# Master of Science by Research (MScRes) in the Environmental Sciences – current opportunities

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# Introduction

In this booklet you can find out more about current opportunities to undertake a self-funded Master of Science by Research (MScRes) in Environmental Sciences degree at the School of Environmental and Natural Sciences of Bangor Univesity, entirely focused on a research project of your choice.

The MSc by Research (MScRes) is a one-year full-time research programme (or 2 years part-time) that differs from a taught Masters programme by placing more emphasis on research, and by being examined much more like a PhD, by an internal and an external examiner, rather than by grading of coursework and dissertation. This degree will equip you with confidence and competence in the latest research skills (including generic skills such as literature searching, legal and ethical aspects, project planning, grant proposal writing, and statistical analysis of data) and allow you to apply for further research training (PhD) programmes, or to directly apply for research positions in universities or research institutes.

The list or projects in this document is not exhaustive; please feel free to contact individual members of staff whose research aligns with your own interests to discuss additional possibilities.

In addition to working on your research projects, as postgraduate researchers at Bangor you will have access to a range of research skills and professional development training opportunities as well as the chance to develop your teaching skills by undertaking paid demonstrating opportunities for modules on our undergraduate curriculum.

You will also present your work at the annual School and College Postgraduate Conferences and become part of the vibrant College research community. There are multiple research seminarsthat run across the three Schools within the College of Science and Engineering, and you’d be able to join any that relate to your research interests.

Successful applicants typically have a good first degree in a relevant subject (2:1 or above). While the minimum qualification that would allow you to apply for this programme of study at Bangor University is a 2:2, if that is the case we strongly encourage that you discuss your academic background with a potential supervisor before applying. If you have valuable non-academic experience that is relevant to your research plans, you may be in a good position to secure a place on this course, even if you do not have a First or a 2:1 degree from your undergraduate studies.

You would also need to have identified a way to fund your studies (tuition fees, bench fees, living expenses).

**How to apply:** The first step is to identify a project you are interested in then and contact the member of staff who is advertising it. They will then advise you if and how you should make a formal application to the University. When contacting potential supervisors, you should briefly outline your academic background and explain your interest in the project you are contacting them about, as well as attach a CV.

**Do not submit a direct application for a postgraduate research degree to Bangor University without first identifying a potential supervisor and discussing your research interests with them first.**

In addition to contacting the individual members of staff who have advertised specific projects here, you may also contact the following staff with general inquiries:

School Director of Postgraduate Research Studies (School of Environmental and Natural Sciences): Dr Aaron Comeault ([a.comeault@bangor.ac.uk](mailto:a.comeault@bangor.ac.uk))

College Director of Postgraduate Research Studies (College of Science and Engineering): Dr Alexander Georgiev ([a.georgiev@bangor.ac.uk](mailto:a.georgiev@bangor.ac.uk))

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# MScRes in Environmental Sciences

<https://www.bangor.ac.uk/courses/postgraduate-research/environmental-sciences-mscres>

## Microplastics

### Understanding the impact of nano- and microplastics on soil health and microbial communities in agricultural systems?

**Subject area:** Soil and Environmental Science

**Supervisor(s): Prof Davey Jones** (<https://www.bangor.ac.uk/staff/sens/davey-jones-008496/en>), Prof Dave Chadwick (<https://www.bangor.ac.uk/staff/sens/dave-chadwick-089544/en>)

**Contact:** [d.jones@bangor.ac.uk](mailto:d.jones@bangor.ac.uk)

**Project description:**

The proliferation of nano- and microplastics (NMPs) in terrestrial ecosystems represents an emerging environmental threat to soil health and agricultural sustainability. These particles (<100 nm to 5 mm) enter agricultural soils through biosolid application, agricultural plastics degradation, and atmospheric deposition. This MScRes project will investigate NMP interactions with soil ecosystems, focusing on microbial communities and soil health indicators. Using state-of-the-art techniques including fluorescence microscopy, LDIR spectroscopy, and molecular methods, the research will:

1. Quantify NMP impacts on soil microbial biomass and activity
2. Evaluate changes in soil enzyme activities and nutrient cycling
3. Assess alterations in soil physical properties
4. Investigate NMP interactions with agricultural chemicals

This research will provide crucial insights for maintaining soil health in NMP-contaminated environments.

