



## Marine renewable energy potential in Gibraltar

ERI researchers have been collecting data to assess the potential for marine renewable energy solutions in Gibraltar. This collaborative project with the Government of Gibraltar Department of the Environment, Sustainability, Heritage and Climate Change (DESHCC) is investigating opportunities for the development of wave, tidal and current energy.

The ERI's Dr Benjamin Williamson and Dr Jason McIlvenny along with DESHCC scientists and technicians deployed a wave monitoring buoy and current monitoring devices in British Gibraltar Territorial Waters. These instruments will measure flow speeds and wave height, to inform the development of a computational model of the ocean currents surrounding Gibraltar. This will allow the Government to decide on whether they may be able to generate significant amounts of Gibraltar's electricity requirements at sea. In 2019, the Gibraltar Parliament unanimously declared a climate emergency echoing the Paris

Agreement's priority to limit global warming to 1.5°C. Gibraltar's climate emergency sets targets of making Gibraltar carbon neutral by 2030, thus the development of marine renewable energy may contribute significantly.

Minister for Environment and Climate Change Prof John Cortes said "COVID-19 is rightly taking almost all our attention at this point in time. But we mustn't forget that long term, climate change is at least as big a problem for humanity. I am glad to see our collaboration with University of the Highlands and Islands continuing as we try and play our part in this. If these investigations are successful, they will be very helpful in reducing our emissions and improving air quality in Gibraltar".

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# Biogas from distillery by-products

ERI researchers Mark Walker and Magnus Davidson are collaborating with Abbey Ecosse, based at Forss Business and Energy Park, to assess the environmental benefits of biogas production from distillery by-products in the northern Highlands.

Anaerobic digestion (AD) is a proven process that can offer multiple benefits from both an economic and environmental perspective. Integration with the distillery allows a reduction in costs and the carbon footprint of the whisky through use of both renewable heat and electricity to offset fossil fuel usage. Furthermore, the process allows standardization of the bio-nutrient profile and reduced biodegradability in the residual biosolids allowing more widespread and beneficial use in agriculture and further carbon reductions through displacement of mineral fertilizers.

This feasibility study, funded by the Industrial Biotechnology Innovation Centre (IBioIC), will focus on a modular AD system, currently being installed in the north Highlands, that will be fed with mixed distillery by-products from local whisky producers, with the aim to integrate the AD into a flexible low-carbon local energy network. The network will supply flexible energy (electricity and heat), to meet demands of local businesses and housing as well as for export from the site and electric vehicle charging. The study will assess the greenhouse gas (GHG) emissions for small-scale distilleries co- and by-product management with the aim to estimate the carbon intensity of the energy produced at the site.

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## PhD successes!

ERI PhD students Matteo Marasco and Uthman Badmus successfully defended their PhD theses. Both Matteo and Uthman passed their thesis examination with only minor corrections and were a credit to themselves and their supervisory teams.

Matteo's thesis was entitled "structure and coherence of flow through a tidally energetic channel measured by high frequency radar" and was funded by the Marine Alliance for Science and Technology Scotland and Marine Scotland Science.



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Uthman’s thesis was entitled “seaweed as a value-added product for the food and drink sector” and 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.

Both have moved on to continue their scientific careers, with Matteo working on marine modelling in Majorca and Uthman working for University College Cork on seaweed research.

## Phosphorus recovery from wastewater

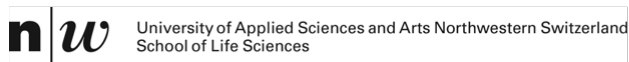
Whilst targeting phosphorus (P) recovery from municipal wastewater treatment plants (WWTP), the Phos4You Project (North West Europe (INTERREG) Programme) also provides an opportunity for the development of small-scale P-recovery technologies more applicable for use in remote, rural areas. As part of this, ERI has been developing the FILTRAFLO-P Unit (Veolia design) to generate a P-rich biomass from WWTP/septic tank effluent through a filtration/adsorption process using chitosan-calcite adsorbent (CCM), obtained from fishery and seafood industry waste.

Earlier this year, Dr Szabolcs Pap carried out a successful 6-week trial of this technology at the Scottish Water Horizons Development Centre at Bo’ness near Edinburgh. This small unit employs enhanced gravitational filtration through adsorption media with continuous self-backwashing. The trial was designed to assess how FILTRAFLO-P would operate under ‘real’ conditions, and to ascertain the effectiveness of the CCM adsorbent to recover P from final effluent. P-rich samples from the trial were sent to University of Ghent for inclusion in quality assurance testing.

