



Oil and Gas Extraction's Ecological Impact on Marine and Coastal Environments in Angola,

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Abstract

Oil and gas extraction has become a significant contributor to Angola's economy, but its environmental impacts on marine and coastal ecosystems are under scrutiny. A combination of satellite imagery analysis and ground-based sampling was employed to monitor environmental indicators such as water quality, seabed habitats, and local wildlife populations. A generalized linear mixed model (GLMM) with robust standard errors was used to assess the relationship between extraction activities and ecological changes. Pollution levels in coastal waters were found to be elevated by at least 20% compared to pre-extraction conditions, affecting both primary and secondary productivity. The GLMM analysis revealed a statistically significant ($p < 0.05$) relationship between the intensity of oil extraction activities and water quality degradation, with clear indications of ecosystem stress in areas adjacent to active operations. Given the findings, it is recommended that Angola implements stricter environmental protection measures and conducts regular ecological monitoring around extraction sites. Oil Extraction, Marine Ecosystems, Coastal Environments, Angolan Coast, Environmental Impact Assessment The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Mangroves, Disturbance, Ecosystem Services, Biodiversity Loss, Habitat Fragmentation, Coastal Management*

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