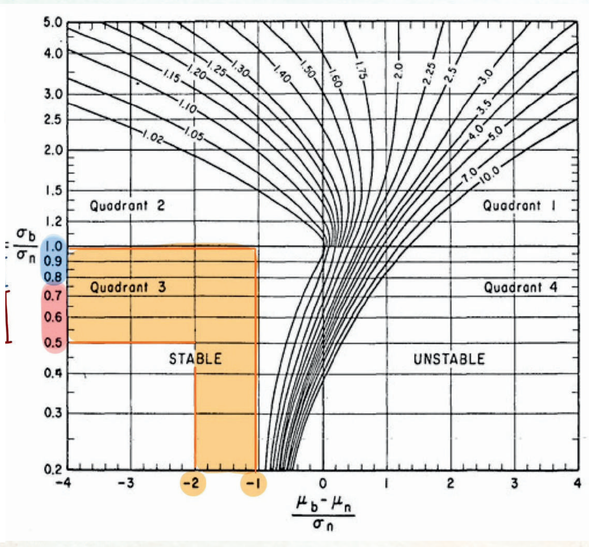



Fig.2 Overfill Factor (modified from James, 1975)

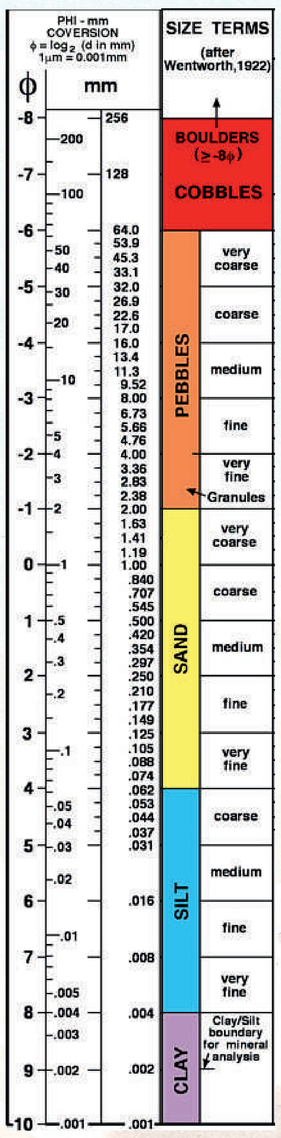



Fig.3 Grain size classification (modified fromafter Wentworth, 1922).

## Results

Overall, coarse sand is identified as the representative grain size for the entire beach. However, when broken down into individual zones, the results are as follows :

