

MULTI-PLATFORM MONITORING OF COASTAL EROSION AT A POCKET BEACH

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INTRODUCTION

As in many other regions of the world, coastal recession in West and Central Africa is the result of natural factors, anthropogenic factors, or both (Anthony et al., 2016; Luijendijk et al., 2018), and when it occurs, it may continue unless it is firmly addressed. Erosion along Ghana's coastline is endemic as in most of the Gulf of Guinea countries in West Africa. The current challenge is how to document and understand the dimensions of erosion despite limited human and logistical capacity. Regular monitoring of coastal areas is a prerequisite to evade any imminent erosive disaster within the coastal cities (Angnuureng et al., 2022). Data-driven decisions have remained more uncertain because most monitoring platforms are unable to capture events of a certain frequency.

OBJECTIVE

The main goal of this work is to test the feasibility of using multiple sources of remote sensing platforms to assess the dynamics of a pocket beach at Elmina in Ghana, as a showcase for local governance.

METHODS

In the study, shoreline change was assessed by an intensive multi-platform data collection strategy deployed for a year at Elmina Bay, Ghana using drones, shore-based video camera, and sentinel 2 satellite images over one year (2019).

RESULTS

The results reveal that frequent and local video cameras and drones are rather effective for operational monitoring of shoreline changes at all time scales while satellite imagery is a potential alternative tool, but not frequent enough to describe daily and intraseasonal event-based beach changes with sufficient accuracy for practitioners and management decision. A combination of sentinel satellite images, video and drone data collection platforms would allow large scale, high frequency, and regular observation of the beach for management purposes (Figure 1). We presented the accuracy and disadvantages of the various methods and the different options for coastal managers to choose from.

CONCLUSION

The potential areas and causes of erosion at Elmina have been clearly brought out at a very fine scale by our sediment budget calculations. Furthermore, while the presence of jetties in front of Elmina Castle adequately protected that section of beach in front of the castle, the larger unprotected portion of the beach is out of balance with high erosion rates (Angnuureng et al., 2022).

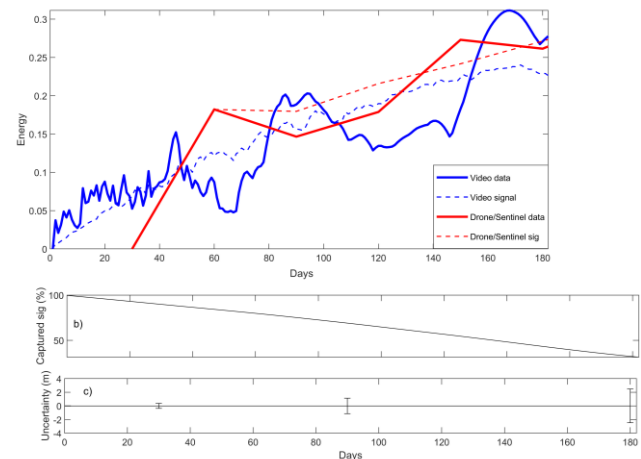


Figure 1. The estimated performance of daily (VCS data) and monthly data (UAV and Sentinel) and the signals of VCS, UAV and Sentinel platforms.

There is constrained sediment supply, and the short and narrow nature of this pocket beach seems to constitute an important management problem by rendering these beaches vulnerable to sediment loss and erosion, further exacerbated by human interventions including sand mining and maladapted engineering solutions. This work proposes proper management of the sediment budget including strict adherence to prohibition of sand mining on this beach and other beaches in Ghana.

REFERENCES

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