Grain-Size Distribution and Characteristics of Surface Sediment in Chanthaburi Estuary at Pak Nam Leam Sing and Bang Kachai Subdistricts, Leam Sing District, Chanthaburi Province

Author: Nirattisai Srangnok Student ID: 650510416
Advicer: Dr.Kritsada Moonpa
Department of Geological Sciences, Faculty of Science, Chiang Mai University

ABSTRACT

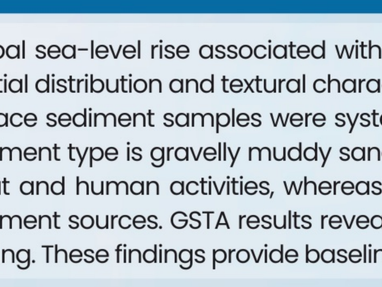
Global sea-level rise associated with climate change has significantly influenced coastal and estuarine environments, which are highly sensitive to variations in hydrodynamic processes. This study investigates the spatial distribution and textural characteristics of surface sediments in the Chanthaburi Estuary, Thailand, and evaluates sediment transport dynamics using the Grain-Size Trend Analysis (GSTA) method. A total of fifteen surface sediment samples were systematically collected across the estuary and analyzed using mechanical sedimentology and the Folk (1954) sediment classification system. The results indicate that the dominant sediment type is gravelly muddy sand (gmS), representing 53.33% of the samples. Coarse sediments are mainly concentrated in the central estuary, reflecting relatively high-energy conditions influenced by terrestrial input and human activities, whereas finer sediments increase away from the river mouth under lower hydrodynamic energy conditions. Sorting and skewness patterns suggest mixing between fluvial and marine sediment sources. GSTA results reveal sediment transport vectors converging toward the central estuary, indicating a potential sediment accumulation zone under the combined influence of river discharge and tidal forcing. These findings provide baseline information for sustainable coastal and estuarine sediment management under ongoing environmental change.

OBJECTIVES

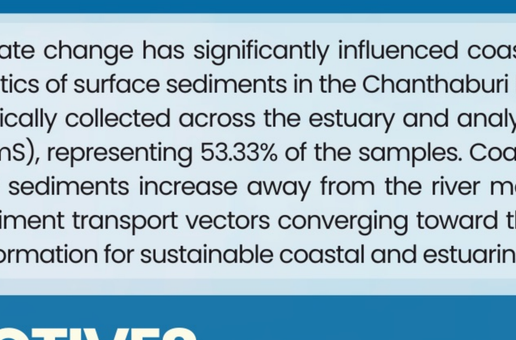
- To analyze the distribution and characteristics of surface sediments in the Chanthaburi Estuary at the Pak Nam Laem Sing and Bang Kachai Subdistricts, Laem Sing District, Chanthaburi Province.
- To investigate the sediment transport dynamics through the application of the Grain-Size Trend Analysis (GSTA) method.

STUDY AREA

- the Chanthaburi Estuary, covering the Pak Nam Laem Sing and Bang Kachai Subdistricts, Laem Sing District, Chanthaburi Province.
- the eastern coast of the Gulf of Thailand
- Climate (Fluvial, Wave, Tidal) with anthropogenic processes



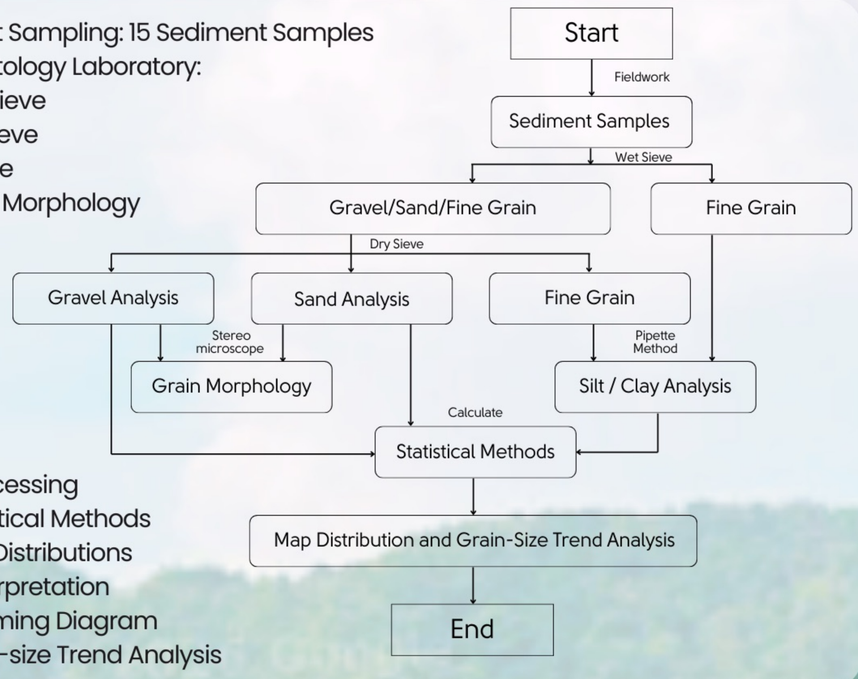
- Figure 1 A diagram showing classification of global delta types dominated by river, tide, and wave processes. Adopted from Seybold et al. (2007)



- Figure 2 Chanthaburi Estuary (Basemap data from Esri World Topographic Map (2025); modified from QGIS.)

