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## Beach Profiling At Vettukadu Beach Trivandrum

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### ABSTRACT

Beach profiling is an important coastal study used to understand shoreline shape, sediment movement, and seasonal changes along a coast. This paper focuses on Vettukadu Beach, a dynamic coastal stretch influenced by wave action, tides, and monsoon patterns of the Arabian Sea. Monitoring such beaches helps identify erosion and accretion trends and supports sustainable coastal management.

The study is based on field data collected from September to December, a period that includes post-monsoon and winter coastal conditions. During this time, variations in , sediment deposition, and beach slope are observed, allowing analysis of short-term seasonal changes in beach morphology. The collected data helps assess shoreline stability, sediment transport patterns, and the overall morphology of the beach, which are essential for coastal planning, hazard prevention, and environmental conservation.

### INTRODUCTION

Vettukadu Beach in Thiruvananthapuram is highly vulnerable to coastal erosion due to its direct exposure to the Arabian Sea and strong monsoonal wave activity. During the southwest monsoon season, high-energy waves and storm surges continuously remove sand from the shoreline, leading to noticeable shoreline retreat and narrowing of the beach. The absence or reduction of natural protective features such as sand dunes and coastal vegetation further increases its susceptibility to erosion. Human interventions,

including coastal constructions and disturbances to natural sediment movement, have also contributed to the imbalance of the coastal ecosystem. As a result, nearby houses, roads, and fishing community settlements are at risk, affecting the livelihoods of local residents. Continuous erosion at Vettukadu Beach highlights the need for sustainable coastal management measures to protect both the environment and the community. Objectives of the Study

## OBJECTIVES OF THE STUDY

1. To measure and analyze the beach profile and slope of Vettukadu Beach.
2. To identify patterns of erosion and deposition during the study period.
3. To assess seasonal changes in beach morphology from September to December.

## MATERIAL

### ○ Field Study (September and December, 2025)

The field investigation was conducted from September to December to assess post-monsoon and pre-summer coastal conditions. Beach profiling was carried out along selected transects laid perpendicular to the shoreline to capture the cross-sectional characteristics of the beach. The clinometer method was employed to measure the angle of slope between successive points along each transect, enabling the determination of beach gradient and identification of morphological variations in the surface profile. For more precise elevation measurements, levelling was performed using a dumpy level, with staff readings taken at regular intervals from a fixed reference benchmark point extending toward the shoreline. In addition, *soil samples were collected from the mid-tide zone of the beach* along each transect for further analysis. During each field visit, beach width and elevation differences were systematically recorded to monitor monthly changes and to prepare detailed and comparative beach profiles.

### ○ Sediment Sampling and Laboratory Analysis

- Specific Gravity Test: To determine the density characteristics of the beach sediment particles.
- Moisture Content Test: To measure the water content present in the soil samples, which influences sediment stability.
- Shear Strength Test: To evaluate the resistance of beach sediments against erosion and wave action.
- Sieve Analysis: To determine grain size distribution and classify the sediment type (coarse, medium, or fine sand).
- Permeability Test: It is used to determine the rate at which water flows through soil under a given hydraulic gradient.

**METHODOLOGY**

Table 1

| MONTH & TIME<br>DISTANCE | SEPTEMBER<br>(24 <sup>th</sup> Sept,<br>2025,10.25am) | OCTOBER<br>(22 <sup>nd</sup> Oct,<br>2025,11.25am) | DECEMBER<br>(10 <sup>th</sup> Dec,<br>2025,10.40 am) |
|--------------------------|---|--|--|
| High tide                | 34.2m   | 40.2m  | 62m  |
| Mid tide                 | 43.85m  | 46.3m  | 63.5m  |
| Low tide                 | 53.5m   | 52.4m  | 65m  |

