

# A multi-method approach to analyze changes in gully characteristics between 2009 and 2018 in southeast Nigeria

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## Abstract

Gully erosion is the dominant environmental problem in southeast Nigeria and has led to loss of human and material resources. In this study, we evaluated changes in gully characteristics in southeast Nigeria between 2009 and 2018 using a multi-method approach including geotechnical investigations, analysis of high-resolution satellite imagery (2 – 5 m) and focus group discussions. Gully numbers increased from 26 to 39 and mean gully length increased from 0.39 to 0.43 km. We found that the soils in the study area have low cohesion and high sand content which make them susceptible to dispersal by erosive forces. Land adjacent to rivers had the highest concentration of gullies, and there was a sharp rise in slope from 10 – 58.2% within a distance less than 500 m from the river. Regarding potential gully-drivers, land-use changes were observed. Non-vegetated lands increased from 58.6 km<sup>2</sup> to 144.7 km<sup>2</sup> between 2009 and 2018, while reductions in fallowed lands from 281.2 km<sup>2</sup> to 57.8 km<sup>2</sup> were observed. Results from focus group meetings indicate there was no gullying in the area before the Nigerian civil war. Although war-time activities which led to initiation of oldest gullies have ceased, land-use changes likely increase volume of surface runoff. We infer that interactions between soil conditions which potentially enhance seepage erosion and higher surface runoff resulting from land-use changes have propagated gullying in the study area post-civil war.

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