# Abstract

In recent times, the increasing frequency and intensity of natural disasters have highlighted the urgency of a stronger resilience and preparedness within the built environment. Climate change has amplified risks in urban areas, challenging the traditional approaches to risk assessment, and stressing the importance of data-driven assessment strategies. In this context, a series of enabling technologies for the built environment can support the transition to new and innovative solutions, that rely on integrated approaches to support the development of intelligent representation systems.

This research addresses these challenges by developing a methodological framework for the integration of heterogeneous data sources into a unified digital environment. The process begins with the collection and harmonization of various and different datasets, including GIS data coming from public datasets, BIM models with varying levels of development and detail, and other spatial and non-spatial data related to risk factors across the Italian territory. A conversion and integration strategy is designed and implemented in order to interoperate data between the BIM and GIS domains, relying on free and open-source resources for scalability and replicability. The static datasets are then combined with dynamic, real-time data streams, in order to construct a Digital Twin of territories, buildings, and monitoring systems.

The result is a framework of data integration for the built environment, and the prototype of a Spatial Decision Support System (SDSS), designed to assist decision-makers and communities in gaining better and deeper insights into the fragilities of their territory, improving critical knowledge, and increasing their awareness over evolving and constantly changing disaster scenarios.