Proposed Studentship

ROYAL HOLLOWAY UNIVERSITY OF LONDON

COMPETITION FUNDED

The effects of engineered water transport systems on earthquake-triggered landslide potential

Supervisors: Dr Ian Watkinson (RHUL), Prof. Richard Ghail (RHUL)

Project description

During 2018-2019, earthquakes in Indonesia and Pakistan triggered deadly landslides that were both intimately connected to engineered water transport systems. At Palu, Sulawesi, lateral spreads were induced by liquefaction downslope of an irrigation conveyance canal during a September 2018 M7.5 earthquake. In September 2019, a M5.6 earthquake at Mipur, Azad Kashmir, caused rotational landslides along the banks of a canal downstream of the Mangla hydroelectric dam. Similar landslides in Iran and Tajikistan during the 20th Century highlight the risks associated with modifying natural water networks. Rapid development in tectonically-active countries is leading to unprecedented numbers of water engineering projects and associated urbanisation, often in areas with limited recent experience of large earthquakes.

Research methodology

This project aims to understand how water engineering projects affect the potential for earthquake-triggered landslides, especially in developing countries. Stage 1: Collate known and suspected landslide examples. Stage 2: Use remotely-sensed data, observations from selected field sites, targeted paleoseismic trenching, existing geotechnical information and earthquake parameters, detailed landslide studies to understand common features and the role of engineering projects in their development. Stage 3: Analysis of historic and recent remote sensing data to compile a database of major water engineering projects in areas of high seismic risk. Stage 4: Numerical modelling, possibly supplemented by physical analogue models, to simulate future landslide style and probability and mitigation approaches.

Training

Project-specific training will be provided in remote-sensing interpretation, image analysis, field-based geomorphology and paleoseismology, soil mechanics, landslide development and mitigation, alongside relevant GIS-based and modelling techniques.

Person specification

The student will have a degree in a physical science, engineering or geography. They should be comfortable using GIS (geographic information systems) and/or MatLab or be a fast learner. A willingness to conduct fieldwork under difficult conditions is important, as well as flexibility and adaptability. The project is impact-focused, aiming to contribute to a reduction in landslide vulnerability, so a desire to engage in delivering impact will be advantageous.

Key references

Watkinson, I.M., and Hall, R. 2019. Impact of communal irrigation on the 2018 Palu earthquake-triggered landslides. Nature Geoscience, 12, 940-945. https://doi.org/10.1038/s41561-019-0448-x
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Ishihara, K. Okusa, S., Oyagi, N. & Ischuk, A. 1992. Geotechnical aspects of the June 20, 1990 Manjil earthquake in Iran. Soils and Foundations, 32, 61–78. https://doi.org/10.3208/sandf1972.32.3_61
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Watkinson, I. M. & Hall, R. 2017. Fault systems of the eastern Indonesian triple junction: evaluation of Quaternary activity and implications for seismic hazards. In: Geohazards in Indonesia: Earth Science for Disaster Risk Reduction. Cummins, P. & Meilano, I. (eds.). Geological Society of London Special Publications, 441, 71-120. https://doi.org/10.1144/SP441.8

Application details

This project has been shortlisted for funding by the ARIES NERC DTP and will start on 1st October 2021. The closing date for applications is 23:59 on 12th January 2021.

Successful candidates who meet UKRI's eligibility criteria will be awarded a NERC studentship, which covers fees, stipend (£15,285 p.a. for 2020-21) and research funding. For the first time in 2021/22 international applicants (EU and non-EU) will be eligible for fully-funded UKRI studentships. Please note ARIES funding does not cover visa costs (including immigration health surcharge) or other additional costs associated with relocation to the UK.

ARIES students benefit from bespoke graduate training and ARIES provides £2,500 to every student for access to external training, travel and conferences. Excellent applicants from quantitative disciplines with limited experience in environmental sciences may be considered for an additional 3-month stipend to take advanced-level courses in the subject area.

ARIES is committed to equality, diversity, widening participation and inclusion in all areas of its operation. We encourage enquiries and applications from all sections of the community regardless of gender, ethnicity, disability, age, sexual orientation and transgender status. Academic qualifications are considered alongside significant relevant non-academic experience.

All ARIES studentships may be undertaken on a part-time or full-time basis, visa requirements notwithstanding

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