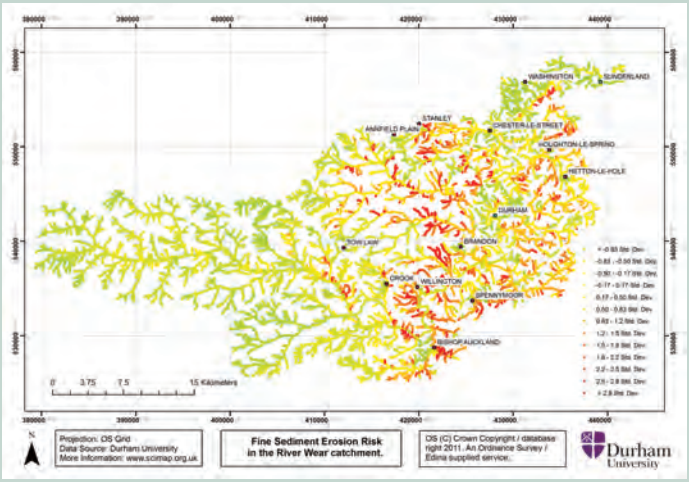
Risk-based mapping tool for targeting sources of river pollution released as free software

Institute of Hazard, Risk and Resilience, Durham University, UK

For immediate release

A powerful scientific tool developed by researchers to manage non-point source (diffuse) river pollution will be available as free software to NGOs, governments and communities throughout the world who want to reduce the impacts of agricultural river pollution on water quality and ecology. The software tool, called 'SCIMAP', was developed jointly by scientists with the Institute of Hazard, Risk and Resilience (IHRR) at Durham University and Lancaster University in the UK.

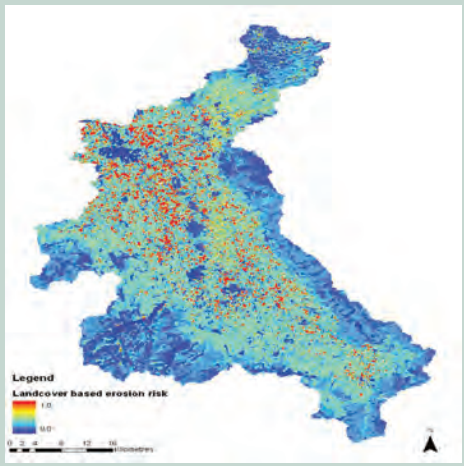
Sources of river pollution exist throughout landscapes, often originating from agriculture or industry that resides within river catchments. While pollution from industrial point sources is understood and regulated there is a far greater challenge in addressing agricultural non-point sources. Sources of non-point source pollution are distributed across the landscape and are highly variable in both time and space. To tackle this challenge, SCIMAP identifies where the sources of river pollution exist and prioritises high risk areas where pollution from the landscape can enter rivers. It produces high resolution maps based on both a set of risk weightings that calculate the probability that nutrients will leave a point in the landscape and the probability that these points will connect to the river channels, exporting the nutrients. SCIMAP can also incorporate local knowledge of the landscape or scenario modelling of the areas investigated.



Fine sediment erosion risk map of river catchment in County Durham, UK

Dr Sim Reaney, a hydrologist in IHRR who is part of the research team that developed SCIMAP said: "Many people in the UK, including the Environment Agency and local River Trust organisations have found SCIMAP a valuable tool in their work. This is because SCIMAP focuses on where the problems are likely to originate and hence where to take action. The fine spatial scale that SCIMAP works on makes it possible to identify the fields and parts of fields that may be the origin of the non-point source pollution problems in the rivers".

SCIMAP can be used as a management tool to test hypotheses about why plant and animal species in rivers have declined over time along with exploring which land use changes can lead to ecological risks. It can also help reveal how projections of climatic change may impact connectivity of the landscape and rivers. This makes it a valuable tool for government agencies but also NGOs focused on preserving aquatic wildlife or restoring river habitats.



Land cover-based erosion risk map of England

Dr Lucy Butler, Scientific Officer for the Eden Rivers Trust, an organisation dedicated to preserving the ecological quality of the River Eden and its tributaries in the UK, has used SCIMAP to help restore salmon and trout fry habitats in parts of the River Eden where numbers were found to be low. "With limited resources it helped us identify tributaries or river subcatchments which had particularly high risk for diffuse pollution and showed us where that was linked to low fish numbers. We could then focus our work in giving farmers advice on nutrient use and improvements to farm yards and infrastructure where it matters most, in order to prevent soil erosion and sediment entering the river", said Butler.

SCIMAP will be made available internationally under a Creative Commons licence on a non-profit, attribution and share-alike basis. The project was made possible through a grant from the National Environmental Research Council and support from the Environment Agency in the UK.

