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

PHD STUDENT PROJECT

Funding and application details

Funding status: Self funded students only

Application instructions:
Detailed instructions are available at https://blogs.napier.ac.uk/scebe-research/available-phd-student-projects/

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. Lina Khaddour (Email: L.Khaddour@napier.ac.uk)
- 2ND SUPERVISOR: Dr. Temidayo OSUNSANMI

Subject Group: Built environment

Research Areas: Architecture, Building & Planning

Project Title: Building back better: Integrated assessment for post-disaster housing configuration mitigation and resilience

Project description:

The purpose of the study:

The occurrence of natural and man-made disasters is increasing rapidly worldwide. Post-disaster housing projects have been one of the most challenging and controversial responsibilities faced by the impacted countries. In the last 20 years, more than 500 natural disasters per year have been recorded globally. Many of these events led to a major loss of lives as well as properties, making mitigation of natural disaster consequences crucial. Post-disaster housing plays a vital role in

disaster risk mitigation and resilience, providing traumatized displaced people with a habitable environment while coping with disaster consequences.

The need for Post-disaster housing is expected to increase in the future due to many reasons such as the impacts of climate change, increased number of conflicts refugees, as well as natural disasters. As Post-disaster housing are usually built after a disaster to quickly accommodate displaced survivors, the construction is usually very fast, and unsustainable methods are frequently used. The Post-disaster housing have significant failures such as their high cost, ignoring of cultural and environmental factors, and long construction time compared to traditional construction. Post-disaster housing projects has been criticized due to requiring large public expenditures, prolonging the permanent housing reconstruction delivery time and cost, involving minimum community participation, and having negative environmental effects.

The aim of this study is to assesses different types of design to build emergency and mid term Post-disaster housing . The study will develop a comparative and comprehensive Life Cycle Assessment (LCA) and Life Cycle Costing (LCC). The energy performances of different types of post-disaster projects will be evaluated via simulation e.g. Rhino, Ladybug, the Integrated Environmental Solutions Virtual Environment (IESVE). After the energy/carbon analysis, the cost life cycle was calculated for the three selected types. A simplified multiple-criteria decision approach was then developed to assess the appropriate PDTH technique suitable for the climate in Damascus. The study outcomes will assist with decision-making for post-disaster reconstruction solutions by planning authorities and construction manufacturers. This in turn will play a key role in accelerating the reach of this new technology to post-disaster re-construction.

References:

[1] Climate Change Committee

[2] Environmental Audit Committee

[3] Asfour, O. S. (2019). Learning from the past: Temporary housing criteria in conflict areas with reference to thermal comfort. International Journal of Disaster Risk Reduction, 38. https://doi.org/10.1016/j.ijdrr.2019.101206

[4] Hosseini, S. M. A., Farahzadi, L., & Pons, O. (2021). Assessing the sustainability index of different post-disaster temporary housing unit configuration types. Journal of Building Engineering, 42. https://doi.org/10.1016/j.jobe.2021.102806

[5] Ismail, F. Z., Halog, A., & Smith, C. (2017). How sustainable is disaster resilience?: An overview of sustainable construction approach in post-disaster housing reconstruction. International Journal of Disaster Resilience in the Built Environment, 8(5), 555–572. https://doi.org/10.1108/IJDRBE-07-2016-0028

[6] Karpova, E., Skripkiunas, G., Sedova, A., & Tsimbalyuk, Y. (2021). Additive manufacturing of concrete wall structures. E3S Web of Conferences, 281. https://doi.org/10.1051/e3sconf/202128103007

[7] Khaddour, L. A. (2023). Comparative analysis of residential building envelopes newly implementing the building insulation code in Damascus. International Journal of Environmental Science and Technology. https://doi.org/10.1007/s13762-023-05053-x

Candidate characteristics

Education:

A first-class honours degree, or a distinction at master level, or equivalent achievements in Built Environment subject i.e. Civil / Structural Engineering; Architecture / Architectural Technology; Construction project management, Sustainable Built Environment or equivalent

Subject knowledge:

The candidate should have fundamental knowledge of sustainability, construction management, risk management, supply chain management, energy efficiency and sustainable built environment.

Essential attributes:

- Experience of supply chain mapping
- Knowledge of sustainable building design and construction
- Capable of collecting and analyzing data sets and undertaking complex predictive modelling
- Competent communicator capable of engaging with industry and external stakeholders
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes:

- Risk management
- Supply chain management
- Building performance
- Sustainable building design and construction