

## **Evolution of an intermittent lagoon-barrier system with rising sea level: observations and projections from the Muni-Pomadze lagoon, Ghana**

Sian Davies-Vollum

Dept of Natural Science (Geoscience), University of Derby, Derby, UK (s.davies-vollum@derby.ac.uk)

Intermittently closed lagoon-barrier systems are a transitory environment between land and sea that are influenced by fluvial and marine processes as well as human activities. Fluvial processes dominate most of the time, when the barrier is closed. However, when the barrier is breached an ephemeral connection between the lagoon and the ocean develops and estuarine-like conditions ensue. As sea level rises, the evolution of these systems from intermittently closed to open is dependent on multiple processes including barrier breaching, fragmentation and overwashing. Human intervention, often to prevent flooding, also has an impact. The Muni-Pomadze lagoon in central Ghana is a small, intermittently closed lagoon-barrier system that supports a local fishing community. A beach-barrier separates the lagoon from the ocean, impounding river water and sediment behind it for most of the year. At the end of a rainy season the barrier may be breached, either naturally or by human intervention to prevent flooding of dwellings on the barrier. Field observation, digital mapping and GIS analysis of the shoreline has enabled an understanding of how the barrier is evolving with rising sea level. The shore face of the barrier has shifted landwards with an average retreat rate of 0.22 m/yr. Small washover fans, developed at low points along the lagoon side of the barrier have developed. However, aerial photos reveal that these fans have remained stable since 1972 (earliest available air photos). The small size and stability of these fans suggests that overwashing is not an important factor in the evolution of the barrier and that the barrier is being eroded rather than moving landward. Erosion is particularly prevalent at the breach end of the barrier with an average rate of loss of 3 metres per year and palm trees that were providing stability to the barrier have been washed away. Unconsolidated sands forming a transient, spit-like feature have replaced the stable barrier, which makes breaching easier. Local fishermen have impacted erosion of the barrier by digging a breach when local dwellings at risk of flood. Sea level rise creates the potential for further barrier erosion and an increasingly permanent connection between the lagoon and ocean. Creation of an inundation map for a one-meter rise of sea level reveals fragmentation, permanent breaching of the barrier and a shift to estuarine conditions. Given the current situation, it is likely that barrier erosion at the breach point, assisted by human impact, is the most significant factor driving the loss of the barrier.