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Posters 1

[KSxAOV1I-10] [Withdrawn]From Data to Decisions: Digital Twin Applications for Ecosystem-Based Coastal Climate Adaptation and Resilience

*Chinomnso Onwubiko[1] (1. University of Cape Coast (Ghana))

Coastal regions are increasingly exposed to climate-driven hazards, including flooding, erosion, sea-level rise and ecosystem degradation, creating interconnected risks for communities, infrastructure, biodiversity and local economies. Addressing these challenges requires decision-support approaches capable of integrating environmental, ecological, and socioeconomic information across sectors. Digital twins offer an emerging opportunity to transform diverse coastal datasets and modeling outputs into dynamic, scenario-based tools for climate adaptation and resilience planning.

This presentation explores the application of digital twin approaches to ecosystem-based coastal adaptation, with particular emphasis on integrating geospatial data, coastal vulnerability modeling, ecosystem service information, and stakeholder knowledge. Building on experience with GIS and the InVEST Coastal Vulnerability model for assessing the contribution of mangrove ecosystems to coastal flood-risk reduction, it proposes a pathway for translating conventional spatial and ecosystem-service modeling into more integrated digital representations of coastal systems. Such digital twins could enable users to explore alternative scenarios, including mangrove conservation and restoration, ecosystem degradation, coastal development, and changing climate hazards, and evaluate their implications for people, ecosystems, and infrastructure.

The proposed approach demonstrates the cross-sector potential of coastal digital twins by connecting climate adaptation, disaster risk reduction, nature-based solutions, ecosystem conservation, spatial planning, and community resilience. Importantly, incorporating local and stakeholder knowledge alongside biophysical and socioeconomic data can strengthen the relevance and inclusiveness of digital-twin-supported decisions.

By moving beyond static vulnerability assessments towards interactive and scenario-based decision support, digital twins can help bridge the persistent gap between coastal data, scientific modeling, and practical action. The presentation highlights opportunities for applying this approach in data-constrained coastal regions, particularly in developing countries, to support more adaptive, ecosystem-informed, and climate-resilient coastal management.

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