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*Dr Szabolcs Pap at the Scottish Water Horizons Development Centre at Bo’ness near Edinburgh*



# Blue Circular Economy, REGIOSTARS finalist

The European Commission has announced the finalists of the prestigious REGIOSTARS 2020 awards, and there is good news for the ERI. Following a record 206 project nominations, Blue Circular Economy has been chosen as a finalist in the category “Sustainable Growth-Circular economy for a green Europe”

The REGIOSTARS Awards ([regiostarsawards.eu](http://regiostarsawards.eu)) are a yearly competition organised by the European Commission’s Directorate General for Regional and Urban Policy. Its remit is to identify good practices in regional development and highlight innovative, EU-funded projects, to inspire and inform other regions and projects.

Blue Circular Economy ([bluecirculareconomy.eu](http://bluecirculareconomy.eu)) funded by the EU’s Northern Periphery and Arctic programme, is a transnational project supporting and innovating, the development of the fishing net waste industry at Europe’s most northern edge. It’s mission is to generate sustainable business opportunities offered by abandoned, lost or otherwise discarded fishing gear (ALDFG). The vision is to focus on the full product life-cycle, up skilling SMEs to create resource efficient businesses offering products and services from marine plastic waste.

As part of the project the ERI is leading the development of tools and resources to help identify which species are affected by debris. This has led to the launch of the citizen science,

crowdsourcing website [www.birdsanddebris.com](http://www.birdsanddebris.com), which allows users across the globe to report incidences where anthropogenic debris has entangled birds, or has been incorporated into their nests.

As a REGIOSTARS finalist, Blue Circular Economy is also a contender for the Public Choice Award, which will be announced during the awards ceremony in Brussels in October 2020. The project can be voted for by clicking the heart next to the project description here: [www.interreg-npa.eu/news/npa-project-blue-circular-economy-is-among-the-finalists-of-the-regiostars-award-2020](http://www.interreg-npa.eu/news/npa-project-blue-circular-economy-is-among-the-finalists-of-the-regiostars-award-2020).

The recognition of the project follows the success seen by its predecessor. The ERI-led project Circular Ocean won the inaugural REGIOSTARS Public Choice Award in 2016, and was itself a finalist in the category “Sustainable Growth: Circular Economy”.

Blue Circular Economy is led by the Norwegian University of Science and Technology (Norway), and in addition to the ERI includes the Western Development Commission (Ireland), Technical University of Denmark (Denmark/Greenland), and The Centre for Sustainable Design (UK).

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**BLUE CIRCULAR ECONOMY**

**Northern Periphery and Arctic Programme**  
2014–2020

**EUROPEAN UNION**  
Investing in your future  
European Regional Development Fund



# Utilising biochar in arsenic removal

Arsenic (As) is a naturally occurring toxic metalloid readily distributed in the Earth's crust and is frequently used in agriculture and medicine. People can involuntarily consume As contaminated drinking water, leading to long term health effects. Recently, new technology has been developed using modified adsorbents

produced from various wastes to remove As from drinking supplies. UHI fourth year BSc Applied Science student, Nicole Jarvie, carried out her dissertation with ERI researchers Szabolcs Pap and Huiyi Zhang to investigate the effectiveness of magnetic biochar on the removal of As from water.



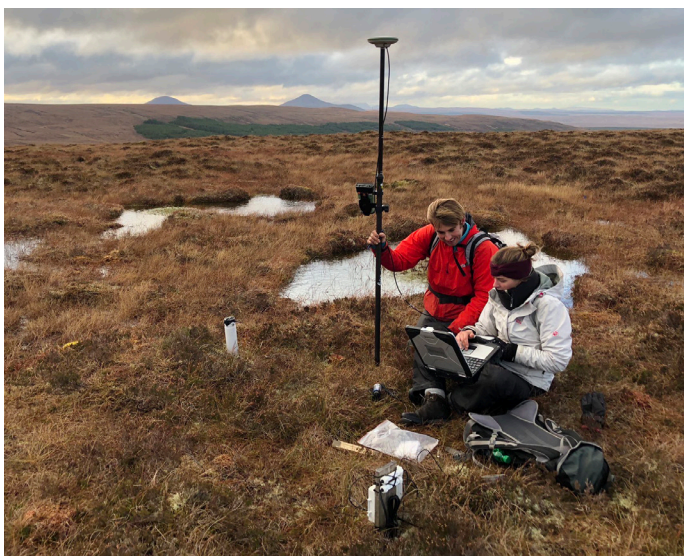
Nicole investigated the use of biochar derived from garden waste, by undertaking a series of column adsorption experiments. A glass column containing the modified biochar was configured and various parameters were studied to investigate the As removal efficiency, including the flow rate through the column, the initial As concentration and the bed height (effectively the amount of biochar in the column). Results will feed into ongoing research at the ERI into the use of biosorbents in water treatment.

