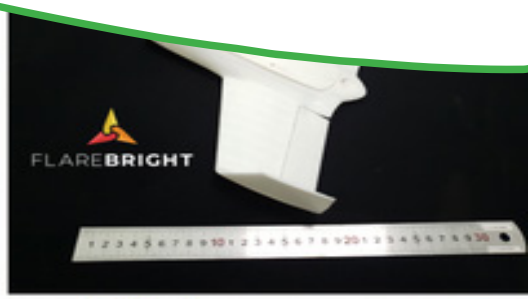
eri environmental research institute

elements

Winter 2020/21 newsletter

North Highland College University of the Highlands and Islands

University of the Highlands and Islands Oilthigh na Gàidhealtachd agus nan Eilean



Sustainable Aviation

The North Highland College's ERI and Engineering, Technology and Energy Centre (ETEC), are part of a new initiative aiming to develop a sustainable aviation programme that could transform short flight travel between remote communities. Sustainable Aviation Test Environment (SATE) is a £3.7 million project, part funded by UK Research and Innovation (UKRI) through the Industrial Strategy Challenge Fund, which will create the UK's first operationally-based, low-carbon aviation test centre at HIAL's Kirkwall Airport on the Orkney Islands.

Led by Highlands and Islands Airports Limited (HIAL), the 18-month project was launched as part of UKRI's Future Flight Challenge which supports the development of greener ways to fly. Improving UK regional air connectivity and helping to decarbonise the Highlands and Islands region, SATE will stimulate job creation and use local renewable energy to bring together aviation industry specialists, local Orkney and Caithness businesses, public sector bodies and academia. SATE's technology partners- Ampaire, ZeroAvia, Loganair, Windracers and Flarebright - will trial exciting new transport options. These will include testing low-carbon aircraft using electric, hydrogen or Sustainable Aviation Fuel (SAF) as well as using drone applications to supply on-demand medical supplies to health centres. Local consortium members will also look at how to implement zero-carbon airport infrastructure using green energy sources, as well as the development of resilient communications. ERI is leading the work on impact and policy, looking at socio-economic impacts, developing an aviation system 'digital twin' and assessing skills and training needs.

Magnus Davidson, ERI work package leader, said "It's a great opportunity to be involved with such a high calibre consortium of partners working on cutting edge issues. It is also an excellent showcase that here in the Highlands and Islands we can undertake world leading research - UHI is very much integral to this. From a socio-economic point it is obvious that for our rural communities, air travel is a lifeline rather than luxury, so looking to make that case will be important for us as a region".

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UK Research and Innovation

Biochar from woody waste!

New research at ERI is aiming to transform wood waste into biochar, potentially for use in water treatment and/or agriculture. These projects involve a number of collaborations and funding sources including the Royal Society for the Protection of Birds (RSPB) and Sustainable Thinking Scotland, with additional funding support from UHI's Water Quality Innovation Group, the Royal Society of Chemistry and the Scottish Funding Council.

Our research aims to explore wood waste from a variety of sources for example, conifer brash (waste tree tops and branches). This is a by-product of forestry operations and 'forest-to-bog-restoration', taking place across the Flow Country (and beyond) on formally afforested blanket bog. Here, peatland restoration aims to put sites on a trajectory back towards healthy functional open blanket bog. Tree stems are removed by harvesting, while waste brash can be left on site. Decomposing brash can both slow down peatland restoration processes, by influencing vegetation recovery and also affect local water quality through the release of nutrients, especially phosphate. Further, brash removal incurs extra costs as it has no real 'value'.

However, brash can alternatvely be converted to biochar through pyrolysis, as can other wood wastes. Biochar from lignocellulose (woody waste) material has been effectively used for many purposes. Through biochar production there is potential to 'add-value' and create a useful water treatment product. This could perhaps be used 'on-site', to help mitigate against nutrient pollution in field drains/surface waters following peatland restoration or forestry operations.

Our projects aim to test various biochars (derived from wood waste) for use in water treatment and potentially agriculture. Laboratory trials will look to optimise biochar production processes in terms of pre-treatment, furnace burn temperatures, cost and water treatment efficiency. In later stages, we will potentially modify biochar through chemical functionalisation, to increase its effectiveness (i.e., in water treatment and nutrient removal).

To further this work, a Hydro Nation PhD scholarship (with the RSPB and Forest Research) will commence in October 2021, investigating both innovative peatland restoration and brash management techniques to improve water quality at forestry and peatland restoration sites.