Table 2

| MONTHS<br>PROPERTIES          | SEPTEMBER | OCTOBER | DECEMBER |
|-------------------------------|-----------|---------|----------|
| D10(mm)                       | 0.2205    | 0.22    | 0.52     |
| D30 (mm)                      | 0.3434    | 0.35    | 0.68     |
| D60(mm)                       | 0.4605    | 0.46    | 0.86     |
| Coefficient of curvature, Cc  | 1.16      | 1.16    | 1.03     |
| Coefficient of uniformity, Cu | 2.08      | 2.08    | 1.65     |
| Gravel (%)                    | 0         | 0       | 0        |
| Coarse sand (%)               | 0         | 0       | 0        |
| Medium sand (%)               | 42        | 42      | 95       |
| Fine sand (%)                 | 58        | 58      | 5        |
| Silt + Clay (%)               | 0         | 0       | 0        |

RESULTS

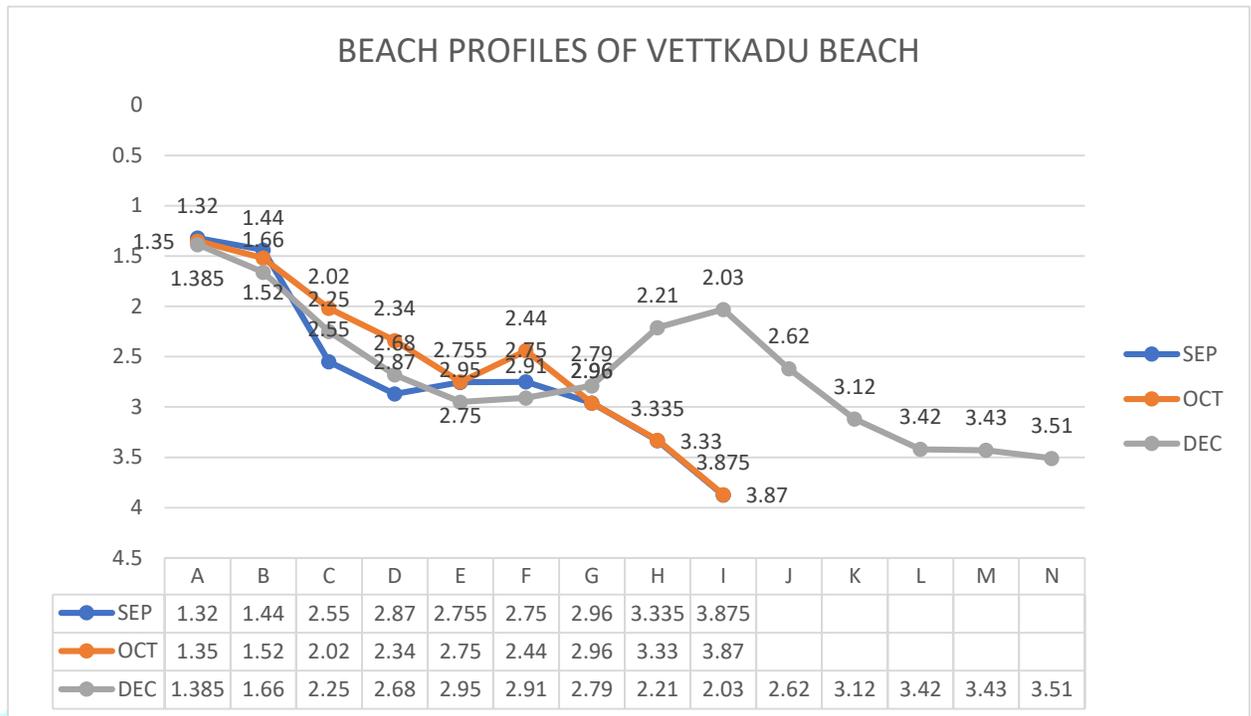


Figure 1

Table 3

| MONTH                            | SEPTEMBER               | OCTOBER                | DECEMBER                |
|----------------------------------|-------------------------|------------------------|-------------------------|
| PROPERTIES                       |                         |                        |                         |
| MOISTURE CONTENT (%)             | 12.58                   | 10.24                  | 7.85                    |
| SPECIFIC GRAVITY                 | 2.62                    | 2.56                   | 2.52                    |
| COHESION                         | 0.04                    | 0.05                   | 0.02                    |
| ANGLE OF INTERNAL FRICTION (deg) | 32                      | 34                     | 30                      |
| PERMEABILITY (m/s)               | 1.53 * 10 <sup>-3</sup> | 1.6 * 10 <sup>-3</sup> | 1.45 * 10 <sup>-3</sup> |

