CATA-TWIN - Catastrophe Risk and Emergency Response with Digital Twin Technologies
EPSRC funded PhD studentship with full fee waiver and £21,805 pa stipend (2026/27 rate)

Project Code:	DLA_DTP_2026_11
Main Supervisor:	Dr Nicola Chieffo
Co-Supervisor:	Professor Mauro Vallati

Project Introduction

This project develops a digital twin framework for urban catastrophe risk and emergency response. By integrating real-time data, advanced simulation, and decision-support tools, it enables cities to anticipate, respond to, and recover from extreme events more effectively. The platform enhances urban resilience by modelling critical infrastructure, optimising emergency operations, and supporting rapid, informed decision-making. The research addresses societal and economic vulnerability to natural and anthropogenic hazards, providing scalable, data-driven solutions for urban planners, emergency managers, and policymakers. This work advances digital technologies for resilient, adaptive, and secure urban systems.

Project Details

This project aims to develop a digital twin framework for urban catastrophe risk assessment and emergency response, combining advanced modelling, real-time data integration, and decision-support tools. The research will focus on identifying urban exposure and mapping existing typological classes of buildings to understand the spatial distribution of risk.

A core objective is the assessment of vulnerability and hazard-specific risk, including quantification of potential social losses and casualties under various catastrophic scenarios. By integrating these data into a digital twin platform, the project will enable real-time simulation of catastrophic impacts, allowing emergency planners and stakeholders to test response strategies dynamically.

A novel aspect of the research is the use of the digital twin for insurance-oriented impact reporting, providing quantitative estimates of expected losses and potential liabilities for urban infrastructure and populations. This includes scenario-based evaluation of both direct physical damages and indirect social consequences, supporting risk-informed decision-making for urban resilience and disaster preparedness.

The project will be structured to ensure that all research outcomes are achievable, and the PhD thesis can be completed within 3 years, without reliance on extended write-up periods. Key work packages include:

1. Urban exposure mapping and typology classification – compiling spatial datasets and categorising building types, infrastructure, and population distributions.

2. Vulnerability and risk assessment – developing hazard-specific vulnerability models and integrating them with exposure data to quantify social and infrastructural risk.

3. Digital twin development – creating a dynamic simulation platform capable of modelling catastrophic impacts in real time.

4. Impact simulation and insurance analysis – estimating expected losses and casualties under multiple scenarios, producing actionable outputs for emergency management and insurance reporting.

The expected outcomes of this research include:

- Identification of urban exposure patterns and typological classes

- Quantitative assessment of vulnerability, risk, and social losses

- Real-time catastrophic impact simulation using a digital twin

- Insurance-oriented reporting of expected losses and casualties

- Enhanced decision-support for emergency response and urban resilience planning

By providing a scalable, data-driven tool, this project will support urban planners, emergency managers, and policymakers in reducing vulnerability, optimising emergency operations, and preparing for extreme events, while delivering a clearly defined set of outputs achievable within a standard 3-year PhD timeline.

Project-specific entry requirements

Qualifications: A master's degree in civil engineering, or a related area.
Skills:
- Strong analytical skills, with the ability to conduct both qualitative and quantitative research.
- Proficiency in data analysis software and tools (Python, R, Matlab) and GIS tool.
- Excellent communication skills for conducting interviews and presenting findings.
Experience:
- Demonstrated experience in conducting literature reviews and developing theoretical frameworks.
- Experience in handling and analysing large datasets, statistical data related to urban compounds and climate events.
Knowledge:
- Understanding of risk and hazard(s) at urban layout, insurance, statistics and probability and climate change.
- Familiarity with resilience concepts
- Awareness of current mitigation strategies for climate change-related events and best practices in proactive maintenance.

Further Information

This call is open to **UK Applicants only**.

Applicants should be of outstanding quality and exceptionally motivated.

The studentships are funded for 3 years (subject to satisfactory annual performance and progression review) and will provide for tuition fees and a tax-free stipend paid monthly.

Please note that there are more projects than funded studentships available and therefore this is a competitive application process which will include an interview. Shortlisted candidates will be contacted for an interview in person or via Teams. After interview the most outstanding applicants will be offered a studentship.

Queries about the application process are welcome and should be emailed to pgrscholarships@hud.ac.uk.

Informal enquiries about this project should be directed to Dr Nicola Chieffo.

Type of Award: Doctor of Philosophy (PhD).

Eligibility: UK applicants only. First Class or Upper Second-Class Honours degree or equivalent in a relevant subject area, please refer to the entry requirements on the specific projects being advertised.

Location: Huddersfield.

Funding: 3 years full time research covering tuition fees and a tax-free bursary (stipend) starting at £21,805 for 2026/27 and increasing in line with the EPSRC guidelines for the subsequent years. Funded via the Engineering and Physical Sciences Research Council Doctoral Training Programme.

Duration: 3 years full-time plus 12 months writing up (please note no funding available for writing up period).

Closing date: 28th April 2026

Start date: 1st October 2026

Application details

- Go to the EPSRC webpage and download the Expression of Interest Form 2026.
- Provide copies of transcripts & certificates of all relevant academic and professional qualifications.
- Provide references from two individuals – please contact your referees and ask them to send them directly to pgrscholarships@hud.ac.uk from their email address.
- Proof of eligibility – e.g. scan of passport photo page.
- Completed forms, including all relevant documents should be submitted via-email to pgrscholarships@hud.ac.uk.

Please note: if you do not attach all the relevant documentation prior to the closing date your application will not be considered.