

**Project title:** Complex Risk Assessment for Urban Areas

**Ref:** OP2408

**Keywords:** Risk analysis, Vulnerability, Compound hazards, Cascading failure

**One Planet Research Theme:**

Climate & Climate Change  | Earth System Processes  | Anthropocene  | Environmental Informatics

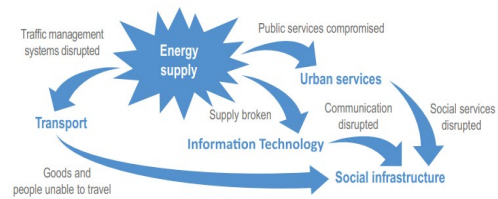
**Lead Supervisor:**

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**Key Research Gaps and Questions:**

1. Complex risks arise from interactions between multiple climate hazards, exposures, and human vulnerabilities.
2. Understanding of climate risks is limited to conceptual framing, as shown by the figures, which are from the latest IPCC report.
3. This PhD will develop and apply a framework for urban complex risk assessment that can analyse compound or concurrent hazards and their interactions with the different physical infrastructures and socio-economic vulnerabilities that exist in urban areas.

1 Rapid onset event, e.g. flood or storm surge



2 Slow-onset or chronic impacts, e.g. recurrent food price shocks or everyday flooding



**Project Description:**

The latest global assessment by the Intergovernmental Panel on Climate Change (IPCC) revealed the unexpected, dramatic consequences of ‘complex risk’, stating they are the greatest adaptation gap and threaten water security, health, livelihoods, and infrastructure. For convenience, managers organise risk assessments into silos, focusing on a particular hazard (e.g. flooding) or impacts on a particular sector (e.g. transport) rather than an interaction-oriented view. However, the world is highly interconnected; multiple drivers of social, environmental and climate change interact. These connections transmit climate risk from one system or sector to another, creating new risks or exacerbating existing ones. For example, heatwaves reduce productivity and thereby household income. A concurrent drought could increase infectious disease and water scarcity. Inequalities, such as poverty or limited access to key services, increases vulnerability to different climate impacts in different ways, limiting different people’s ability to adapt. Current methodologies for climate change risk assessments consequently significantly misestimate risk. These issues are most acute in urban areas which sit at the nexus of natural hazards, engineered structures and socio-economically diverse communities. This project will develop a framework for complex risk in urban areas. This will involve developing approaches to handle compound or concurrent hazards, cascading failure between infrastructure and assess differential impacts according to social vulnerability.

**Essential (E) and Desirable (D) Prerequisites:** **E1:** 2:1 UG Degree (or equivalent) in STEM subject **E2:** Knowledge of GIS and a high-level programming language e.g. Python, R **D1:** Use of climate and/or geospatial data **D2:** Ability to write and communicate well.

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