

# An Exposition of the Estimation of the Lake Chad Shoreline Dynamics

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**Key words:** Geoinformation/GI; Hydrography; Land management; Land readjustment; Risk management; Spatial planning; Shoreline; Lake Chad; Landsat images; DSAS; GIS

## SUMMARY

Lake Chad in the central part of the Sahel Region is an economically important lake. According to the UN Food and Agriculture Organization (FAO), the Lake Chad basin is one of the world's most important agricultural heritage sites. Due to a number of both anthropogenic and natural factors, the lake is now classified as among the most fragile hydrologic systems exposed to potential modifications of its hydrological conditions. In the last few decades, it has been shown that it has been drastically reduced in size by almost 90 percent (90%) in the last 60 years. The FAO has called the situation an "ecological catastrophe" and predicted that the lake could disappear this century. Despite its political and socio-economic importance, there has been no documented evidence of a specific study relating to the lake's shoreline, particularly on Nigeria's border. This paper aims at an exposition of the estimation of the Lake Chad shoreline dynamics on parts of the Nigerian side of the lake. Shoreline by its nature is an ambulatory line, there is a need for a sound understanding of the trends of the phenomena to help set out clearly the locations where safeguard measures are likely to be required and others where alternative options are more sustainable. Landsat 8 operational land imager (OLI) and Landsat 7 enhanced thematic mapper plus (ETM+) images of the study area of the study period, freely obtainable from the USGS website, were compiled and processed in ArcMapTm. The analysis was based on the concept of the Digital Shoreline Analysis System (DSAS) software (an add-in to the Esri ArcGIS desktop). The software was utilized for the determination of the rate-of-change statistics from multiple historical shoreline positions as well as to assess the dynamics of the rates and for shoreline forecasting. The study covered a thirty-year (1991–2021) period carry out at a 10-year interval. The delineated shoreline of 1991 was used as the baseline for the generation of transects. Baseline maps, shoreline change statistics calculations, tables, charts, and graphs were used to present the results of the intermittent and overall shoreline movement. It shows the time-varying trends of the lake's shoreline dynamics and identifies the vulnerability extents at specific locations. The software used includes ArcGIS

10.6.1, ERDAS Imagine 2015, ENVI 5.1, Microsoft Office, and MATLAB R 2016a.

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