The beach sediment is:

- Predominantly non-cohesive sand
- Moderately dense ( $\phi = 30^\circ - 34^\circ$ )
- Highly permeable
- Low cohesion

## DISCUSSION

The present study on beach profiling and soil sample analysis at Vettukadu Beach from September to December 2025 reveals noticeable seasonal variations in shoreline characteristics and sediment properties. The comparison of tidal distances and beach profiles indicates changes in beach width and surface elevation over the study period. A gradual increase in high, mid, and low tide distances from September to December suggests a landward shift of the shoreline, which reflects a reduction in beach material. The beach profiles show minor sediment deposition during October, indicating short-term accretion under relatively calm conditions. However, the December profile exhibits increased irregularity and surface lowering, signifying removal of sediments due to intensified wave and current action during the post-monsoon period. This confirms the dominance of erosional processes in the later part of the study. Laboratory test results further support these observations. The decrease in moisture content, cohesion, and angle of internal friction towards December indicates reduced sediment stability and increased susceptibility to movement. The consistently high permeability values reflect the sandy nature of the beach, which facilitates rapid water infiltration and enhances sediment transport under wave action.

Overall, the integrated analysis of field measurements and laboratory data indicates that Vettukadu Beach experienced minor accretion during October followed by significant erosion towards December. The net effect over the study period is progressive shoreline retreat and loss of beach material. This highlights the vulnerability of the study area to coastal erosion and emphasizes the need for continuous monitoring and implementation of suitable coastal protection and management measures.

## REFERENCES

- 1.DORA, G. U., KUMAR, V. S., JOHNSON, G., PHILIP, C. S., VINAYARAJ, P., Ocean Engineering, CSIR-National Institute of Oceanography, & Council of Scientific & Industrial Research. (2012). Short-term observation of beach dynamics using cross-shore profiles and foreshore sediment. In *Ocean Coast. Manage.* (Vol. 67, pp. 101–112).
- 2.John Wilson, J. S., a, Sujitha, S. B., Shruti, V. C., Zaman Ahmed, S., Kumar, S. P., & Chandrasekar, N. (2014). Seasonal variability of beach characteristics between Candoliam and Colva coast, Goa, India. In *Journal of Coastal Sciences*, *Journal of Coastal Sciences* (Vols. 1–1, pp.33–40)[Journal-article]. [https://drs.nio.res.in/drs/bitstream/handle/2264/4571/J\\_Coast\\_Sci\\_1\\_33.pdf?sequence=1](https://drs.nio.res.in/drs/bitstream/handle/2264/4571/J_Coast_Sci_1_33.pdf?sequence=1)
- 3.Thankappan, N., Varangalil, N., Varghese, T. K., & Philipose, K. N. (2017). Coastal morphology and beach stability along Thiruvananthapuram, south-west coast of India. *Natural Hazards*, 90(3), 1177–1199. <https://doi.org/10.1007/s11069-017-3090-1>
- 4.Sheela Nair, L., Prasad, R., Rafeeqe, M.K. et al. Coastal Morphology and Long-term Shoreline Changes along the Southwest Coast of India. *J Geol Soc India* 92, 588–595 (2018).<https://doi.org/10.1007/s12594-018-1072-x>
5. Luppichini, M., Bini, M., Berton, A., Casarosa, N., Merlino, S., & Paterni, M. (2022). A method based on beach profile analysis for shoreline identification. In *Firenze University Press eBooks* (pp. 47–60). <https://doi.org/10.36253/979-12-215-0030-1.05>