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Communications in Computer and Information Science 2088

# Geomatics for Environmental Monitoring: From Data to Services

26th Italian Conference, ASITA 2023  
Virtual Event, December 18–20, 2023  
Revised Selected Papers

MOREMEDIA 

 Springer





## Towards a Spatial Decision Support System for Hydrogeological Risk Mitigation in Railway Sector

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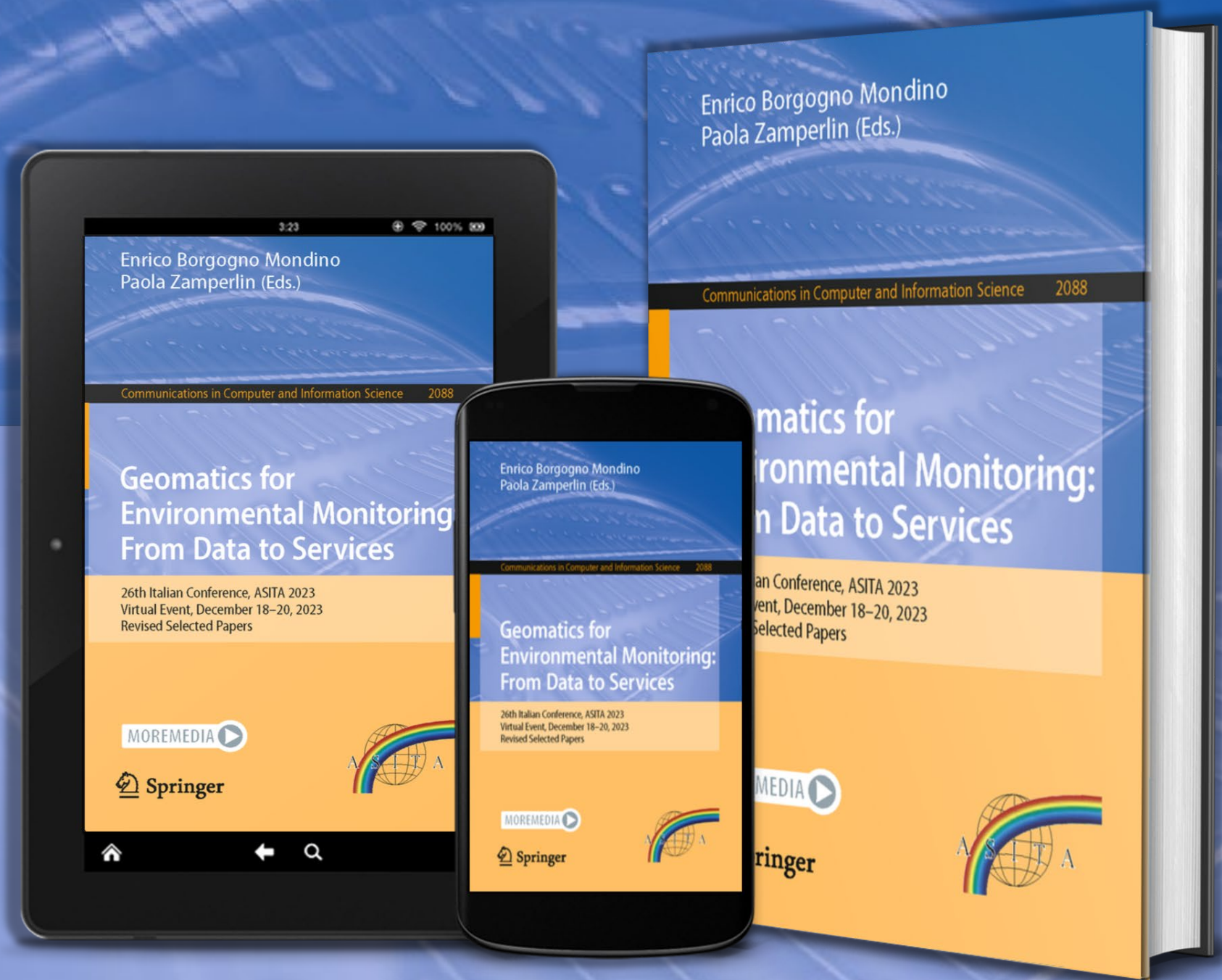
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**Abstract.** Railway systems are exposed to the impacts of climate change weather-related events, such as landslides and flooding due to intense rainfall. To maintain resilient infrastructure and operations, railway owners face the challenging task of identifying and prioritizing adaptation interventions, which is exacerbated by railways spatial extent and by uncertainties in future weather events. Given the distributed structure of railways and their interaction with the surrounding territory, the optimal approach is to integrate a Geographic Information System (GIS) with predictive models to analyze multiple scenarios, resulting in a Spatial Decision Support System (SDSS). A SDSS provides a systematic approach for railways adaptation, assessing their exposure and vulnerability to hydrogeological hazards, and facilitating the identification of effective structural and non-structural interventions for resilience enhancement. By combining management experiences in railway infrastructure with scientific advancements, this research proposes a conceptual framework for developing a SDSS that can support strategic decision making. First, an inventory of adaptation measures for railways to hydrogeological hazards was produced in the context of the Italian National Adaptation Plan (PNACC, [1]). The subsequent step investigated the cause-and-effect relations between hydrogeological hazards and damage to railway in a specific case study. The GIS component of the SDSS allows to integrate heterogeneous data sources from different information systems related to the examined railway track, with the aim of identifying a set of geographic data sources applicable at the national scale. The SDSS prototype is implemented, in parallel with the framework development, in the Strategic Information Management System (SIMS) of the Italian FS Group.

**Keywords:** Railways · Geographic Information System · hydrogeological hazards





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