

MODELLING AND MANAGING TOMORROW'S RISKS FROM NATURAL HAZARDS

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ABSTRACT

Understanding, modelling, quantifying and managing future risks from natural hazards is becoming increasingly crucial as the climate changes, the human population grows, asset wealth accumulates, and societies become more urbanised and interconnected in many parts of the world. The 2015-2030 *Sendai Framework for Disaster Risk Reduction* recognises this need, emphasising the importance of preparing for the disasters that our world may face tomorrow through strategies to minimise uncontrolled development/densification in hazardous areas. While the vast majority of natural-hazard risk-assessment frameworks have so far focused on static impacts associated with current conditions and/or are influenced by historical context, some researchers have sought to provide decision-makers with risk-quantification approaches that can be used to cultivate a sustainable future. Modelling dynamic natural-hazard risk can support the development of meaningful decision support for urban development in the design of less-exposed and more-resilient cities and regions.

This talk will discuss these latter efforts, briefly examining work that is being carried out to model and quantify the individual components that comprise tomorrow's risk, i.e., future natural hazards affected by climate change, future exposure (e.g., in terms of population and land use), and the evolving physical vulnerabilities of the world's infrastructure. The talk will highlight the challenges modellers face in determining the risks that tomorrow's world may face from natural hazards and the constraints these place on the decision-making abilities of relevant stakeholders. Finally, the talk will introduce the risk-based, pro-poor urban design and planning framework (and its implementing Decision Support Environment, DSE) developed within the Tomorrow's Cities project, the United Kingdom Research and Innovation (UKRI) Global Challenge Research Fund (GCRF) Urban Disaster Risk Hub. The Hub aims to support the delivery of the United Nations' Sustainable Development Goals and priorities 1 to 3 of the *Sendai Framework for Disaster Risk Reduction*. In particular, the Tomorrow's Cities DSE integrates physics-based natural hazard modelling, dynamic exposure and vulnerability (physical and social) modelling, consideration of multi-hazard scenarios, and participatory approaches for identifying impact metrics tailored to the specific context and needs of marginalised communities. The talk will discuss the ongoing implementation of the Tomorrow's Cities DSE in Kathmandu, Nepal, where methodologies and guidelines for action-oriented, pro-poor, multi-hazard risk-based decision-making are co-produced with local, national, and global stakeholders and research partners.

About the Author



Dr Carmine Galasso is a Full Professor of *Catastrophe Risk Engineering* in the University College London (UCL)'s Department of Civil, Environmental & Geomatic Engineering (CEGE), UK. His research focuses on developing and applying probabilistic and statistical methods and computational/digital tools for catastrophe risk modelling and disaster risk reduction. He is investigating risks to building portfolios and infrastructure exposed to multiple natural hazards, including earthquakes, strong wind, and flooding, with particular emphasis on low-income countries and community-based infrastructure (schools, hospitals, heritage assets). Carmine has authored >200 peer-reviewed papers; his research (>£5M as a PI) is

funded by the UK Research Councils, the European Commission, the British Council, the Chinese International Centre for Collaborative Research on Disaster Risk Reduction (ICCR-DRR), the World Bank and its Global Facility for Disaster Reduction and Recovery (GFDRR), the Motorola Solution Foundation, and the Willis Research Network. He is an Associate Editor for the *International Journal of Disaster Risk Reduction* (Elsevier) and *Frontiers in Earth Science/Geohazards and Georisks*; a handling editor for the *Journal of Earthquake Engineering and Nature Communications Engineering*; and the Executive Editor for Operations for *Seismica* (McGill University) a new community-driven, Diamond Open Access journal publishing peer-reviewed research in seismology and earthquake science.

Carmine is a key investigator of the £20M Global Challenges Research Fund (GCRF) Urban Disaster Risk Hub by UK Research and Innovation (UKRI), where he leads the Risk Working Group. The Hub works in four cities (Istanbul, Kathmandu, Nairobi and Quito), collaborating with local, national, and global organisations to strengthen disaster risk governance by undertaking integrated, multi-scale and cross-disciplinary research to better understand natural multi-hazard risk and its drivers.