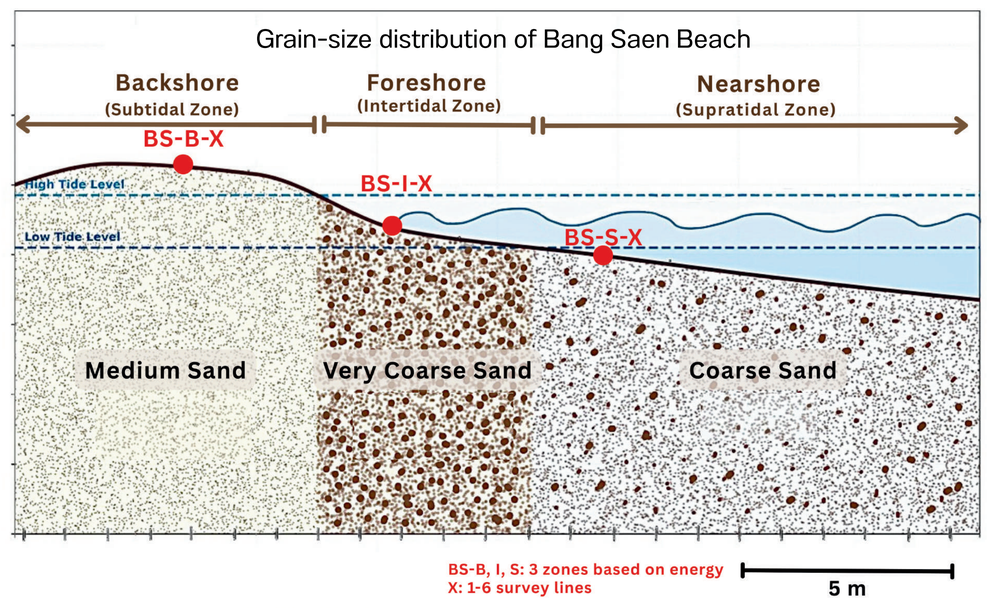



Fig.4 Grain-size distribution

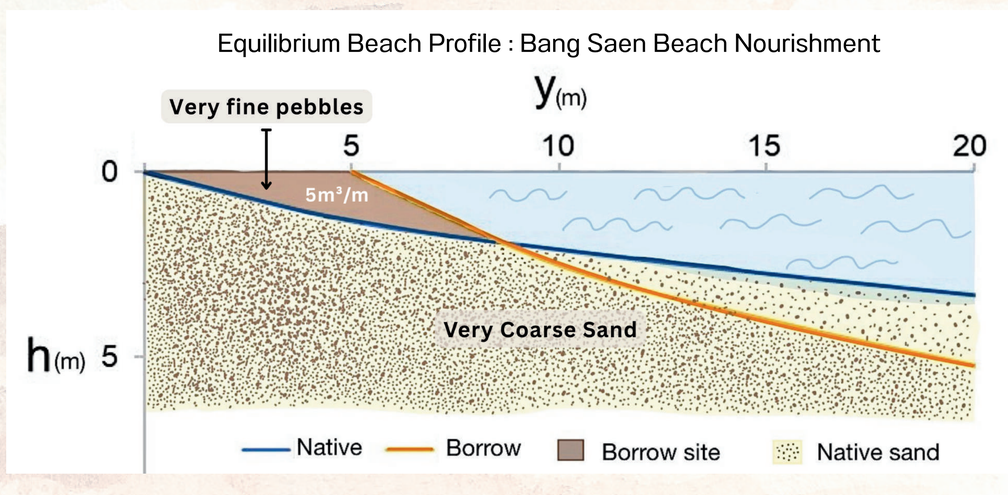



Fig.5 Equilibrium Beach Profile of Bang Saen Beach

## Conclusion

Bangsaen Beach features uniform coarse sand, with the largest sediments found at the northern headland. The nearshore zone is poorly sorted due to major river discharges and Southwest Monsoon longshore drift. However, the sediment gradation from backshore (finest) to nearshore (medium) and foreshore (coarsest) confirms a natural equilibrium driven by wave energy. For nourishment purposes, the intertidal baseline is very coarse sand -0.15 Ø (1.11 mm). We propose **very fine pebble borrow material -1.15 to -2.00 Ø (2.22-4.00 mm)** with **Moderately sorted - Moderately well sorted** for practical sourcing. The Overfill Factor (Ra) The intercepts range from (-1.07, 1.00) to (-1.98, 0.53), approaches 1.0 (Quadrature 3), achieving a cost-effective 1:1 ensuring minimal sediment loss.

This methodology utilizing the Equilibrium Beach Profile (EBP) model can be adapted to design various beach widths. While results depend on specific borrow material properties, the model serves as a vital database for calculating the precise volume required for maximum efficiency. For this study's 5-meter expansion goal, a fill volume of 5.0 $m^3/m$ is required, resulting in a stable, steeper profile that enhances both recreational space and wave resistance

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Wentworth, C. K. (1922). A scale of grade and class terms for clastic sediments. The Journal of Geology, 30(5), 377-392.

James, W. R. (1975). Techniques in evaluating suitability of borrow material for beach nourishment. Technical Manual No. 60. Ft. Belvoir, VA: Coastal Engineering Research Center, U.S. Army Corps of Engineers.

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