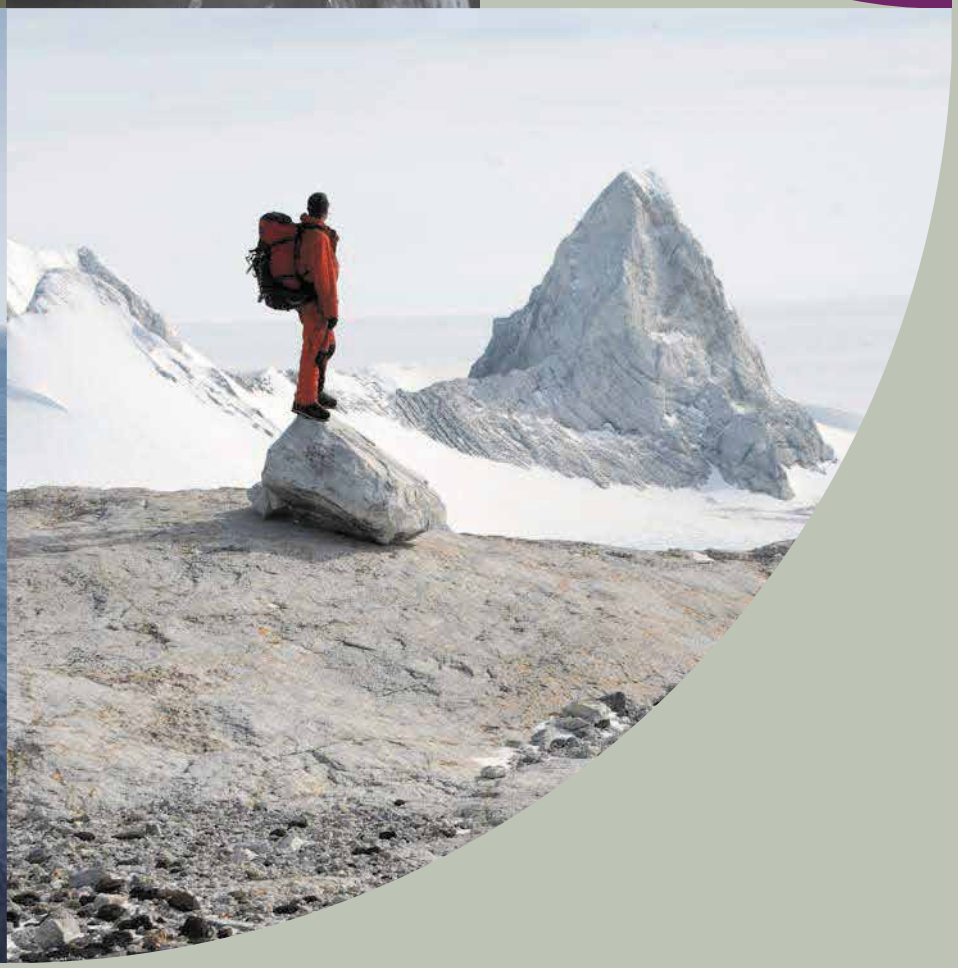
Durham University

Inspiring the extraordinary

Protecting our planet: How Durham University's research helps to safeguard the environment



