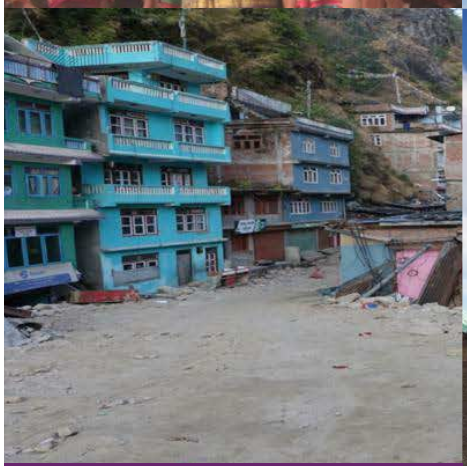
Durham University

Institute of Hazard, Risk and Resilience



The Institute of Hazard Risk and Resilience

The **Institute of Hazard, Risk and Resilience (IHRR)** is an international-leading research institute based at Durham University, one of ten University Research Institutes that work collaboratively across all departments and with multiple external stakeholders.

Purpose

The IHRR works to forecast **hazards** through cutting-edge modelling, understand **risk** to empower decision makers, and craft **resilience** through future-proof solutions for climate health, economic and social emergencies, from local to global scales. Its aim is to strengthen and inform the global response to the challenges presented by an ever-changing world.

The IHRR supports innovative **research and training** for use in **policy and practice**, collaborating directly with communities, NGOs and governments. Our commitment is to work with and learn from the widest possible range of stakeholders living with hazard and risk – empowering people, fostering resilience, and improving lives, both now and in the future.

The IHRR Team

Led by Professor Bruce Malamud, the Institute has three Co-Directors, two Professors in Practice, three Postdoctoral Research Associates, six associated PhD students, an associated Risk Masters degree run by the Geography Department, a manager and a part-time administrator. The IHRR works with 26 departments and 10 research institutes and supports a broad and inclusive interdisciplinary community.

Established in 2004 and initially led by academic staff in the Department of Geography, the original goal of the IHRR was **to bring together a community of top researchers working in hazard, risk and resilience across different Durham University departments,** thereby increasing impact and growing new early career researchers through postgraduate opportunities (PhD and Masters).

Building on Success

The Institute has gone from strength to strength. Its success stems from its **capacity to approach complex problems holistically**, drawing together trans- and interdisciplinary teams of experts from the physical sciences, social sciences and humanities. The IHRR trains individuals to work with complex situations in order to respond proactively to hazard and risk-related challenges. With over twenty years of field-defining research, the IHRR is made up of a growing community of researchers and practitioners, engaged in a wide range of projects across the globe.

Chandika Shrestha, one of 12 PhD researchers funded by the Christopher Moyes Memorial Foundation, undertaking Nepal fieldwork.

In Yogyakarta, Indonesia, street children are given facemasks by charities to protect themselves from inhaling volcanic ash (Photo: Tri Wahyudi following the 2014 Kelud eruption for the Health Interventions in Volcanic Eruptions project, led by Professor Claire Horwell).

An informal settlement in Jakarta on the banks of the Ciliwung River, which are extremely vulnerable to flood damage (Photo: Dr Sim Reaney).

Image far left: Dr Hanna Ruszczyk listened to the Disaster Risk Reduction group explain their efforts in mitigating flood impacts in Bharatpur region, 2015 (Photo: Rajat Bastola).
Image left: Damage caused by an earthquake-induced landside, Nepal (Photo: Professor Nick Rosser).

Over 200 MA/MSc Students have taken part in Durham University's Risk Masters Programme, run by the Geography Department in association with the IHRR.

From 2008 to 2023, IHRR donors have supported 19 PhD students, many from the Global South, to undertake fundamental research in hazard and risk.

From 2007 to 2023, the IHRR has been associated with over 100 grants, with more than £25 million allocated to Durham University.

Image above: Neelum Valley Road in Pakistan after the 2005 Kasmir Earthquake (Photo: Professor Dave Petley).

