STI07-WEG-008

Satellite-Based Analysis of 20-Year Trends in Water Levels and Land Cover Change in Key Kenyan Lakes

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Abstract

Lakes play a pivotal role in supporting biodiversity and serving as reservoirs of easily accessible surface water resources, making them integral components of both the blue economy and local livelihood systems. In recent times, the water levels of Kenyan lakes have exhibited fluctuations, with a noteworthy upward trend observed over the past two decades. This increase in water levels has led to shoreline flooding, displacing communities residing in proximity to these lakes. The repercussions have been

profound, encompassing human and animal casualties and a loss of biodiversity within these regions. This study centers its focus on ten economically significant Kenyan lakes: Baringo, Bogoria, Elementaita, Jipe, Magadi, Naivasha, Nakuru, Olbolosat, Turkana, and Victoria. Leveraging geospatial data derived from satellite remote sensing and hydrological information sourced from spaceborne platforms, the research employs trend analysis techniques to scrutinize the temporal evolution of lake water levels and to pinpoint their likely determinants. The study's findings reveal a substantial transformation in lake water levels over the last decade, manifesting a distinct and consistent upward trajectory during the study period. Climate change, intricately connected to environmentally degrading human activities such as land clearance for agriculture and infrastructure development, emerges as the primary catalyst behind these fluctuations. The implications of these findings extend to various domains, including integrated water resources management, environmental monitoring, and property development within Kenya and the broader region. This study and its future endeavors stand to gain from the recent advancements in space technologies for earth observation, notably exemplified by Kenya's recently launched Taifa-1 earth observation nanosatellite. These innovations facilitate enhanced spatial-temporal monitoring capabilities, crucial for the sustainable management of natural resources.

In light of the study's outcomes, it is recommended that similar methodologies and data sources be employed to establish a systematic and ongoing monitoring and assessment framework for lake water levels. Such an approach holds the potential to inform evidence-based policies and decisions, safeguarding critical natural resources and ensuring their sustainable stewardship for generations to come.

STI07-WEG-009