Environmental research helps protect us all

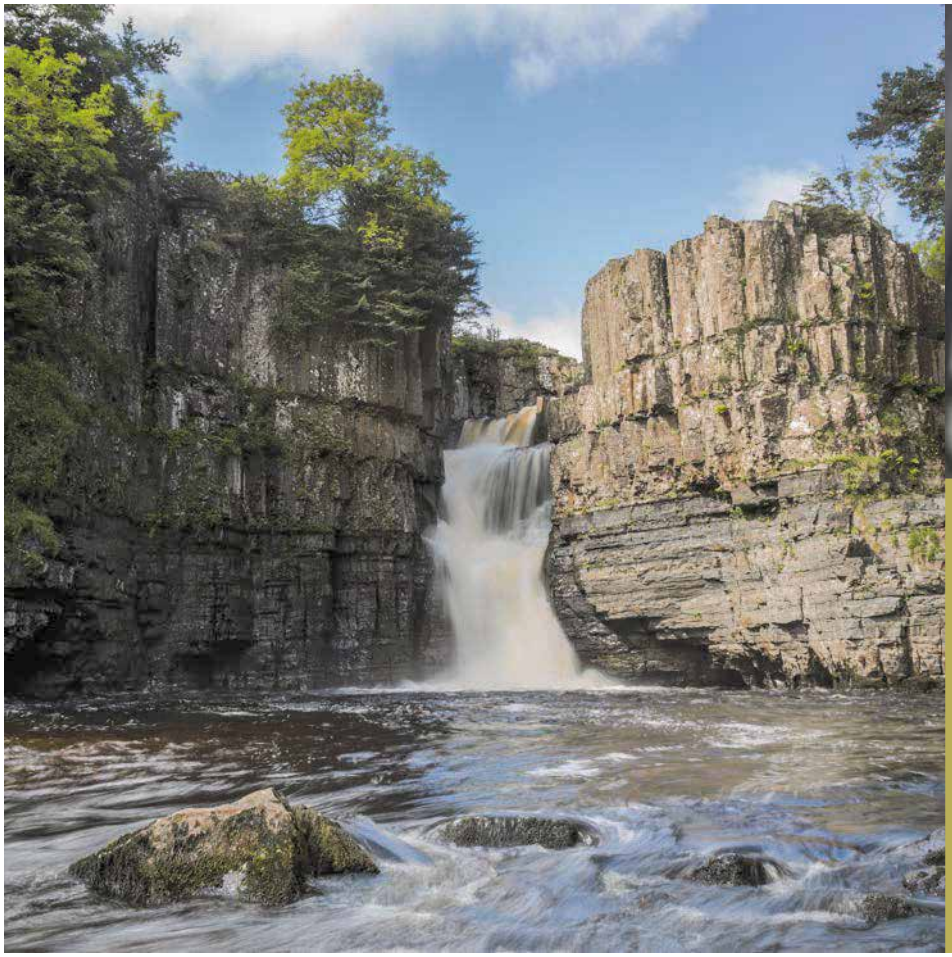
It's hard to imagine a more important focus for research than our environment, since all life depends upon it.

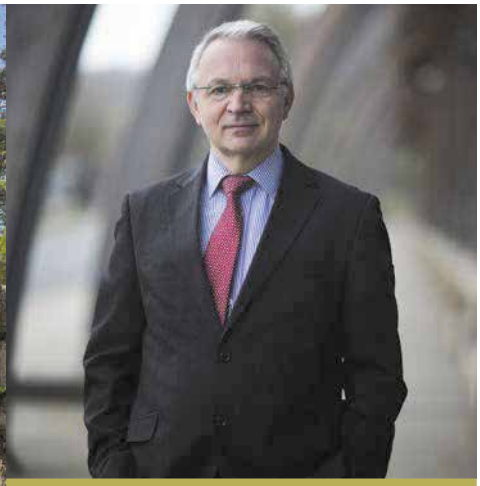
This brochure provides a snapshot of some of the key areas of research at Durham University that are having an impact on the environment and potentially all of our lives.

- We are helping to ensure that water is used sustainably, to avoid future shortages, by working with partners including the water industry and the Environment Agency.
- Our research into cleaner energy includes geothermal energy from former coalmines and reducing the pollution hazard from oil spills.
- We are studying the impact of climate change on animals and plants, to help society manage ecosystems in the future.
- We are investing in our built environment at Durham, with the aim of being one of the most sustainable universities in the UK.

We have some of the world's leading specialists at Durham and our aim is to conduct research that is world leading and world changing.

Stuart Corbridge
Vice-Chancellor, Durham University





Decarbonising heat

Geothermal energy could provide over 100 years' worth of reliable, low-carbon energy in the UK. That's according to researchers at Durham Energy Institute (DEI) who are exploring ways of decarbonising heat. Around half of Europe's energy is used to provide heat and almost all of your heat comes from burning fossil fuels.