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## New faces at @ ERI

### Dr Chris Marshall Peatland Scientist



Hi, my name is Chris Marshall and I have recently returned to the ERI in the role of Peatland Scientist as part of Roxane Andersen's Leverhulme Leadership Award.

Over the next 5 years, I will be following on from previous work using satellite radar (InSAR) to examine how peatland resilience is being affected by changing climate and identifying vulnerable (or resilient) parts of the peatland landscape in the Flow Country. I will do this by examining the phenomenon of 'bog breathing', the seasonal oscillation of the peat surface, which appears to be a sensitive indicator of peatland condition. My recent work in conjunction with the University of Nottingham, Terramotion Ltd, SNH Peatland Action and Forestry and Land Scotland, has shown that restoration trajectories can be observed using bog breathing and suggests restoration success can be measured at the landscape scale. I am excited to be back in the Flow Country and getting back into the field!

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# ERI policy engagement to increase research impact



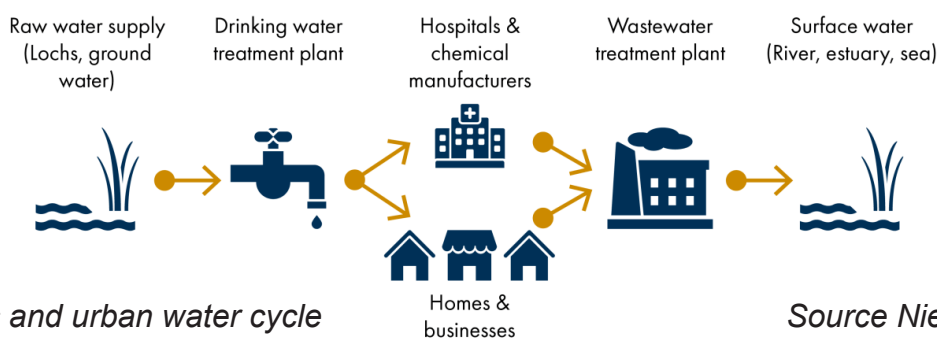
A video was made by the Scottish Policy and Research Exchange (SPRE) on ERI PhD student Lydia Niemi's research into pharmaceutical pollution in the environment. SPRE is a network of academics and officials working together to improve policy outcomes, and the video is part of an initiative to connect early career researchers and policymakers to increase research impact in Scotland. Filming took place at the Thurso ERI labs, field sites across Caithness and at the Scottish Parliament, where Lydia met with representatives from the Scottish Parliament Information Centre (SPICe) and gained first-hand experience of policy engagement. This group provides data analysis and briefs to members of the Scottish Parliament. A blog article was written by Lydia and produced by SPICe which focuses on the cross-sector significance of Lydia's research topic and the applications to current policy in Scotland.

This blog also introduces the multi-stakeholder benchmark group, the One Health Breakthrough Partnership, which is currently addressing the issue of pharmaceutical pollution in Scotland. This collaborative group is dedicated to improving healthcare, safeguarding the environment, informing legislation and driving research and innovation. Founding members include ERI, University of the Highlands and Islands, Scotland's Centre of Expertise for Waters, Highlands and Islands Enterprise, NHS Highland, Scottish Water and the Scottish Environment Protection Agency. Through this policy-engagement opportunity, Lydia promoted her PhD research at ERI and the active work of the One Health Breakthrough Partnership.

Video link: <https://vimeo.com/415947930>

Blog link: <https://spice-spotlight.scot/2020/06/02/pharmaceuticals-in-the-environment-introduction-and-cross-sector-partnership-addressing-the-issue-in-scotland/>

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Pharmaceuticals and urban water cycle

Source Niemi et al. (2020)

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