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rspb giving nature a home

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CONNECTING SCOTLAND'S SOCIAL ENTERPRISES

Peatland pools in Russia

A study of 'Carbon Cycling in Ombrotrophic Peatland Pool Systems' (project CCOPPS), has been awarded funding for collaboration with Russian partners, Yugra State University, through the INTERACT Transnational Access Programme. The project led by Dr Peter Gilbert, Dr Paul Gaffney and PhD student John King, will seek to determine the relationship between peat-pool morphology, geochemistry, and greenhouse gas emissions in contrasting peatlands of Siberia and northern Scotland. Peatland pools are geochemical hotspots for the processing of organic carbon, yet relatively little is known about the role they play in the peatland carbon cycle. This comparative study will increase our understanding of both continental and temperate maritime climatic peatlands, two of the major northern peatland ecosystems providing vital carbon sequestration services across the globe.

The study will see data collection in the familiar Flow Country and in the continental peatlands of Siberia at Yugra State University's Mukhrino field station, Khanty-Mansiysk. While the awarded grant was primarily to facilitate travel to Siberia – which remains uncertain due to COVID - the project will commence through 'remote access', with setup and data collection being undertaken by collaborators at Mukhrino field station.

This work continues the collaboration between the ERI and Yugra State University following previous INTERACT visits by ERI staff and students in 2014 and 2019, and the future ISINCAR network led by Dr Roxane Andersen.

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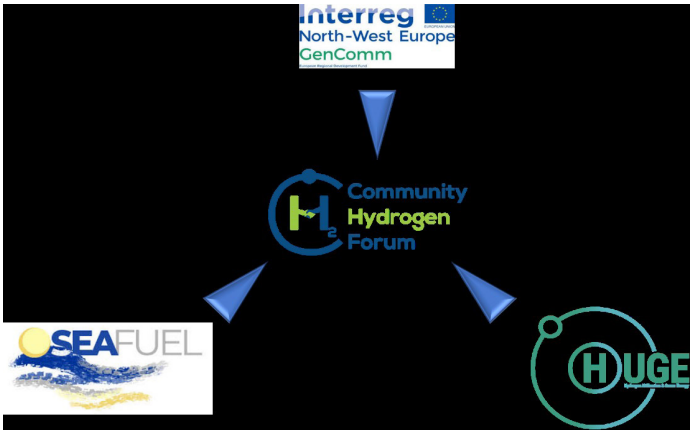
Yugra State Univerisity's Mukhrino field station

Pool system in continental peatlands of Siberia, where measurements of carbon processing will be conducted.

HUGE Hydrogen Triple Alliance

Global awareness of the benefits of hydrogen as an energy carrier, or fuel, have grown exponentially. Potential applications in the industrial, transport, and power sectors have been demonstrated in urban areas and rural communities. Moreover, hydrogen,as a zero-emissions fuel, is viewed as a critical energy carrier if we are to meet the 2050 climate neutrality goal proposed in the European Green Deal.

Several projects have been developed to increase awareness of the use of hydrogen in European communities. However, a number of obstacles hinder the integration of hydrogen technology including how to connect stakeholders, end-users, policymakers, and communities interested in its use.



To address these challenges, a new collaboration, was formed between the HUGE (Hydrogen Utilization & Green Energy) project funded through INTERREG Northern Periphery and Arctic Programme and led by ERI, and two other INTERREG funded projects- GENCOMM and SEAFUEL. Together these form a unique Hydrogen Triple Alliance which aims to secure wider reach and combine data from each of the projects. Desislava Todorova, project coordinator from ERI, said "'We need HUGE solutions even for the smallest and most remote places if we are to realise net zero carbon future"

The alliance will integrate their resources to enlarge the Community Hydrogen Forum (CH2F), share expertise and amplify the outputs from each project; and more importantly, deliver enhanced benefits for the European communities (http://communityh2.eu/).

The Hydrogen Triple Alliance has already held its first webinar '*How Can Renewables Sustain Resilient Communities? Utilising hydrogen to increase coastal sustainability'* which included presentations from all three projects as well as INTERREG Directors and the Community Hydrogen Forum. This successful event attracted an audience from across Europe.

