*Research Article*

# Development Of Coastal Sediment Database

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***Abstract:*** *Sediment is a naturally occurring material that is broken down by weathering and erosion and then moved by the action of wind, water, or ice, or by gravity acting on the particles. Presently, data are scarce regarding the specific attributes of sediment found along the coast, particularly in the northern area of Peninsular Malaysia. The databases provide data on sediment pH, moisture content, particle size, and organic matter. The database would facilitate efficient management of coastal area development for government sectors and industry stakeholders. Sampling activities included collecting samples of beach and paddy field sediments. The development of the coastal sediment database is consistent with the Sustainable Development Goals established by the United Nations which include SDG 14: "Life below water," SDG 2: "Zero hunger," SDG 3: "Good health and well-being," and SDG 13: "Climate action".*

*Keywords: Organic matter, sediment pH, surface sediment*

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## 1. INTRODUCTION

The features of sediment have a complex impact on geological, environmental, and engineering fields, offering significant insights into Earth's processes, evaluating environmental conditions, and promoting sustainable growth (Dunn et al., 2023). Poor sediment quality in coastal regions may adversely impact water quality (Kamaruddin et al., 2020). Additionally, the pH of the soil has a big impact on how easily accessible nutrients are to plants. These nutrients become less available when the pH of the soil is too high or too low, and plants may have nutrient shortages. Overabundance of organic matter (OM) in the soil and sediment can have both positive and negative effects on the environment. It is complex and might alter depending on the specific situation (Azid et al., 2015). Sediments containing high levels of silt and clay retain more water compared to sandy sediments, which makes them particularly suitable for the leaching process. The distribution of soil particle sizes influences not only soil permeability and organic matter content but also soil fertility, erodibility, conservation efforts, moisture and nutrient movement, vegetation productivity, ecological restoration, and land degradation (Wang et al., 2023). The marine environment with poor sediment quality could lead to further adverse health effects if not adequately monitored (Kamaruddin et al., 2021).

## 2. METHOD & MATERIAL

Sediments are assessed in the laboratory shortly after collection to determine their physicochemical properties using the British Standard Method (Institution & British Standards Institute Staff, 1990).

### 2.1 *Percent organic matter*

As shown in Figure 1 was the method measured percent organic matter. Firstly, soil was collected and package in a well-labelled polyethylene plastic bag. Samples was dried in the oven at 60º C for 24 hours to get rid of any moisture in the soil sample. After the set time is up, the samples then were removed from the oven and let aside to cool before being weighed for their dry weight in the weighing tin. 10.0 grams of soil sample was weighed and grind using a grinding machine or do it manually use stone mortar or pestle. Burning in sample in a high-temperature muffle furnace (450ºC) in four hours. (D.M. Sullivan, 2019) .

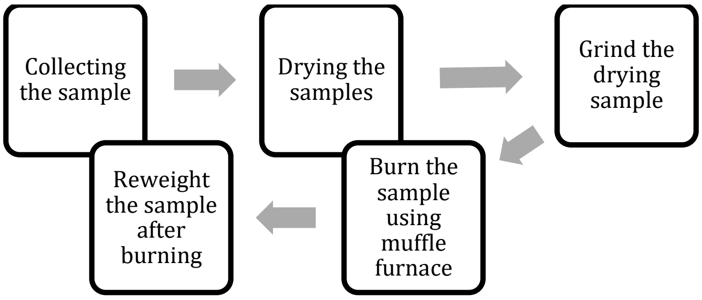


**Figure 1** Workflow of percent organic matter measurement

### 2.2 *pH*

As shown in Figure 2 is the method to measure pH. Firstly, collect the sample and package it in a well-labelled polyethylene plastic bag. Samples will be dried in the oven at 60º C for 24 hours to get rid of any moisture in the soil sample. After the set time is up, the samples then will be removed from the oven and let aside to cool before being weighed for their dry weight in the weighing tin. 10.0 grams of soil sample was weighed into a 100 ml beaker before 25 ml of distilled water was added. The mixture will be shaken thoroughly for 60 minutes. The mixture will be left to stand for another 60 minutes. The electrode of the pH meter will be placed partially suspended to read the pH of the soil.

