# Digital Solutions to Quantify the Natural Event Impacts and their mitigation in the Age of Climate Change

*(Proposer: Francesca da Porto)*

**Background**

Italy is one of the most sensitive countries to catastrophic natural events. UNISDR (2017) showed that Italy ranks fourth (behind Japan, the United States and China) for average expected losses caused by natural disasters. Among these, flood events are the most frequent, followed by earthquakes, which are responsible for the greatest economic losses. Together, earthquakes and floods represent more than 80% of the economic losses from natural disasters (CRED EM-DAT, 2015). Only in the last five decades, earthquakes have resulted in a financial impact of €180 billion for Italy (ICPD, 2018, https://www.protezionecivile.gov.it/it/notizia/on-line-il-documento-sulla-valutazione-nazionale-dei-rischi/), while economic losses from climate-related events were estimated at €65 billion between 1980 and 2015 (European Environment Agency). In addition, the ongoing climate change effects are intensifying the impacts of natural events such as flash floods, debris flows, landslides, storms, and tornadoes (IPCC, 2023, https://www.ipcc.ch/report/sixth-assessment-report-cycle/). However, only 6% of the damage incurred from these events is covered by insurance (Willis Towers Watson, 2017). This highlights the urgent need to invest in understanding and management of these natural hazards and mitigating their effects. One tool is to develop effective *CatNat* models and digital platforms (*Insurtech*), to rationally and automatically assess the impacts of climate change related hazards, in order to support the planning of proper risk reduction and mitigation strategies.

**Aim**

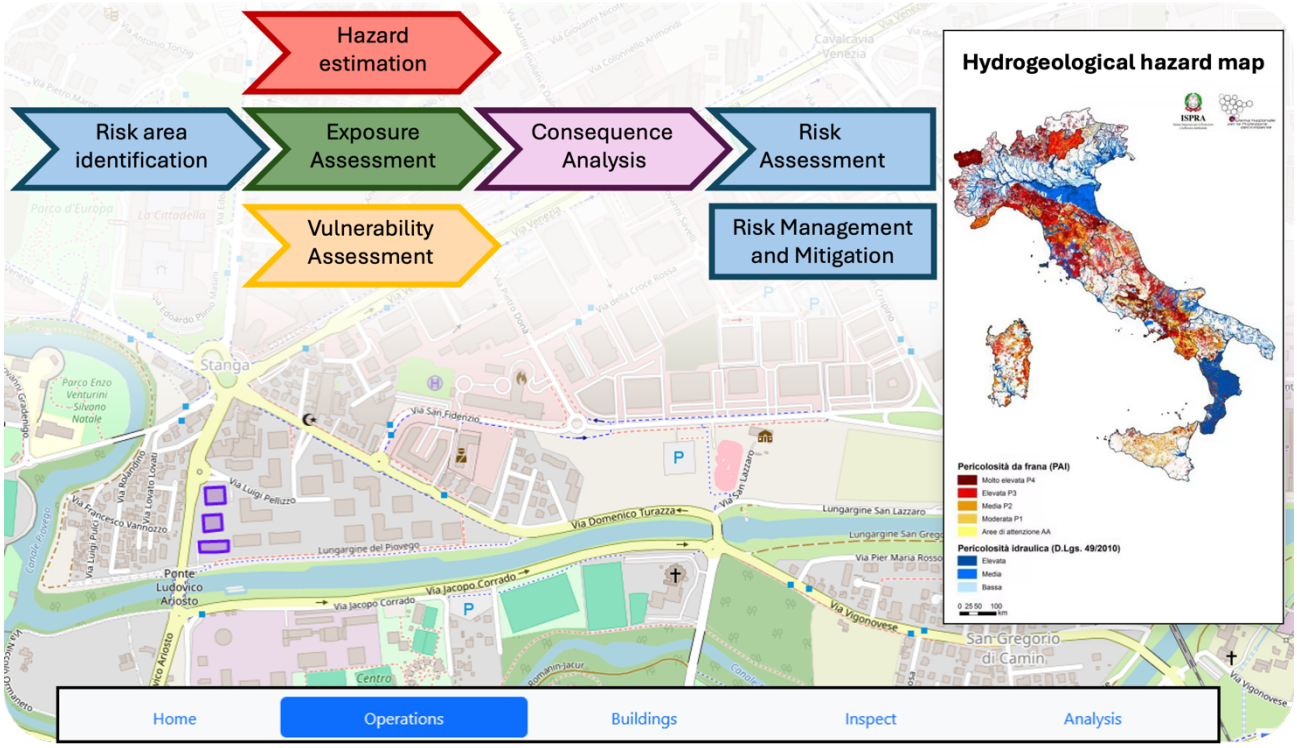
This PhD project seeks to create cutting-edge digital tools to enhance multi-risk management in response to natural disasters. Expertise in information engineering is essential for transforming traditional risk analysis processes into fully digitalized and more efficient systems. Specifically, the project focuses on creating a digital platform for implementing *CatNat* models tailored to the Italian context, developing AI tools for the automatic retrieval of exposure information related to at-risk assets, and utilizing Data Science techniques for processing large datasets, such as structural monitoring data. The results will enable more accurate and rapid assessments of the impacts and economic losses from natural disasters, facilitating the development of effective mitigation strategies in the context of climate change. This research is particularly timely, as underscored by the recent 2024 budget law, which requires Italian businesses to secure insurance against natural events.

**Expected results.** The main tasks of the PhD project are:

- develop a new *CatNat* model tailored to the Italian context in the era of climate change, along with AI and Data Science operational tools to feed and enhance the latest hazard, vulnerability, and exposure models, enabling rational and systematic multi-risk assessment from natural disasters;
- design a user-friendly digital platform, based on Python language and WebGIS technology for geo-referenced data visualization, to enable easy implementation and interactive access to the *CatNat* model and AI and Data Science tools, for the purpose of automatic risk profiling;
- build the digital platform as an open and scalable framework, orchestrated internally through modular composition and able to interoperate with external databases, to meet the needs of real estate asset owners and insurance companies, with the goal of "democratising" catastrophe models.

**Funding**: Progetto Triennale ReLUIS 2024-2026; PE3 – RETURN; Uni-Impresa 2021 "Platform for the Evaluation of Risk: Insurtech innovation for Loss estimation" - PERIL

**Possible Collaboration**: ReLUIS (Laboratories University Network of Seismic and Structural Engineering); Department of Civil Protection; Insurance and Insurtech Companies.


Hazard estimation
Risk area identification
Exposure Assessment
Consequence Analysis
Risk Assessment
Vulnerability Assessment
Risk Management and Mitigation
Hydrogeological hazard map
Pericolosità da frana (PAI)
Molto elevata P4
Elevata P3
Media P2
Moderata P1
Aree di attenzione AA
Pericolosità idraulica (D.Lgs. 49/2010)
Elevata
Media
Bassa
Stanga
Via San Fidenzio
Via Domenico Turazza
Lungargine San Lazzaro
Lungargine del Piovego
Via Jacopo Corrado
Ponte Ludovico Ariosto
Via Vigonovese
San Gregorio di Camin
Centro
Home
Operations
Buildings
Inspect
Analysis