METHODOLOGY

- Sediment Sampling: 15 Sediment Samples
- Sedimentology Laboratory:
  - Wet Sieve
  - Dry Sieve
  - Pipette
  - Grain Morphology
- Data Processing
  - Statistical Methods
  - Map Distributions
- Data Interpretation
  - Flemming Diagram
  - Grain-size Trend Analysis



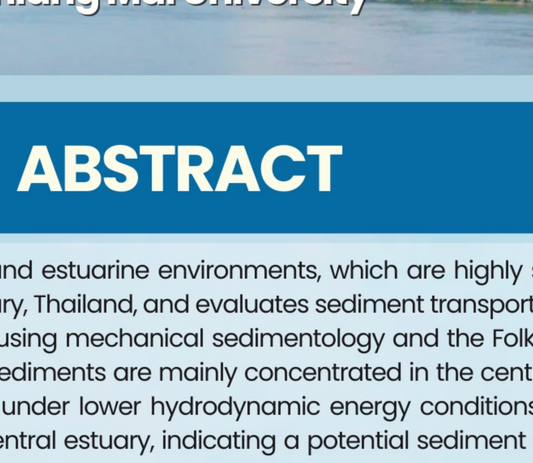
RESULTS



- Figure 3 Grain morphology indicates 100% sub-rounded grains with mostly low sphericity

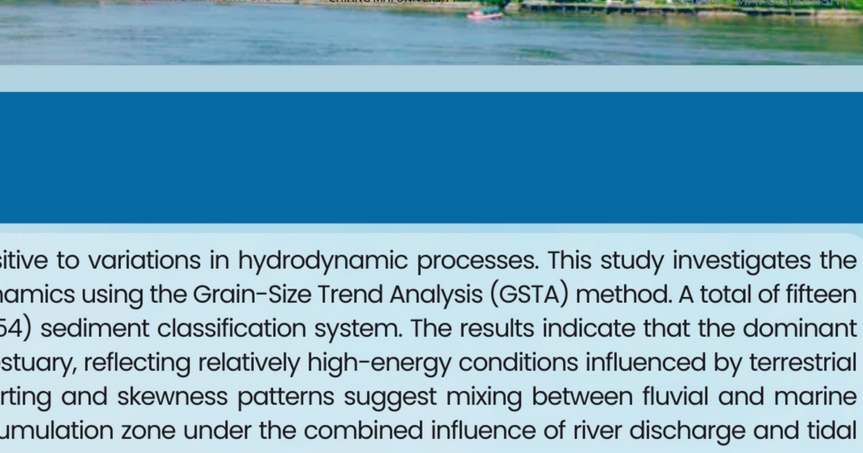


- Figure 4 Folk's sediment classification system, modified from Folk (1954, 1974)

