Coastal Erosion in South Western Part of Sri Lanka from December 2006 to June 2007

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Abstract: Coastal region is a very valuable area for developing countries like Sri Lanka, since a good protected coastal region will facilitate the tourism as well as fishing Industry. But the coastal erosion, especially in South Western parts of Sri Lanka has significantly destroyed the coastal land. Therefore, effective management of the coastal area has become a necessity. Present study is focussed on the variation of coastal profile at ten selected locations from Moratuwa to Balapitya and the monthly changes of beach width, profile and the grain size distribution of sediment at the mean sea level. The study was conducted from December 2006 to June 2007. Results showed that during North East monsoon, the beach face became wider and gentler whereas, during South West monsoon the beach face became narrower and steeper. Further, the mean grain size showed higher values during North East monsoon period than South Western monsoon. This variation of beach width, beach profile and the sediment grain size was strongly correlated with the rainfall changes and it was concluded that the coastal erosion in this area is directly controlled by monsoon changes.

Keywords: Beach profile, Coastal erosion, Mean grains size, Monsoon.

1. Introduction

The coastal region is the most populated and valuable part for any country. But, in Sri Lanka this valuable land is depleting gradually for many years. Therefore, accurate long term studies are necessary to mitigate this problem. Coastal erosion appears as a natural hazard. But sand mining, coral mining, human activities and improper construction also affect the erosion. (rate of coastal erosion would change) Depending on the kinetic energy of the waves, determined by weather and astronomical factors and also upon the resistance of the coast line, as influenced by geology and morphology. Therefore, it is important to quantify the coastal erosion and identify its seasonal behaviour. Especially, the ocean in the Southern part of the Sri Lanka changes according to the monsoonal pattern; which is a seasonal behaviour.

The objectives of the present study were to identify the seasonal variation of the profile of coastal region and the beach width, to analyse the coastal erosion. Also the grain size analyse was done to identify the energy regime the relation of coastal erosion with respect to rain fall, temperature and wind pattern.

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This study would give an insight to decide on construction activities in coastal areas as well as to carry out beach nourishment programs.

2. Study Area

Ten locations (Figure 1) from Moratuwa to Balapitiya were selected for the study. Each of location represented a different type of equilibrium beach system.

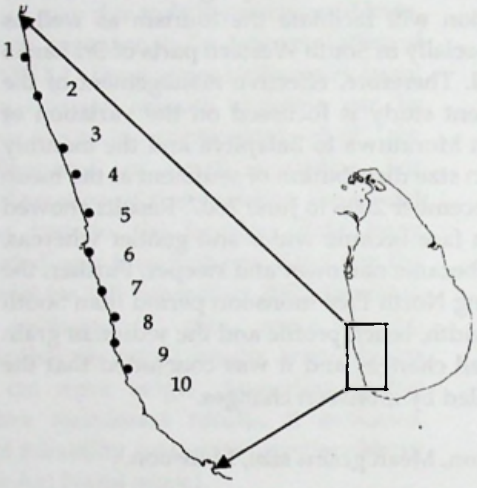

Figure 1. Study area, on coastal region of Moratuwa to Balapitiya

The selected locations are as follows;

1. Egodauyana, 2.Panadura Moya, 3.Welladoda, 4. Kani Lanka Hotel Kalutara, 5.Payagala, 6. Beruwala, 7. Induruwa, 8. Kosgoda (with geo nets), 9. Kosgoda and 10. Balapitiya

3. Materials and Methods

3.1 Materials used

- Topography and Bathymetry maps of Colombo, Kalutara, Aluthgama, Balapitiya and Galle.
- Field data (such as reduce levels, dead measurements)
- Rain fall, Wind and Temperature data
- GPS (Magellan explorist 200)
- Engineering Level (Wild KNOS 408626)

The relationship between the erosion and deposition of sediment with the monsoonal wind pattern was investigated Criteria for the selection of location was based on coastal geomorphology, bathymetry and human activities. Erosion and deposition varies with the geomorphologic features. The mean sea level (MSL) at 1st location was determined. Dead measurements were taken to find out the correct location in the following day during the survey. The survey was conducted to measure the ground elevation with the inundation. Also the temperature, wind and Rain fall data were recorded. The preserved samples which were taken at every location MSL from the surface were subjected to the conning and quartering for accurate sampling. Determination of the particle size distribution of the collected samples was done by sieve analysis. (British Standard 1881).

3.2 Data Interpretation

The retained percentages in each sieve were recorded against sieve size. Then the cumulative retain percentage was calculated. The sieve size was converted to the phi scale and graphs were plotted on the cumulative percentage vs. particle size in both moment method and phi method.

Mean, Sorting Index and Skewness was calculated for both moment and phi methods.

