

University PhD Research Studentship 2018/19



University for the Common Good

School of Engineering and Built Environment

Project Title: The impact of organic waste materials on the provision of soil ecosystem functions

Project Reference Number: SEBE2018001_ Ollauri

Key words: organic waste, agriculture, soil, ecosystem functions, antimicrobial resistance, food chain

Applications are invited for a full-time PhD research studentship at Glasgow Caledonian University within the School of Engineering and Built Environment. The studentship of £19,300 per year is for a period of three years, subject to satisfactory progress. The studentship covers the payment of tuition fees (currently £4,500 for UK/EU students or £15,000 for international students) plus an annual stipend of £14,800 for UK/EU students or an annual scholarship of £4,300 for international students.

Project Summary

The production of organic waste materials (OWM) is growing steadily worldwide. OWM are commonly applied after treatment into the soil to enhance its physical, chemical and biological properties. Thus, the use of OWM as amendments seeks to improve the provision of soil ecosystem functions –e.g. fertility, carbon and water storage, nutrient cycling, erosion control, etc.. At the same time, OWM application to land constitutes a waste management solution, thus avoiding the need for landfill or incineration. OWM's application rate traditionally depends on their composition –i.e. organic matter, dry matter, nitrogen and phosphorous and microelements- with respect to soil background levels. However, human and animal waste-derived sources of OWM can contain pathogenic microbes and antimicrobial resistant genetic material (ARG). In addition, contaminants such as heavy metals and pharmaceutical compounds present in OWM can drive selection for ARG in the soil microbial communities (SMC). As a result, there may be a risk to SMC that play a vital role in the correct functioning of the soil compartment. Yet, this issue has been largely neglected. Studies investigating how the application of OWM may affect SMC and the functioning of the soil compartment are urgently needed to protect soil resources effectively and to recycle OWM into the soil safely without jeopardising the integrity of the environment and the public health. It is envisaged that these issues will be investigated through controlled microcosm experiments (i.e. vegetated soil tubes) in which soil functioning traits and ARG will be analytically monitored following sludge, biosolids and/or manure applications.

Example References

1. Teddie O. Rahube, Romain Marti, Andrew Scott, Yuan-Ching Tien, Roger Murray, Lyne Sabourin, Peter Duenk, David R. Lapen, Edward Topp (2016) Persistence of antibiotic resistance and plasmid-associated genes in soil following application of sewage sludge and abundance on vegetables at harvest. *Canadian Journal of Microbiology*, 2016, 62:600-607, <https://doi.org/10.1139/cjm-2016-0034>
2. Kinga Bondarczuk, Anna Markowicz, Zofia Piotrowska-Seget (2016) The urgent need for risk assessment on the antibiotic resistance spread via sewage sludge land application. *Environment International*, Vol 87, pp49-55.

Aims

The aims of the project are to:

- Explore the effect of different OWM on the structure and function of SMC
- Investigate the effect of different OWM on the provision of relevant soil ecosystem functions
- Find numerical relationships describing the effect of OWM on SMC and soil ecosystem functions

Research Supervisors

Candidates are encouraged to contact the following researchers for further details:

- Dr Alejandro Gonzalez Ollauri, alejandro.ollauri@gcu.ac.uk, [http://researchonline.gcu.ac.uk/portal/en/persons/alejandro-gonzalez-ollauri\(4c8fa05b-c1c0-4eb7-9b7c-a2326dfecce1\).html](http://researchonline.gcu.ac.uk/portal/en/persons/alejandro-gonzalez-ollauri(4c8fa05b-c1c0-4eb7-9b7c-a2326dfecce1).html)
- Dr Karin Helwig, Karin.Helwig@gcu.ac.uk
- Dr Janice Spencer, Janice.Spencer@gcu.ac.uk
- Dr Colin Hunter, Colin.Hunter@gcu.ac.uk

Mode(s) of Study

The studentship is available as a:

- PhD: 3 years full-time

Eligibility

Applicants will normally hold a UK honours degree 2:1 (or equivalent); or a Masters degree in a subject relevant to the research project –e.g. environmental science, ecology, microbiology, molecular biology, agricultural engineering, biogeochemistry, etc. Equivalent professional qualifications and any appropriate research experience may be considered. A minimum English language level of IELTS score of 6.5 (or equivalent) with no element below 6.0 is required. Some research disciplines may require higher levels.

Specific requirements of the project:

The successful applicant will be able to demonstrate understanding of ecosystems functioning with special focus on the soil compartment. Expertise undertaking field and laboratory work is required. A good grasp of molecular biology methods, environmental modelling, and statistical tools, such as R, is desirable. Effective oral and written communication skills are mandatory.

How to Apply

Candidates are encouraged to contact the research supervisor(s) for the project before applying. Applicants should download and complete the **GCU Research Application Form**, available from: <http://www.gcu.ac.uk/phdopportunities> stating the *Project Title* and *Reference Number* (listed above).

The completed GCU Research Application form should be sent with copies of academic qualifications (including IELTS if required), 2 references and any other relevant documentation to: researchapplications@gcu.ac.uk. Applicants shortlisted for a PhD studentship will be contacted for an interview.

The closing date for applications is **Wednesday 21 March 2018**