DEI researchers say we can harness warm water from the UK's flooded mines to heat our homes and workplaces. To support this work, we've engaged with communities and local authorities in former mining areas, and politicians nationally, on what could be a low-carbon, secure, affordable heat source.

Cheaper offshore wind power

Durham is working with industry and other universities to reduce the cost of electricity generated by offshore wind farms by improving the efficiency of wind turbines.

Greater solar efficiency

Physicists are working on ways to make solar power cheaper and more efficient while also using less material.
Together with partners, we've been looking at why solar panels made from cadmium telluride produce cheaper electricity than traditional silicon panels.
Researchers found that a substance called selenium stops tiny electrons from becoming trapped and lost in miniscule defects in panels, increasing the amount of power that can be extracted.

Cleaning up oil spills

Oil spills can have a hugely damaging impact on the environment and wildlife. Cleaning up spills is by no means simple and there is a clear need for new, easy and quick ways to separate oil from water.

Our surface scientists have now developed a coated mesh that could be a faster and more eco-friendly way to clean up oil.

The stainless steel mesh, similar to what you might find in screen doors to keep out flies, not only separates oil from water, but also kills water-borne bacteria very successfully.

Tests have so far shown the mesh separates oil from water with 100 per cent efficiency and kills at least 99.9 per cent of E Coli and Staphylococcus bacteria in the water.

Current studies are testing the patent pending coated meshes for real world applications.

Food security and conservation in a changing climate

Durham's bioscientists are monitoring the effect of climate change on plant and bird life to support food security and conservation. Our researchers have found a protein that controls how plant roots grow and adapt to soil conditions. Understanding this process could lead to the development of crops that can continue to branch roots even in challenging conditions like drought. This could help develop food crops that are more adaptive to climate change, helping deliver future food security.

We're also working with organisations like the RSPB to see how birds are responding to changing temperatures. Together we've found that the UK's woodland bird chicks could be missing out on a vital food source as warmer springs lead to caterpillars hatching earlier than normal. Migratory birds like the pied flycatcher are most likely to be at risk as they will not be in the UK to respond to earlier spring weather.

Photo credit: Tom Wallis

Improving water sustainability and flood resilience

We're working with the Environment Agency and other partners to make water more sustainable both in the UK and overseas. Water resources are under threat from climate change and growing demand.

The Environment Agency has warned that England will face water shortages within 25 years if we do not take a more sustainable approach to water use.

Against this backdrop, Durham University is a partner in The Water Hub, which works with Government, businesses and communities to ensure we safeguard this precious resource.

The Water Hub is a project of our Institute of Hazard, Risk and Resilience (IHRR), in partnership with the Environment Agency, Durham County Council and Northumbrian Water and funded by the European Regional Development Fund.

The project is helping businesses and the public sector to find answers to problems facing North East England's water and environment sector.

It's hoped that these solutions could have a wider impact on water sustainability, nationally and internationally.

Water Hub projects include:

- Transferring skills from digital and data businesses into environmental management to better manage river basins and share information with communities;
- Helping businesses to put forward ideas to manage water at the site of a new industrial and logistics centre called Follingsby Max, near Gateshead;
- Installing specially adapted planters to capture rainwater run-off from the roofs of homes in County Durham to reduce flooding risk and encourage plants to grow in urban areas.

The Water Hub supports this work by providing opportunities for small businesses to apply their novel solutions, share technical ideas between sectors and grow practical applications to support water sustainability. It also offers small grants to businesses and hosts events bringing together people from different sectors to share ideas about water sustainability and innovation.

The Water Hub is taking part in the UK Government's Year of Green Action by bringing together businesses, communities, charities and health organisations to share ideas about growing a green economy and resilient neighbourhoods.

Internationally, IHRR researchers are part of a Global Challenges Research Fund project working with local governments, charities and communities in Asia to monitor the effects of changes in river deltas caused by human exploitation, environmental damage and climate change.

