ADVANCEMENTS IN GIS AND RS TECHNOLOGIES FOR MONITORING MARINE OILSPILLS: A SYSTEMATIC REVIEW OF ENVIRONMENTAL IMPACTS AND FUTURE DIRECTIONS.

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Marine oil spills are one of the major human-induced disasters with serious environmental impacts. Therefore, understanding the extent and depth of environmental impacts is crucial to the concept of ecosystem health assessment. With this background, we conducted a systematic review to identify the main types of GIS and RS applications to detect oil spills and to identify how these types of GIS and RS have been useful in quantifying the environmental impact caused by oil spills. In the article screening process, research articles related to oil spills published from 2018 to 2023 were extracted using the "Google Scholar" academic search engine. We employed "oil spill, GIS & RS, marine biodiversity, Asian region" as inclusive keywords to screen out articles. For the final analysis of the data, the screening process yielded a total of 52 articles. The analysis results showed that the majority of studies have employed Arc GIS combined with machine learning models to detect the location, extent, and characteristics of the oil spill, including oil type, texture, and thickness. In monitoring oil spills, satellite imagery, synthetic aperture radar, and high-resolution hyper-spectral sensors with CNN machine learning are utilized, along with optical RS, ESRI, and ArcGIS databases. Integration of GIS platforms with spatial decision support systems and analytical hierarchical process models, plus secondary data sources, assesses the onshore and offshore environmental impacts caused by oil spills. Studies evaluate GIS and RS tools' effectiveness and their impact on marine oil spills, revealing significant progress in Asian marine oil spills. However, it is clear that introducing inclusive and comprehensive approach is important to address challenges including the development of real-time monitoring systems, the integration of autonomous systems, RS fusion approaches, and oil spill remediation techniques. Such advancements will contribute to the effective management and responses to oil spills on spatiotemporal aspects and minimize their ecological and economic impacts on the marine environment.

Keywords: GIS and RS; Marine Biodiversity in Asian region; Oil spills detection; Advanced machine learning.

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