



Mapping urban coastal pressures through citizen science: an adaptive spatial data model for the coast of Naples

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Urban coastal areas represent complex socio-ecological systems where land–sea interactions intensify environmental pressures, functional conflicts, and governance challenges. In this context, spatial knowledge frameworks play a crucial role in supporting integrated coastal management and maritime spatial planning. This contribution presents an adaptive spatial data model (SDM) designed to map and interpret the multiple dynamics shaping the city–sea interface, with a specific application to the Metropolitan City of Naples.

The proposed SDM integrates heterogeneous datasets within a GIS-based geodatabase, combining physical, environmental, socio-economic, and functional layers. The model is structured to capture cumulative pressures on the marine environment, including port infrastructures, coastal land uses, tourism-related activities, and ecological constraints. Attention is given to the representation of land–sea interactions, enabling the identification of spatial overlaps between anthropogenic uses and vulnerable ecosystems.

The methodological approach is based on a modular and scalable framework, allowing both comparative analyses across coastal contexts and incremental implementation in WebGIS environments, while also enabling the integration of citizen science data as a complementary source of spatial information. The Naples case study grounds the model's analytical capacity, highlighting spatial patterns of pressure concentration, fragmentation of coastal accessibility, and the coexistence of protected areas with high-intensity uses.

Beyond its current implementation, the framework opens to interdisciplinary extensions, where citizen science can further implement the geodatabase structure, enriching spatial interpretation, improving data granularity, and fostering greater public awareness. The contribution supports evidence-based interpretations of coastal complexity, enabling the construction of spatial indicators and comparative analyses aimed at identifying critical hotspots and latent potentials along the city–sea interface.

Developed within a research consultancy at the Department of Humanities of the University of Naples Federico II, in the context of the “PNRR_BIODIVERSITY_SPOKE1”, the framework is conceived as a transferable tool linking spatial analysis with the interpretation and management of the city–sea interface.