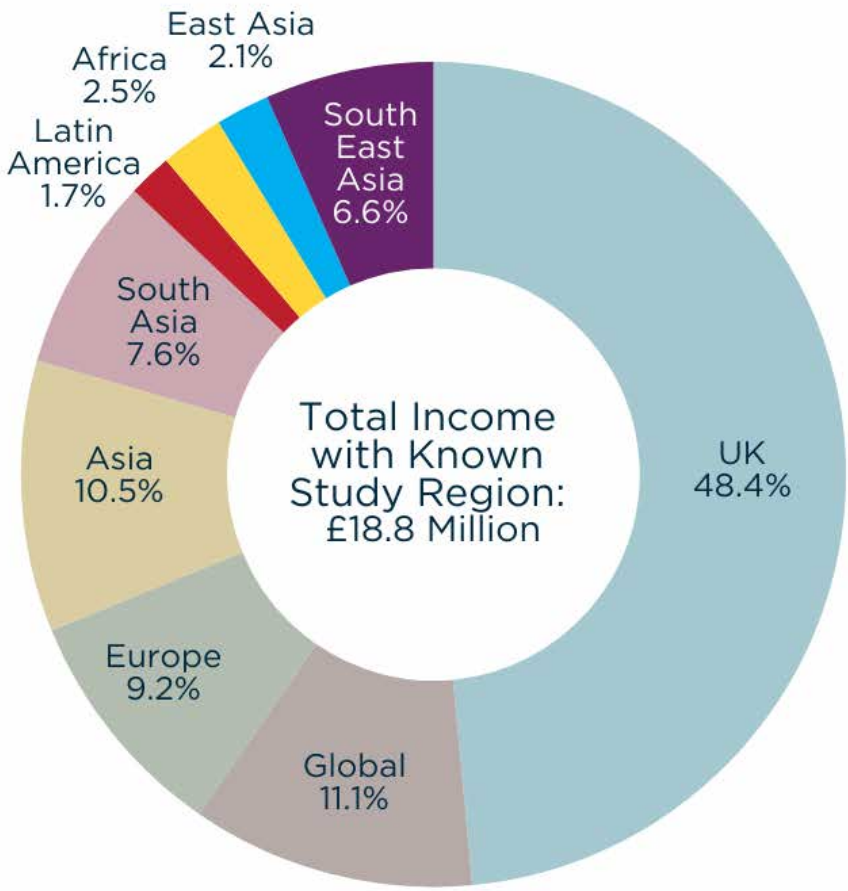


Figure Left: Percentage of income to Durham University by region of interest if known (91 of 102 grants included) for research grants tagged with IHRR from 2007 to 2023.

IHRR Initiatives

Earthquakes without Frontiers

This partnership brought together a group of earth scientists with a long track record in integrated earthquake science, social scientists with extensive experience in exploring the vulnerability and resilience of communities in disaster-prone regions, and experienced practitioners in the communication of scientific knowledge to policy makers. The project had three overarching objectives:

- To provide transformational increases in knowledge of the distributions of primary and secondary earthquake hazards in the continental interiors.
- To identify pathways to increased resilience in the populations exposed to these hazards.
- To secure these gains over the long term by establishing a well-networked, trans-disciplinary partnership for increasing resilience to earthquakes.

In each of the earthquake-prone regions on which the project was focused, the team worked closely with local scientists, policy-makers and organisations, both government and non-governmental.

Tipping Points

This project sought to investigate to what extent the notion of a 'tipping point' has shaped our thoughts on change and transition, consider the implications of this and understand whether they can be applied to systems. The project proposed that, with a greater understanding of the drivers and regulators of change system-wide, we might better plan and predict for the future.

The research was a multidisciplinary programme, involving specialists from natural sciences, mathematics, social sciences and the arts and humanities. The outcome of the project, led by Professors Stuart Lane, Dave Petley and Sarah Curtis, was a recommendation that societies should strive less for absolute and precise prediction of tipping points. Instead, they should examine likely conditions arising from processes of change. This will help them to adapt to systems that are constantly changing.

SEAL

This project, which is focused on developing a framework for Landslide Susceptibility and Adaptability in South East Asia (SEAL), was funded by NERC's COP26 Adaption and Resilience programme, with collaborators in India, Indonesia, Japan, Malaysia, Thailand and Vietnam.

Professors Ashraf Osman and David Toll are leading a group of SEAL researchers with the following objectives:

- To produce guidelines for landslide hazards and protective measures in South East Asia.
- To establish a think-tank focusing on incorporating landslide hazards into national planning, funding cycles and infrastructure design whilst considering future climate scenarios and cognisance of sustainability, affordability, and appropriate technology aspects.

Living Deltas

River deltas comprise just 1% of global landscapes yet support over half a billion people. Focusing on three deltas in Asia, the Living Deltas Hub operated on a model of equitable partnership with the delta-dwellers and the research community working together to develop new knowledge and policies.

