New research project to tackle emergency natural disaster response problems

4 November 2019 11:00

Cattle wander amid the debris in front of the destroyed mosque in Palu, Indonesia, after a tsunami

A new research project aims to tackle problems and improve natural disaster emergency preparedness and response in countries badly affected by earthquakes, flooding, volcanic eruptions and tsunamis.

The RESilient Emergency Preparedness for Natural Disaster Response through Operational Research **(RESPOND-OR)** project will look at ways of improving existing systems, identify current challenges, and develop methods to overcome them.

Researchers from the **Centre for Transport and Logistics** (CENTRAL) at Lancaster University Management School (LUMS) will lead the work, in conjunction with a multinational, interdisciplinary research team from Indonesia and Sudan, including researchers from Universitas Indonesia, Universitas Gadjah Mada and University of Khartoum.

The Engineering and Physical Sciences Research Council (EPSRC), part of UK Research and Innovation, has provided more than half-a-million pounds from the **Global Challenges Research Fund** for the £600,000 two-year project, which will start in October.

RESPOND-OR will investigate the issues relating to emergency response management of large-scale natural disasters in Indonesia and Sudan. The focus will be on optimising disaster preparedness and response, looking across strategic, tactical and operations decisions, developing fast and efficient algorithms that account for the fast response time needed and the need to deal with data from across many different organisations.

Principal Investigator **Konstantinos Zografos**, Director of CENTRAL and Distinguished Professor of Management Science in LUMS, said: "Indonesia and Sudan are among the countries affected by the economic and societal consequences of natural disasters. Indonesia is a country where one natural disaster can trigger another – an earthquake leading to a tsunami, for instance – while Sudan suffers from flooding which can cause a health emergency that needs simultaneous consideration.

"The optimisation of disaster preparedness and response interventions provides great potential to decrease the magnitude of the negative impacts of disasters, with significant economic and societal benefits for the affected communities. Our research is motivated by this desire, and the mathematical models and solution methods will be transferable to similar problems in other developing and developed countries."

Challenges already identified include building a system for allocating disaster response resources in the event of combined natural disasters; integrating systems from different bodies and organisations; distributing disaster relief in the presence of civil disobedience and social conflict; evacuation of affected populations; and ensuring fairness into preparedness and response decisions.

Professor Zografos, who will work alongside **Professor Juliana Sutanto**, **Professor Kevin Glazebrook**, and **Dr Ahmed Kheiri** on the project at LUMS, added: "There is an urgent need to address the identified challenges. The RESPOND-OR project will develop the next generation of cutting-edge mathematical models and solution algorithms which will incorporate real world complexities and the requirements of all the stakeholders.

"This will have a significant economic and social impact by enabling more efficient and effective allocation and use of the available disaster preparedness and response resources in communities across disaster-prone areas."

The research team will be working with key stakeholders representing disaster management organisations in both Sudan and Indonesia: Indonesia's National Disaster Management Authority (BNPB); Disaster Management Agency of the Yogyakarta Special Region (BPBD DIY); Humanitarian Forum Indonesia (HFI); RedR Indonesia; and Nile Basin Institute (NBI). The aim is to develop a sustainable international partnership between academics and those organisations – including governments.

Professors Zografos and Sutanto, together with fellow LUMS **Professor Adam Letchford**, will also work with the University of Kent and the University of Southampton on a parallel capacity building project, Improving Community Resilience and Sustainability Through Operational Research Capacity Building (CREST-OR), again funded by the EPSRC.

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