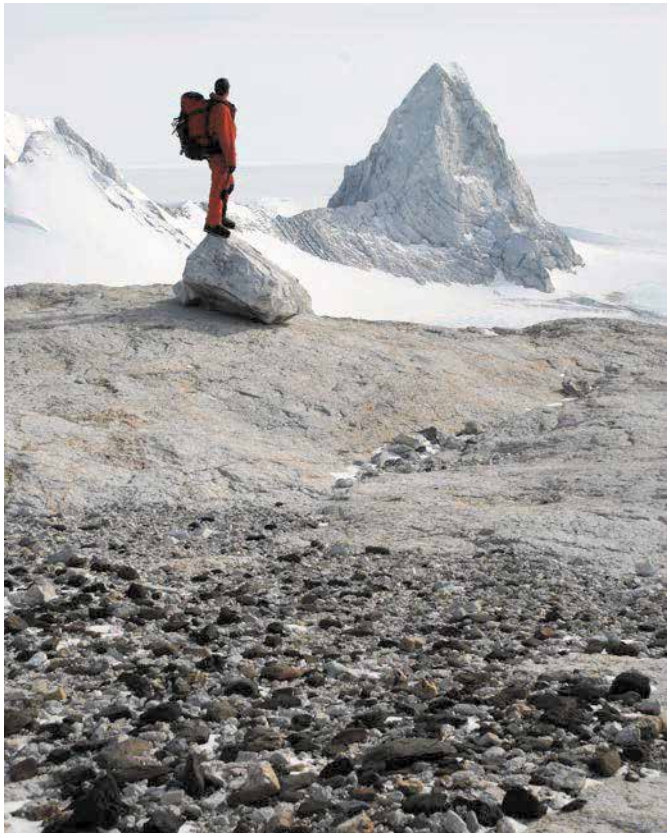
Separately, our researchers are behind a project to build flood resilience in Java, Indonesia, using internet and social media warning tools to tell locals about potential hazards.

In Mexico, our Smart Urban Resilience project also hopes to mitigate the effects of earthquakes, hurricanes and floods in cities by using smart city technologies that change how people prepare for and respond to natural disasters.

Understanding the threat of melting ice sheets

Rising sea levels caused by melting ice sheets threaten coastal areas around the world, including major cities such as London. To help plan for the future and mitigate the effects, our scientists are studying the structure and dynamics of glaciers and how oceans interact with them.

With our international partners, we conducted a satellite survey of the Antarctic ice sheet, the most detailed yet carried out, showing that melting has accelerated in recent years. In another project, we are drilling cores from the sea bed to see what fossil plankton can tell us about previous climate change events and how ice sheets have responded.



Plastic concrete

Three PhD students who developed a method of recycling waste plastic by turning it into concrete aggregate have set up a business to commercialise the idea. Award-winning Plastech Innovations aims to reduce the amount of plastic in our oceans and landfill sites.

The tiny bug that could help provide clean water

A tiny bug called a springtail is the inspiration for new technology that could help to provide clean drinking water. The springtail has a special pattern on the surface of its body to repel water very efficiently and our scientists are working with industry to use this design in water filters that can remove contamination. In another project, tiles with a special surface coating are being used to 'harvest' fog, condensing it into drinking water.

Protecting people from natural disasters

Many people live with the threat of natural disasters and while most cannot be prevented, the toll of death, injury and damage can be reduced by careful planning based on research.

In Nepal, we have been working with authorities and aid agencies to increase resilience to earthquakes and landslides, for example by identifying the communities at greatest risk and providing advice about where to deploy emergency aid equipment. We have also been asking local people about their concerns and giving them a voice in decision-making.

In Hawaii, we have studied the health effects of breathing volcanic ash and provided advice on the best design of mask to protect residents. The haze caused by an eruption is known as 'vog' and can cause severe respiratory problems.