The aim of the Living Deltas Hub was to safeguard the future of river deltas. Deltas are vital social-ecological systems and global food-baskets, but the terrain and the livelihoods of those who rely on them are under threat from human exploitation, environmental degradation and climate change. A collaborative project including 55 co-investigators and 60 early career researchers, the hub focuses on three river deltas: the Mekong (working in Thailand, Cambodia, LAO PDR and Vietnam), the Red River (Vietnam) and Ganges-Brahmaputra-Meghna (Bangladesh and India).

North East Water Hub

The North East Water Hub was a collaborative initiative between Durham University, Durham County Council, the Environment Agency and Northumbrian Water. The aim was to engage with Small and Medium-sized Enterprises (SMEs) in the North East of England to identify and develop innovative, practical solutions to challenges in the region's water sector.

The project, which was funded by the European Regional Development Fund, delivered support to SMEs through challenge events, partnership working, flexible small grants and access to test facilities. The Water Hub harnessed the talent and technology of the North East business community to solve real challenges that affect us all in areas such as water efficiency, water cleaning and flooding.

HIVE

The Health Interventions in Volcanic Eruptions (HIVE) project (2015 to 2019), led by IHRR member Professor Claire Horwell, built the first evidence base on effective respiratory protection for use by communities affected by volcanic ash. HIVE gathered samples of protection used all around the world, from bandanas and veils to surgical and high-efficiency masks.

Through laboratory experiments at the Institute of Occupational Medicine, Edinburgh, HIVE determined the effectiveness of the different materials and how well the different forms of protection fit on human volunteers with different facial characteristics.

This novel, interdisciplinary project also involved social surveys based around anthropological and psychological methods in order to understand the cultural and behavioural influences that impact on whether people are motivated to protect themselves.

Based in Indonesia, Mexico and Japan, all with very different cultures, climates and economies, the surveys highlighted the importance of trust in different types of authority and the influence of those authorities in people's decision making. The HIVE team worked closely with local agencies and community representatives to develop a suite of informational products on ash protection, which were endorsed by the World Health Organization and have been used extensively during recent volcanic eruptions.

Professor Bruce Malamud, Director & Wilson Chair of Hazard and Risk in the Institute of Hazard, Risk and Resilience

Our Vision

Durham University launched the Institute of Hazard Risk & Resilience (IHRR) almost 20 years ago, adopting an interdisciplinary approach to the understanding of hazard, risk and resilience and actively translating research into practice. Our research spans physical and social sciences, arts and humanities, engaging a broad stakeholder spectrum.

Our vision is to undertake and foster world-leading research, training and outreach that transforms the understanding of human and natural hazards worldwide, generating innovative research to empower people and build a more resilient future. Our work improves lives globally, from communities in South East Asia and Central America to Europe, Africa and the North East of England.

In an ever-changing and complex world, we need to adapt our approach to help address some of the most pressing challenges of our time. This means being poised to address natural disasters not only in isolation, but as they intersect and coincide.

We are uniquely positioned to make this vital transition. To do this, we need greater investment in student researchers, early and senior career expert staff, working across disciplines and associated resources to ensure that we can continue to improve lives for many years to come.

Our Mission

The IHRR aims to continue its world-leading contributions to the following themes, under the umbrella of hazard, risk and resilience:

Interdisciplinary Research into Practice: Improving Lives

Understanding Single & Multi-Hazard Risk for Strategic Future Planning:

- **Investigate** perspective of **hazard and risk forecasting** and their implications for long-term planning.
- **Examine** both **natural and human-made hazards**, particularly in the context of **multi-hazard risk scenarios** in the Global South, while providing community-based solutions.

Tools and Methodologies:

- Use **interdisciplinary approaches** to **co-create urban risk and resilience strategies with stakeholders**.
- Increase user interactivity and understanding using **accessible web-based platforms** and **virtual or augmented reality tools**.
- **Investigate data flows, conflicts**, and **positionalities** in **disaster risk management data acquisition.**

Adaptation, Resilience, and Recovery:

- **Investigate climate adaptation** and **human resilience strategies** in the context of **hazards and risks.**
- **Develop programmes** to enhance the **resilience of marginalised communities** in the **UK.**
- **Research short-, medium-**, and **long-term recovery** following **disasters.**
- **Evaluate** the **resilience** of **food supply** and **food security** to **natural and anthropogenic challenges.**

Empowerment and Social Equity

- **Focus on empowerment strategies for marginalized groups throughout all phases of disaster events.**

Resident of Bailu Town, Sichuan Province, China, in front of his house (Photo: Professor Alex Densmore).

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