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Hydrogen Triple Alliance

New faces @ ERI

Dr Lydia Niemi

One Health Breakthrough Partnership Coordinator

Hi everyone! I am Lydia Niemi, and I started a new position at ERI to coordinate and deliver a Scottish Government funded project with the One Health Breakthrough Partnership (OHBP). The OHBP is a cross-sector group formed by stakeholders across the healthcare, environment, and water sectors in Scotland, including NHS Highland, UHI, Scottish Water, SEPA, and Highlands and Islands Enterprise. This group is addressing pharmaceutical pollution in the environment by driving research and innovation, promoting sustainable healthcare practices, and informing legislation. Recent work includes the phase one baseline study with the Centre of Expertise for Waters (CREW), which prepared a database on pharmaceuticals detected in the Scottish environment, and assessed risk related to ecotoxicity and antimicrobial resistance. Additionally, the OHBP's work with Caithness General Hospital resulted in the hospital receiving accreditation from the *Alliance for Water Stewardship* (AWS), in recognition of its commitment to improve water use and reduce the environmental impact of the hospital. This standard is a global benchmark for environmentally and socially responsible water management, and further work by the OHBP will roll-out this approach at other hospitals.

In this new role, I will support the OHBP in applying the AWS standard across Scotland, and contribute to ongoing research into sustainable methods to reduce healthcare impact in the environment. I look forward to continuing this work in my new position at ERI!

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PhD Success

Recently, three ERI PhD students successfully completed their degrees, following thesis submission and defence. Dr's Nicola Largey, Derek Elsby and Lydia Neimi all passed with only minor corrections!

Nicola's PhD was entitled "Investigating bird flight characteristics and habitat use to better understand ornithological impacts of wind farms". Nicola is currently an associate with the ERI and a recent publication from her thesis is now available (https://onlinelibrary.wiley.com/doi/abs/10.1111/ibi.12913).

Derek studied "Using wildlife to biomonitor for antimicrobial resistance in the Scottish environment" for his PhD in conjunction with Moredun research institute in Edinburgh. Derek is currently working for Scottish Water. Both Nicola and Derek's research was funded by the European Social Fund and Scottish Funding Council as part of Developing Scotland's Workforce in the Scotland 2014–2020 European Structural and Investment Fund Programme.

Lydia's PhD investigated "Pharmaceutical occurrence, distribution and degradation in rural wastewaters and surface waters in Scotland", funded by the Scottish Governments' Hydro Nation Scholars Programme. Lydia has taken up a role with ERI as the One Health Breakthrough Partnership Coordinator.

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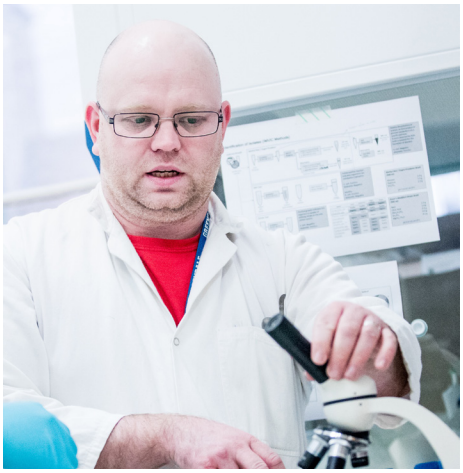
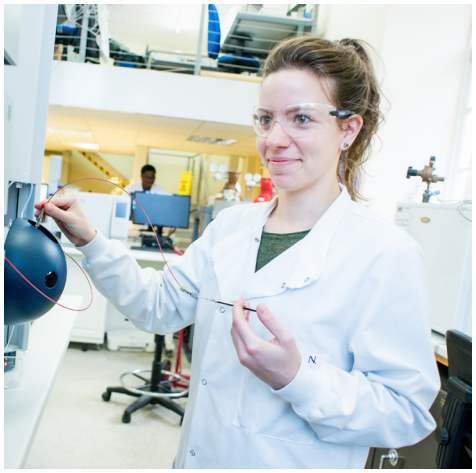

University partnership celebrates 10 years

On 1st February 2021, the University of the Highlands and Islands celebrated 10 years since being awarded university status by the Privy Council. During this time the university has been developing on its mission 'to have a transformational impact on the prospects of our region, its economy, its people and its communities'. A special webpage showcasing some of the highlights of the past 10 years is available on the university website (www.uhi.ac.uk/en/about-uhi/birthday), including a birthday message from the Chancellor of the University of the Highlands and Islands, HRH The Princess Royal.

An academic procession in Inverness marked the opening of the University of the Highalnds and Islands. James Fraser, Principal and Vice chancellor of the new university welcomed the day at Eden Court Theatre with 800 invited guests. ERI director, Professor Stuart Gibb and the late Professor John McClatchey attended the event.

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The university is running a competition for all staff, students and alumni with a top prize of a £100 voucher and is also holding a public seminar series.

Publications

Bond, A. L., & Lavers, J. L. (2020). Biological archives reveal contrasting patterns in trace element concentrations in pelagic seabird feathers over more than a century. Environmental Pollution, 263(Part B), [114631]. https://doi.org/10.1016/j.envpol.2020.11463

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