4. Results and Discussion

During the present study emphasis was given to discuss the seasonal changes of coastal erosion at Egodauyana, Panadura, where the coastline was

straight and several break-waters have already been constructed due to higher erosion. This project should continue at least for about five years to identify the variation of erosion with monsoon rain Figure 2 shows a sketch of the studied profile.

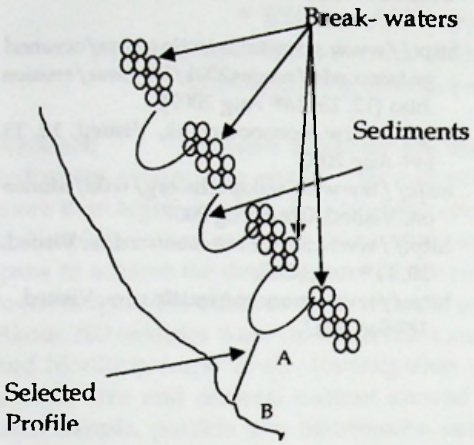

Figure 2. Sketch of the studied profile at Egodauyana, Panadura.

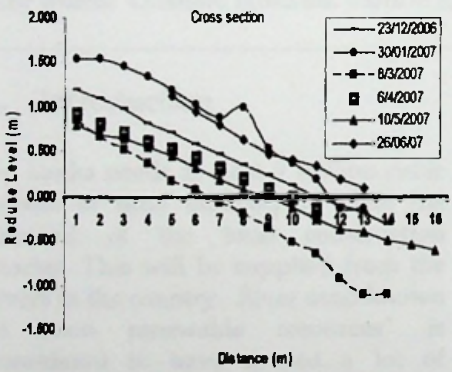

Figure 3. Profile of variation at location 1

Figures 3, 4 and 5 represent the profile at location 1. According to the beach profile, more erosion takes place during South West monsoon period compared to North East monsoon. Duration of the South West monsoon erosion longer than the North West monsoon period. Estimated erosion for North East monsoon was 1.6 m more than South West monsoon.

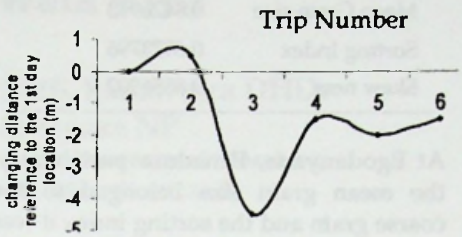

Figure 4. Beach profile variation at location 1

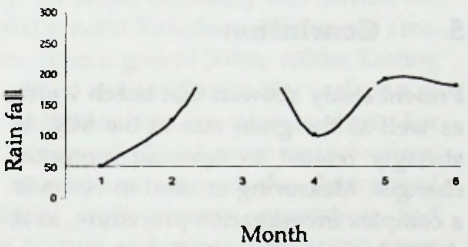

Figure 5. Rain fall variation at location 1

The sieve analysis results of the Egodauyana, Panadura is given in Figure 6.

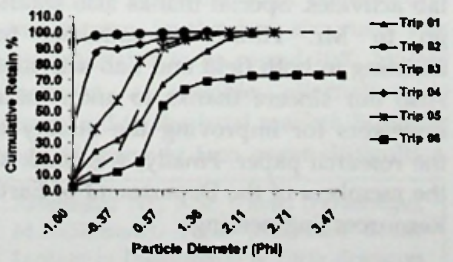

Figure 6. Grain size analysis at Egodauyana, Panadura

According to the parameters given in table 1, grain distribution of Egodauyana, Panadura and erosion of the beach can be described.

Table 1. Grain size parameters

Parameter	Value
Mean Grain size	0.8426943
Sorting Index	0.6973796
Skew ness	0.8556902

At Egodauyana, Panadura particularly, the mean grain size belonged to the coarse grain and the sorting index it was in moderately sorted category. By considering grain size diameter and sorting index it can be said that the location is subjected to erosion.

5. Conclusion

Present study showed that beach width as well as the grain size at the MSL is strongly related to seasonal monsoon changes. Measuring erosion in ocean is a complex investigation procedure, as it depends on several parameters.

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Recommendations

Following recommendations are proposed for future studies.

- The work has to be continued at least for another 5 five years to obtain accurate results.
- Use satellite images would increase the accuracy of the study.
- This work can be expanded to measure the erosion in entire coastal region of Sri Lanka.

References

http://www.gometaldetecting.com/oceanedge.tamu.edu/waves2001/PC_tour/erosion.htm (12, 13, 14th Aug 2007).

http://www.monsoon.co.uk, Visited, 12, 13, 14th Aug 2007

http://www.en.wikipedia.org/wiki/Monsoon, Visited, 02nd Aug 2007

http://www.monsoonrestaurant.ca, Visited, 10, 11th Aug 2007.

http://www.monsoonseattle.com, Visited, 18thSep 2007.