
***School of Computing, Engineering, and the Built Environment***
**Edinburgh Napier University**

# PHD STUDENT PROJECT

**Application instructions:**
Detailed instructions are available at :
https://www.napier.ac.uk/research-and-innovation/doctoral-college/how-to-apply

*Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.*

## Project details

**Supervisory Team:**

- DIRECTOR OF STUDY: DR Nirodha Fernando (Email: n.fernando@napier.ac.uk)
- 2ND SUPERVISOR: Prof. Mark Deakin

**Subject Group:** Built Environment

**Research Areas:** Built Environment

**Project Title:** An agent-based modelling approach to assess the decision-making strategies in community-scale flood resilience

**Project description:**

Flooding is a natural disaster that can have severe consequences for communities, causing damage to infrastructure and homes and even leading to loss of life (Auliagisni et al., 2022). As climate change progresses, the frequency and intensity of floods are expected to increase, making flood resilience an essential component of community planning (Wang et al., 2022). Several countries have experienced increasing flood events in recent years with significant economic, social, and environmental consequences (Rentschler et al., 2022). The increasing frequency and severity of flood events have highlighted the need for proactive measures taken by communities to reduce their vulnerability to flooding, also known as active community-scale flood resilience (Auliagisni et al., 2022). According to Hewawasam and Matsui (2022), community-scale flood resilience refers to the proactive measures taken by communities to reduce their vulnerability to flooding. It involves various behavioural elements, such as preparedness, response, and recovery, and can be achieved through a combination of physical, social, and

economic strategies. To assess the decision-making strategies in the behaviour of community-scale flood resilience, it is crucial to understand the factors that influence community members' decision-making processes and behaviours before, during, and after a flood event (Mehryar & Surminski, 2022). This includes understanding how individuals perceive the risks associated with flooding, their level of knowledge about flood preparedness, and the resources available to them to respond and recover from a flood. Community-level factors, such as social cohesion, leadership, and communication, are crucial in promoting flood resilience (Xu et al., 2023). By fostering a sense of community and creating opportunities for collaboration and engagement, communities can better coordinate their efforts and enhance their overall resilience (Cavaye & Ross, 2019). Accordingly, the aim of this study is to develop an agent-based modelling approach for comprehensively simulating the interacting systems of the community and their complex behaviours to evaluate decision-making strategies for empowering communities for effective community-scale flood resilience.

**References:**


[1] Auliagisni, W., Wilkinson, S. & Elkharboutly, M. (2022). Learning from Floods—How a Community Develops Future Resilience. Water (Switzerland), 14(20). https://doi.org/10.3390/w14203238

[2] Cavaye, J. & Ross, H. (2019). Community resilience and community development: What mutual opportunities arise from interactions between the two concepts? Community Development, 50(2), 181–200. https://doi.org/10.1080/15575330.2019.1572634

[3] Hewawasam, V. & Matsui, K. (2022). Assessing Community Perceptions on Urban Flood Resilience in Sri Lanka. Geosciences (Switzerland), 12(11). https://doi.org/10.3390/geosciences12110406

[4] Mehryar, S. & Surminski, S. (2022). Investigating flood resilience perceptions and supporting collective decision-making through fuzzy cognitive mapping. Science of the Total Environment, 837(May), 155854. https://doi.org/10.1016/j.scitotenv.2022.155854

[5] Rentschler, J., Salhab, M. & Jafino, B. (2022). Flood risk already affects 1.81 billion people. Climate change and unplanned urbanization could worsen exposure. World Bank Blogs. https://blogs.worldbank.org/climatechange/flood-risk-already-affects-181-billion-people-climate-change-and-unplanned

[6] Wang, L., Cui, S., Li, Y., Huang, H., Manandhar, B., Nitivattananon, V., Fang, X. & Huang, W. (2022). A review of the flood management: from flood control to flood resilience. Heliyon, 8(11), e11763. https://doi.org/10.1016/j.heliyon.2022.e11763

[7] Xu, W., Xie, Y., Yu, Q. & Proverbs, D. (2023). An Evaluation of Factors Influencing the Resilience of Flood-Affected Communities in China. Hydrology, 10(2), 1–21. https://doi.org/10.3390/hydrology10020035

# Candidate characteristics

**Education:**

A first-class honours degree, or a distinction at master level, or equivalent achievements in Built Environment

**Subject knowledge:**

- Disaster resilience

**Essential attributes:**

- Experience in fundamental academic writing and critical analysis
- Competent in disaster risk, community engagement, flood resilience and Built Environment studies.
- Knowledge of IT, computer-based modelling techniques, analytical skills and research methods
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management