

Environmental Planning for Sustainable Utilization of Lake Chamo Biodiversity Resources: Geospatially Supported Approach, Ethiopia

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Abstract : Context: Lake Chamo is a significant lake in the Ethiopian Rift Valley, known for its diversity of wildlife and vegetation. However, the lake is facing various threats due to human activities and global effects. The poor management of resources could lead to food insecurity, ecological degradation, and loss of biodiversity. Research Aim: The aim of this study is to analyze the environmental implications of lake level changes using GIS and remote sensing. The research also aims to examine the floristic composition of the lakeside vegetation and propose spatially oriented environmental planning for the sustainable utilization of the biodiversity resources. Methodology: The study utilizes multi-temporal satellite images and aerial photographs to analyze the changes in the lake area over the past 45 years. Geospatial analysis techniques are employed to assess land use and land cover changes and change detection matrix. The composition and role of the lakeside vegetation in the ecological and hydrological functions are also examined. Findings: The analysis reveals that the lake has shrunk by 14.42% over the years, with significant modifications to its upstream segment. The study identifies various threats to the lake-wetland ecosystem, including changes in water chemistry, overfishing, and poor waste management. The study also highlights the impact of human activities on the lake's limnology, with an increase in conductivity, salinity, and alkalinity. Floristic composition analysis of the lake-wetland ecosystem showed definite pattern of the vegetation distribution. The vegetation composition can be generally categorized into three belts namely, the herbaceous belt, the legume belt and the bush-shrub-small trees belt. The vegetation belts collectively act as different-sized sieve screen system and calm down the pace of incoming foreign matter. This stratified vegetation provides vital information to decide the management interventions for the sustainability of lake-wetland ecosystem. Theoretical Importance: The study contributes to the understanding of the environmental changes and threats faced by Lake Chamo. It provides insights into the impact of human activities on the lake-wetland ecosystem and emphasizes the need for sustainable resource management. Data Collection and Analysis Procedures: The study utilizes aerial photographs, satellite imagery, and field observations to collect data. Geospatial analysis techniques are employed to process and analyze the data, including land use/land cover changes and change detection matrices. Floristic composition analysis is conducted to assess the vegetation patterns. Question Addressed: The study addresses the question of how lake level changes and human activities impact the environmental health and biodiversity of Lake Chamo. It also explores the potential opportunities and threats related to water utilization and waste management. Conclusion: The study recommends the implementation of spatially oriented environmental planning to ensure the sustainable utilization and maintenance of Lake Chamo's biodiversity resources. It emphasizes the need for proper waste management, improved irrigation facilities, and a buffer zone with specific vegetation patterns to restore and protect the lake outskirt.

Keywords : buffer zone, geo-spatial, lake chamo, lake level changes, sustainable utilization

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