## Soil Science

### Can consumption of the powerful greenhouse gas, nitrous oxide (N2O), be stimulated in agricultural soils?

**Subject area:** Soil and Environmental Science

**Supervisor(s): Dr Karina Marsden** (<https://www.bangor.ac.uk/staff/sens/karina-marsden-062476/en>), Prof Dave Chadwick (<https://www.bangor.ac.uk/staff/sens/dave-chadwick-089544/en>)

**Contact:** [k.marsden@bangor.ac.uk](mailto:k.marsden@bangor.ac.uk)

**Project description:**

The agricultural sector is required to reach Net Zero, and reducing nitrous oxide (N2O) emissions are a key challenge for meeting this target. N2O is a powerful greenhouse gas, released from agricultural soils following nitrogen amendment due to several microbial processes. However, there is only one known sink for N2O in soils - the biological process of complete denitrification, where N2O is converted to the harmless nitrogen (N2) gas. This project provides an exciting opportunity to probe the controlling factors of soil N2O consumption. Techniques including isotope pool dilution and laser-based N2O isotopomer analysis will be used to explore whether complete denitrification can be stimulated in agricultural soils, informing mitigation strategies.

### Plastic alternatives: The effects on biodegradable plastics tree guards on soil ecosystem function

**Subject area:** Plastic pollution; Soil ecosystem; Toxicology

**Supervisor(s):** **Dr Winnie Courtene-Jones** (https://www.bangor.ac.uk/staff/sos/winnie-courtene-jones-014870/en), Prof Andy Smith (https://www.bangor.ac.uk/staff/sens/andy-smith-017079/en), Dr Tim Peters (https://www.bangor.ac.uk/staff/sens/tim-peters-072185/en), and Dr Ian Willoughby (Forest Research).

**Contact:** [w.courtenejones@bangor.ac.uk](mailto:w.courtenejones@bangor.ac.uk)

**Project description:**

In response to concern of environmental plastic pollution the production and use of biodegradable plastic alternatives has increased. The rate at which biodegradation occurs is variable, influenced by the plastic material and environmental conditions.

Plastic tree guards are used worldwide to protect newly planted trees from herbivory pressure. A range of biodegradable guards are on the market, however a comprehensive assessment of their environmental deterioration and their associated impacts on soil biota and processes are lacking. This presents practitioners with serious challenges when evaluating management options.

Using laboratory and field approaches, this project will examine the ecological effects of biodegradable plastic tree guards on soil biota, biogeochemistry and ecosystem functioning, particularly focussed on indicators of soil health, nutrient and carbon cycling.

## Wastewater Management

### Developing advanced wastewater-based epidemiology methods for early detection of community health trends

**Subject area:** Environmental Science and Public Health

**Supervisor(s): Prof Davey Jones** (<https://www.bangor.ac.uk/staff/sens/davey-jones-008496/en>) Dr Kata Farkas (<https://www.bangor.ac.uk/staff/sens/kata-farkas-107554/en>)

**Contact:** [d.jones@bangor.ac.uk](mailto:d.jones@bangor.ac.uk)

**Project description:**

Wastewater-based epidemiology (WBE) has emerged as a powerful tool for community-level health surveillance, as demonstrated during the COVID-19 pandemic. This MScRes project will advance WBE methodologies for monitoring public health indicators. Using state-of-the-art analytical techniques including LC-MS/MS and qPCR, the research will:

1. Optimize sample collection and preservation protocols
2. Develop and validate analytical methods for biomarker detection
3. Assess environmental factors affecting biomarker stability
4. Analyze temporal trends and correlations with health indicators
5. Evaluate disease outbreak early warning capabilities

The project involves collaboration with water utilities and public health agencies to advance WBE's potential as a routine public health monitoring tool. This research will contribute to developing more effective disease surveillance systems.

### Impact of Climate and Land Use Change on the Effectiveness of Onsite Wastewater Systems in the Conwy Catchment

**Subject area:** Catchment hydrology

**Supervisor(s):** **Dr Sopan Patil** (<https://www.bangor.ac.uk/staff/sens/sopan-patil-096948/en>), Dr Richard Dallison (<https://www.bangor.ac.uk/staff/sens/richard-dallison-087189/en>)

**Contact:** [s.d.patil@bangor.ac.uk](mailto:s.d.patil@bangor.ac.uk)

**Project description:**

Onsite Wastewater Systems (OWS), from treatment plants to septic tanks, are vital for reducing river pollution and protecting water quality. Climate and land-use changes, however, may alter runoff patterns and pollution sources, reducing OWS effectiveness. In the Conwy Catchment, pollution from agriculture and OWS overloads threatens water quality, public health, and ecosystems. This project uses SWAT hydrological model to predict these future impacts, assess OWS performance, identify vulnerable areas, and propose improvements. Findings will support policy, enhance catchment management, and build resilience in water resources. Candidates will need a background in a related field, an interest in environmental change, and skills in GIS and hydrological modelling (although SWAT guidance provided). Strong analytical and communication (verbal & written) abilities are essential.