



**PhD Project Title:** Identification and modelling of microplastic transport pathways from land through river systems

**Funding Agency:** Irish Environmental Protection Agency

**Description:** An exciting opportunity has arisen for a suitably qualified and strongly motivated graduate to undertake a PhD in University College Dublin (UCD) as part of a large-scale interdisciplinary 3-year research project “Sources, Pathways and Environmental Fate of Freshwater Microplastics” funded by the Irish EPA. This project is collaborative and involves research teams in the Galway, Mayo Institute of Technology (GMIT) and Wageningen University in the Netherlands. Given the increasing concern regarding knowledge gaps concerning microplastic pollution there is a need for a systematic approach to understand the movement of microplastics from sources to aquatic receptors and dispersal within freshwater ecosystems. Outcomes from previous studies on microplastics, coupled with the reliance on freshwater courses to receive and transport microplastic waste streams in Ireland, makes it vitally important to understand their pathways and fates so risk to ecosystems and humans can be understood.

The overall project aims to gain further refinement of source characterisation, determine factors critical for pathway attenuation, investigate foodweb transfer and provide recommendations for monitoring of microplastics in freshwater environments. The UCD Dooge Centre for Water Resources in the School of Civil Engineering has a strong reputation in marine and freshwater research and has been involved in many national and international projects in the area.

### **Proposal**

The objectives of the PhD are to:

- Assess the movement of MPs from land based sources to aquatic receptors
- Understanding how MPs are dispersed on entry to aquatic receptors
- Modelling Critical Source Areas for MPs and their potential for impact

There exists many likely pathways for the transport of microplastics (MPs) from source to sea. Given that agricultural biosolids have been shown in Ireland to retain high numbers of MPs, their transport overland and vertically through soils following spreading, is potentially significant. The effect of various rain regimes on overland MP transport in catchments with different characteristics will be assessed under both controlled and field conditions. The work will be experimental and will utilise a rainfall simulator to reproduce rainfall consistent with Irish conditions. MPs in collected run-off will be extracted through density separation techniques and filtration, and will be characterised in terms of size and polymer type using Fourier Transform Infrared spectroscopy (FTIR). Further laboratory-testing will also investigate the vertical translocation of MPs through soils.

High abundances of deposited MPs are increasingly being reported in river sediments. An improved understanding of factors affecting mobilisation and the deposition patterns on MPs in river systems will be obtained through a series of laboratory flume tests. A range of physical properties (flow, velocity and depth) will be progressively varied and measured to identify threshold values that influence the deposition patterns of different MPs, which will be systematically injected into the flume during tests. The deposition patterns of these will be determined by sampling and analysis of flume bed substrates at locations along the flume length. Threshold velocities for remobilisation of MPs will also be investigated.

It is unlikely that the data-sets to be generated in a single project will, by themselves, support dynamic modelling of the delivery of MPs to ecosystems. However, if a strong relationship is found between the mechanisms of mobilisation and transport of MPs and those of sediment, the possibility of utilising more extensive existing sediment-related datasets to infer analogous MPs loadings. This will be explored.

**Requirements/Qualifications:** The successful candidate will hold a 2.1 or first class honours degree in Civil, Water Resources or Environmental Engineering, Geology (water and/ or sedimentation) or a related discipline. A Masters degree in Civil Engineering or a related area may also be suitable.

The candidate must be highly motivated and capable of working both independently and within a team. Strong numerical and analytical skills are essentials as is a demonstrated ability to communicate scientific research findings. Experience in analytical laboratory and field measurement is desirable. A full, clean driving license is also required.

**Project Duration:** 36 months

**Conditions:** €18,000 Stipend per annum

Postgraduate fees for EU students will be covered by the project.

In addition, any necessary travel and material costs incurred during the project will also be covered.

*Please Note:* Candidates from outside the EU are eligible to apply, but will be expected to provide evidence of sources of additional funds to cover excesses associated with Non-EU fees.

If English is not the applicant's first language, a certificate of English language ability is required. For IELTS, an average score of 6.5 over all components and a minimum of 6.0 in each band on the Academic Version is required. Scores deemed to be comparable under different tests will be considered.

**Proposed Start Date:** September 2017

**Application Closing Date:** 4pm on Friday 18<sup>th</sup> August 2017

Applicants should submit their Curriculum Vitae (with names of 2 referees), together with a personal statement explaining (i) how you meet the requirements of the position and; (ii) why you would like to pursue a PhD Research Programme, to [jj.osullivan@ucd.ie](mailto:jj.osullivan@ucd.ie)

For further information on the project please contact:

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