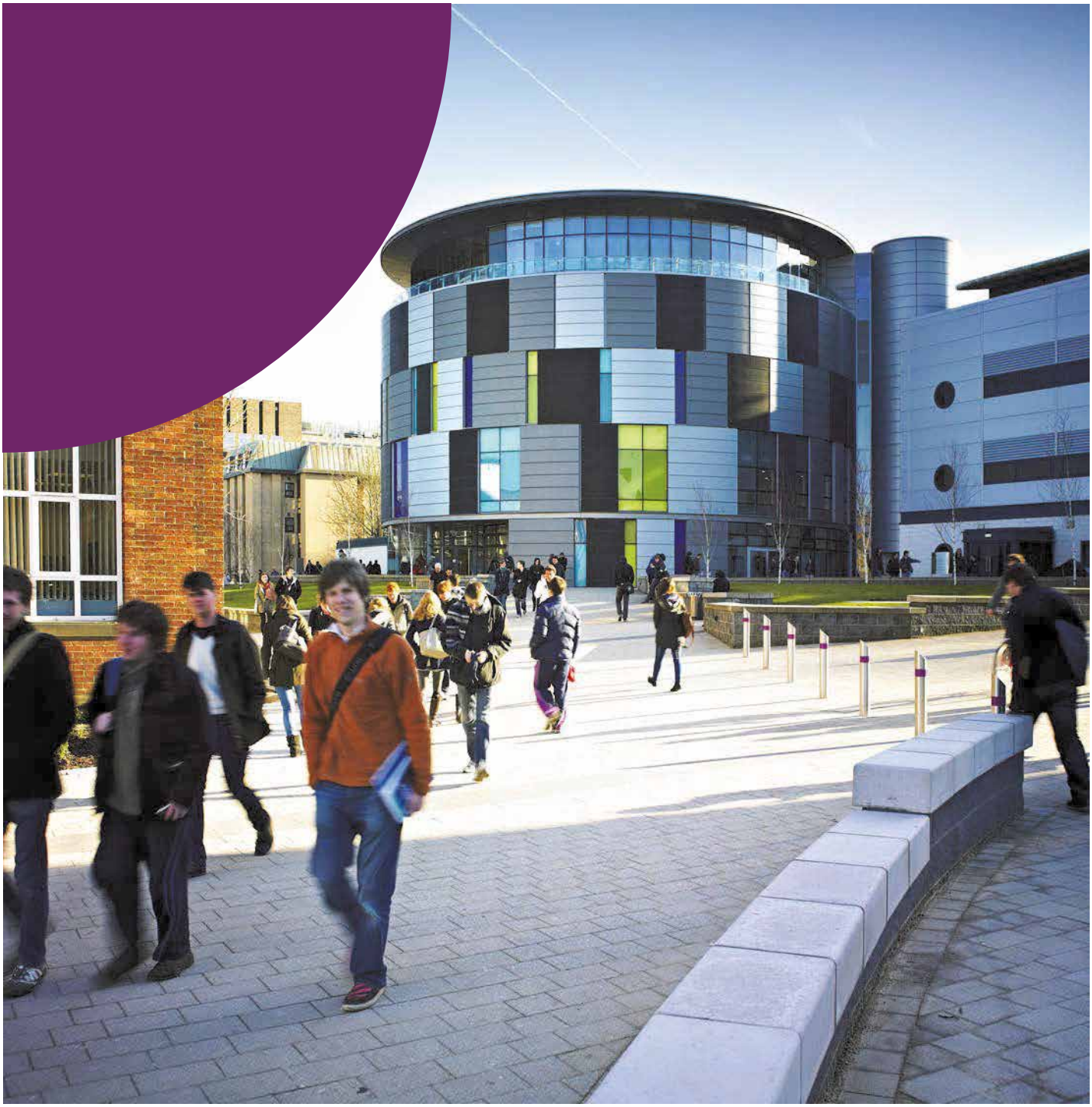
In Europe, outbreaks of summer wildfires and the environmental conditions that cause them are being studied by our researchers, so they can be predicted and their effects mitigated.

Our commitment to the environment

We're working to make Durham one of the most environmentally sustainable universities in the UK.

Alongside major investments in our built environment and our teaching and research activities, we have introduced strong environmental policies and procedures, working to reduce our carbon emissions and promoting increased awareness of environmental issues. We have a dedicated environment team, Greenspace, which plans and promotes our environmental policies, plans and procedures, and coordinates environmental activities.

We have taken the decision to divest from companies involved in fossil fuel extraction and have committed to becoming a major international partner in the development of green energy. We have also signed the County Durham Single Use Plastics Pledge, to work towards removing the use of unnecessary single use plastics from our operations.



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