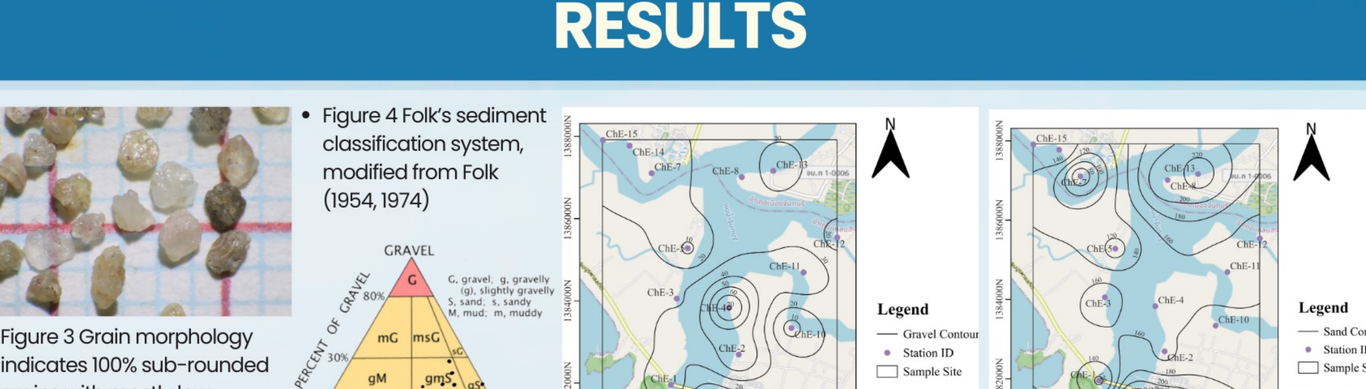


- Figure 5 Sediment Distribution Characteristics Map from Chanthaburi Estuary

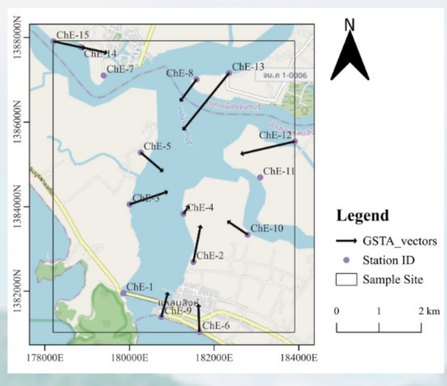




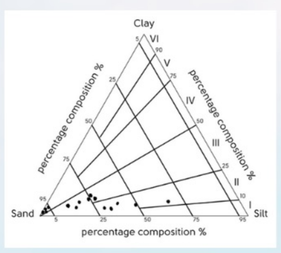
- Figure 6 Planar contour maps showing the spatial distribution of gravel, sand, silt, and clay percentages in the Chanthaburi Estuary



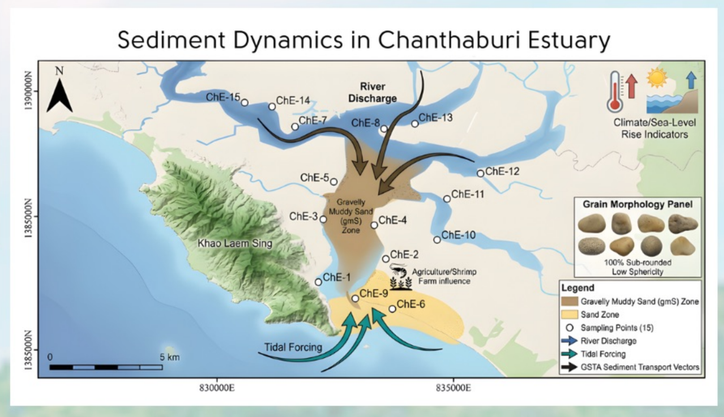
- Figure 7 Planar contour maps showing the spatial distribution mean, sorting, and skewness percentages in the Chanthaburi Estuary



- Figure 8 Resultant sediment transport vectors derived from Grain-Size Trend Analysis (GSTA)



- Figure 9 Flemming diagram results from Chanthaburi Estuary. (modified from Flemming, 2000).



- Figure 10 Conceptual illustration showing sediment transport (created by the author using SciSpace, 2025)

CONCLUSION

- Surface sediments in the Chanthaburi Estuary are predominantly classified as gravelly muddy sand (gmS), indicating a mixed sediment composition influenced by variable estuarine hydrodynamic conditions.
- Spatial grain-size patterns show that coarse sediments (gravel and sand) are mainly distributed along active channels and near the estuary mouth, whereas fine sediments (silt and clay) accumulate in relatively sheltered and lower-energy depositional zones.
- Grain morphology analysis reveals that all sediment grains are sub-rounded with predominantly low sphericity, suggesting moderate transport maturity and repeated mechanical reworking within the estuarine system.
- Interpretation using the Flemming sediment triangle indicates that most samples fall within Zones I–IV, supporting the interpretation of a sand-dominated estuarine environment influenced by mixed hydrodynamic processes.
- Grain-Size Trend Analysis (GSTA) results demonstrate that sediment transport vectors generally converge toward the central part of the estuary, indicating a sediment accumulation zone controlled by the combined influence of fluvial discharge and tidal forcing.

Esri. (2025). World Topographic Map [Map]. Environmental Systems Research Institute. https://www.arcgis.com
Flemming, B. W. (2000). A revised textural classification of gravel-free muddy sediments based on ternary diagrams. Continental Shelf Research, 20, 1125–1137.
Folk, R. L. (1954). The distinction between grain size and mineral composition in sedimentary-rock nomenclature. Journal of Geology, 62(4), 344–359. https://doi.org/10.1086/626171
Folk, R. L. (1974). Petrology of sedimentary rocks. Hemphill Publishing Company.
SciSpace. (2025). SciSpace AI research assistant platform. https://typeset.io
Seybold, H., Andrade, J. S., & Herrmann, H. J. (2007). Modeling river delta formation. Proceedings of the National Academy of Sciences of the United States of America (PNAS). https://doi.org/10.1073/pnas.0705265104