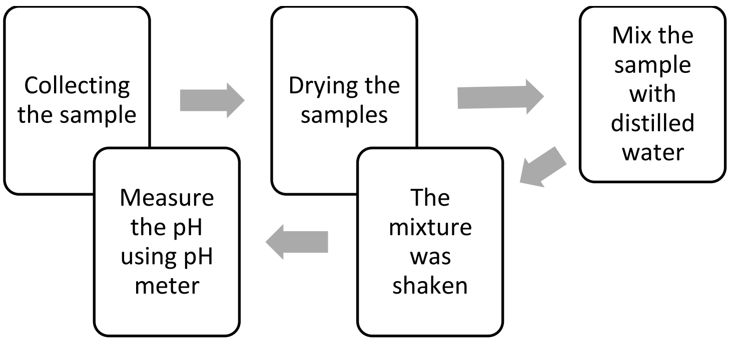


**Figure 2** Workflow of pH measurement

### 2.3 ***Particle grain size***

A particle size analyzer was used to assess the particle size of paddy field sediments. The dried sediment samples were sieved through a 2 mm mesh and treated with 15 mL of 30% Hydrogen Peroxide ($H_2O_2$) to eliminate organic matter. The suspension was heated at 50°C for one hour, after which the clear supernatant was removed with a pipette. This treatment was repeated two to three times until the samples were fully bleached and all organic matter was removed (Abdulkarim et al. 2021). Before introducing the samples into the laser particle analyzer (Laser Diffraction Particle Size Analyzer, Mastersizer 2000), 5 mL of Calgon solution was added. Statistical analyses were conducted using the laser particle sizer control program and MS Excel, with sediment grain size converted to phi (ϕ) units. The sediment type was classified using a textural triangle based on the percentage of sand, silt, and clay fractions (Polakowski et al. 2021).

### 2.4 ***Moisture***

Oven-drying method was deployed to analyze moisture content. 30.0 g of soil, w from each sample bag was weighed into weighing tins. The wet soil samples were dried in the oven at 105 °C for 24 hours to get rid of any moisture in the soil sample. The samples were removed from the oven and set aside to cool before and were weighed for their dry weight in the weighing tin (American Society for Testing and Materials, 2005).

## 3. FINDINGS

Khaire et al. (2021) studied the component of soil known as soil organic matter, or SOM, is made up of variously decayed plant and animal remnants, soil organism cells and tissues, and compounds synthesized by soil organisms that have broken down so thoroughly that it is impossible to identify what they were originally. Hüppi et al. (2015) investigated that the pH of marine sediment is between 6 and 8, with a small tendency towards alkalinity. The chemical and biological processes that occur in marine sediment are influenced by pH. In the present study of paddy field, the sediment particle size distribution varied slightly from clay to very fine silt category and was characterized as silty clay and silty clay loam type of sediment. Understanding soil texture is crucial for soil management and is one of the most important physical properties. The fine size of silt particles makes them prone to erosion by both wind and water. Sediments containing high levels of silt and clay retain more water compared to sandy sediments, which makes them particularly suitable for the leaching process. The distribution of soil particle sizes influences not only soil permeability and organic matter content but also soil fertility, erodibility, conservation efforts, moisture and nutrient movement, vegetation productivity, ecological restoration, and land degradation (Wang et al., 2023). In the present study, the moisture content varies significantly, ranging from 0.14% to 12.90% due to differences in beach topography, capillary flow, complex storm-wave action, and sea level changes. The fluctuation in moisture content, ranging from 5% to 40%, indicates a transitional zone where moisture content decreases toward the land. The cohesive-adhesive forces on the surface of sand grains, induced by surface moisture, help retain and resist the erosion of the uppermost sediment layer into the ocean.

## 5. CONCLUSION

In conclusion, the coastal database of organic matter, pH, particle size and moisture in samples collected from beach and paddy field was observed. Furthermore, it is important to obey the development of the coastal sediment database which consistent with the Sustainable Development Goals established by the United Nations which include SDG 14: "Life below water," SDG 2: "Zero hunger," SDG 3: "Good health and well-being," and SDG 13: "Climate action" to make sure the whole environment always in a good condition. Lastly, conduct a study examining further diverse soil with different parameter and locations also distinctions outside organic matter, pH, particle size and moisture content as well also in various seasons.

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