More information about SCIMAP is available at http://www.scimap.org.uk/.

Notes for Journalists

Dr Sim Reaney is an invited speaker to AGU presenting "A framework to understand spatial and temporal connectivity dynamics at hill slope and catchment scales" on Thursday as part of session H44F: Moving Towards a Unified Threshold-based Hydrological Theory I. And the poster "Understanding nutrient connectivity at the landscape scale: The use of the SCIMAP approach in the UK and Ireland" on Thursday part of session H41H: Threats on Water: Chemical and Isotope Monitoring and Integrated Modelling of Water Quality across Scale in Ecohydrological Systems III Posters.

More information

IHRR: http://www.durham.ac.uk/ihrr/

SCIMAP: http://www.scimap.org.uk

Dr Sim Reaney: http://www.durham.ac.uk/sim.reaney/

Reaney S. M., Lane S. N., Heathwaite A. L. and Dugdale L. J.2011: Risk-based modelling of diffuse land use impacts from rural landscapes upon salmonid fry abundance; *Ecological Modelling* Volume 222, Issue 4, 24 February 2011, Pages 1016-1029 doi:10.1016/j.ecolmodel.2010.08.022

For more information or to arrange interviews contact Brett Cherry: brett.cherry@durham.ac.uk

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Introduction

The Institute of Hazard, Risk and Resilience (IHRR) is harnessing the capacity of researchers from across Durham University to make a difference to how we live with emerging hazards and risks. IHRR is a nerve centre for innovative, interdisciplinary approaches to hazard and risk research in the UK and throughout the world. We are championing key research programmes in hazards, vulnerability and resilience. The Institute operates through a growing array of research projects and externally-funded fellowships. It is involved in policy engagement in risk and hazard debates across much of the globe, strategy development with industry and wider stakeholders and also research consultancy. Our research aims to improve human responses to both age-old hazards such as volcanoes, earthquakes, landslides and floods as well as the new and uncertain risks of climate change, surveillance, terror, banking and emerging technologies. It also focuses particularly on the nature of hazard, risk and vulnerability in the developing world. The Institute aims to develop radical new insight with regard to hazard and risk. By adopting an approach which directly engages policymakers, local communities and other appropriate stakeholders in the co-production of knowledge, the Institute aims to develop innovative policy and to increase social capacity for reducing vulnerability and harm.

Focus

The Institute is developing three areas of activity through interdisciplinary research, allowing problems to be framed in different ways and new theoretical approaches and understandings to be developed in relation to existing problems.

Hazards: how hazards are produced, particularly environmental hazards and notably landslides, floods, droughts, volcanoes, sea level rise and earthquakes; but also hazards that emerge in surprising ways, such as socio-technological and financial hazards.

Vulnerabilities and Resilience: the vulnerabilities and resilience of communities that have to live with hazards, notably those communities whose vulnerabilities arise from poverty, changes in life course and social isolation, and where these in isolation and combination reduce resilience.

Frontier Knowledge: innovative and creative ways of learning to live with the pervasive nature of hazard and risk, through new ways of risk learning, new forms of risk sharing and new ways of risk forecasting.

Examples of Current Research Activities

Landslides: Exploring both the spatial and temporal distribution of landslides, and the impacts that they cause (Figure 1).

Secondary Hazards: Examining the controls on secondary earthquake phenomena, particularly landslides and river basin changes, in space and time, while collaborating with social scientists to explore ways these hazards affect communities in developing countries in order to build resilience.

Climate Adaptation: Understanding the diverse array of influences climate change has on species including humans, especially in the preparation of infrastructure needed for vulnerable groups, such as older people.

Tipping Points: Researching the physical and social complexity of so-called 'tipping points' in past climate systems, historical and contemporary banking crises, knowledge diffusion and mathematics.

Resilience: Developing innovative ways to build resilience in communities to the hazards that they face, ranging from threats from natural disasters (e.g. earthquakes in the Himalayas) through to acute social impacts (such as the loss of major industrial employment in County Durham, UK .

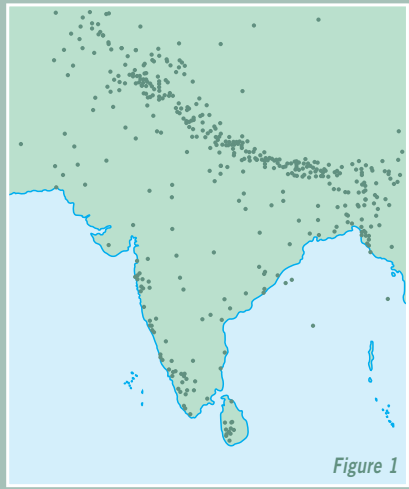

Figure 1