

Measuring and Simulating Delta Shoreline Dynamics: Case Studies in the Volta Delta

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Background

Globally, deltas are facing degradation due to combined impacts of sediment reduction, relative sea level rise, river management, land use, among others. Increased erosion and flooding has been reported in many deltas. These poses threats to ecosystems, natural resources and economic development as well as to populations residing in these regions (Overeem and Syvitski, 2009; Wong et al., 2014; Foufoula-Georgiou, 2013). As a result, there has been increasing interest for improved science-based new assessment tools for Deltas to improve policy formulation and management.

There has been reports of increased erosion, flooding, storm surge among others in the Volta Delta. This study provides a comparative analysis of shoreline dynamics at selected sites on eastern and western sides of the Volta delta using historical data, Unmanned Aerial Vehicles (UAVs) surveys and modeling. Initial results from decadal shoreline analysis and the UAVs are reported in this paper. The results confirm increased erosion in the Volta delta and short term shoreline movement between 48m (accretion) and -78m (erosion).

Approach

- ❖ Reconstruction of multi decadal shoreline changes using existing data (including satellite imagery)
- ❖ Dynamic modelling to simulate changes and predict future shoreline positions
 - ❑ Currently, historical data spanning between 1974-2014 has been analysed
 - ❑ Short term monitoring of lateral and volumetric Change using UAV ongoing at 3 selected sites (Figure 1)
 - ❑ 26 Ground control points established throughout the 3 sites to aid georeferencing
 - ❑ Dynamic Modelling using Delft3D is being set-up for the sites

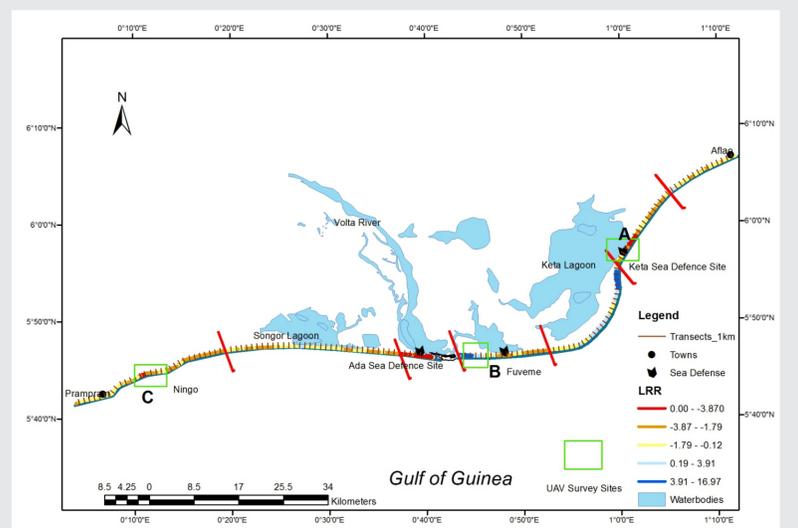


Figure 1: Delta Wide Erosion Analysis and Distribution of Selected Sites

Initial Results

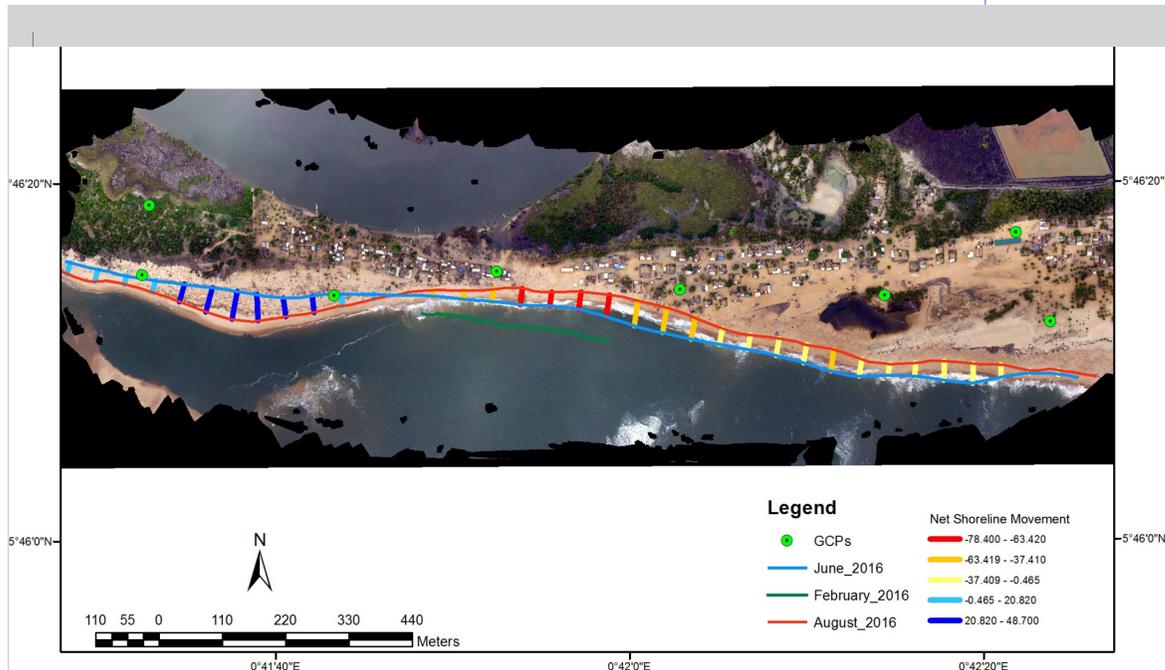


Figure 2: Initial Results from Site B

- ❖ Analysis of historical data spanning 1974-2014 confirms erosion (85% of the the delta shoreline) at an average rate of 2m/yr (Appeaning Addo 2015; Jayson-Quashigah et al., 2013)
- ❖ Generally, the three selected site are experiencing erosion at varying rates. Site B (Fuveme) reveals accretion and erosion over the 5 months period (Figure 2) with net shoreline movement between 48m and -78m.
- ❖ These lateral and volumetric monitoring at the selected sites will provide data and understanding into factors influencing shoreline dynamics in the delta.
- ❖ The UAV monitoring will progress every two months.

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This work is carried out under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) with financial support from the UK Government's Department for International Development (DFID) and the International Development Research Centre (IDRC), Canada. The views expressed in this work are those of the creators and do not necessarily represent those of DFID and IDRC or its Boards of Governors.