Catchment Models and Management Tools for diffuse Contaminants (Sediment, Phosphorus and Pesticides): *Diffuse* Project

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The *Diffuse* Project

- The agricultural sector is the most common suspected source of nutrient pollution in Irish rivers and lakes (Fig 1). However, it is also often the most difficult source to characterise due to its predominantly diffuse nature.
- Particulate phosphorus in surface water and dissolved phosphorus in groundwater are of particular concern in Irish water bodies. Hence the further development of models and indices to assess diffuse sources of contaminants are required for use by the Irish Environmental Protection Agency (EPA) to provide support for river basin planning.
- Understanding connectivity in the landscape is a vital component of characterising the source-pathway-receptor relationships for water-borne contaminants, and hence is a priority in this research.
- The DIFFUSE Project will focus on connectivity modelling and incorporation of connectivity into sediment, nutrient and pesticide risk mapping.

Overview of Work Packages

- **Review** – Review of Models to Support Catchment Management
- **Connectivity** – Connectivity Modelling
- **Sediment** – Sediment Modelling
- **Phosphorus** – Phosphorus Modelling
- **Pesticides** – Pesticides Susceptibility Mapping
- **Workshop** – Workshop: Learning from Models

Project Objectives

i. **Develop catchment models** to improve understanding and enhance the evaluation of water quality, building on previous Irish and international research. The models will inform catchment managers about potential sources of pollution within a catchment, including identifying critical source areas (CSAs) relating to connectivity, sediment, nutrients and pesticides.

ii. **Learn from International modelling experience:** The project will strive to identify the state-of-the-art methods and models that are most applicable to Irish conditions and management challenges.

iii. **Address critical knowledge gaps:** An initial experts workshop will support this review.

iv. **Produce compatibility guidance** for researchers on the development of new tools and maps for the EPA's modelling framework, to ensure continuous use, maintenance and upgrading of the tools available to catchment scientists and managers in Ireland.

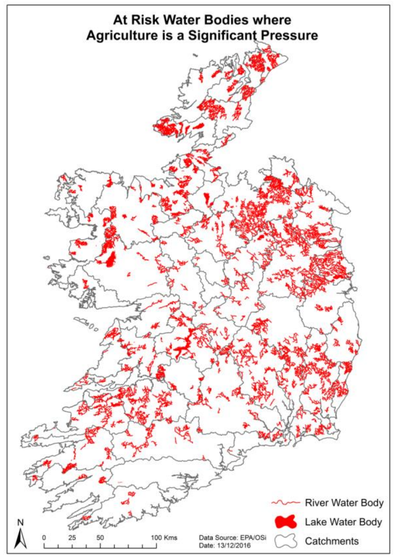

Figure 1. Output from Irish EPA catchment risk assessments.

Building on Previous Research

International experiences and state-of-the-art models that have been successfully implemented to support catchment management will be reviewed to inform model selection. This project will build on a wealth of previous research and modelling that has been undertaken in Ireland, including the EPA-funded *Pathways* Project and the recently completed HYDROFOR, *CatchmentTools*, and SILTFLUX Projects.

Irish Modelling Framework:

The **Source Load Apportionment Model (SLAM)** is a source-oriented modelling framework (Mockler et al., 2016) that predicts the nitrogen and phosphorus exported from each sector including agriculture and WWTP.

SLAM integrates previous national models of nutrient emissions:

- **SANICOSE** model of emissions from septic tank system (Gill and Mockler, 2016).
- **Catchment Characterisation Tool (CCT)** for predicting nutrient losses from diffuse agricultural sources.

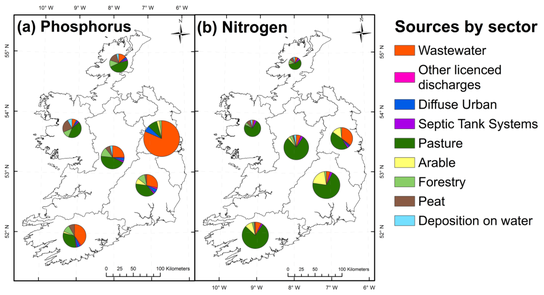

Figure 2. Load apportionment of (a) phosphorus and (b) nitrogen emissions to water by region. The size of the pie indicates the relative total nutrient emissions (See poster A.142 in Hall A, Thursday, 27 Apr, 17:30-19:00).

Workshop: Learning from Models

Join the model inter-comparison workshop in 2018, focusing on models that support catchment management.

- This workshop will provide a comparison of various modelling approaches across spatial and temporal scales with a view to identifying the most appropriate methods and models for Irish WFD characterisation and risk evaluation.
- All styles of modelling considered useful for water resources management are relevant to this project and a balance of technical sophistication, data availability and operational practicalities is the ultimate goal. Achievement of this objective will be measured by comparing the performance of the new models developed in the project with models used in other countries.
- The models and tools developed in the course of the project will be evaluated by comparison with Irish catchment data from study catchments e.g. the Slaney (Figure 3) and with other state-of-the-art models (e.g. INCA and HYPE) in a model-inter-comparison workshop which will be open to other models and the wider research community.
- Contact eva.mockler@ucd.ie to express interest in joining this workshop.

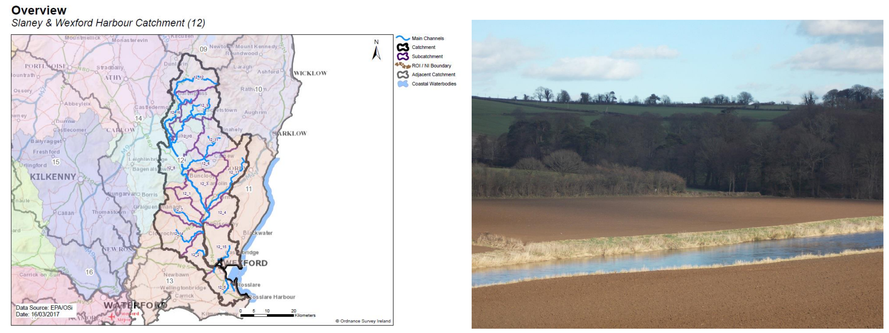

Figure 3. Overview map and photo of the Slaney Catchment, South-East of Ireland.

Summary

- The DIFFUSE project will strive to identify the state-of-the-art methods and models that are most applicable to Irish conditions and management challenges.
- Outputs from this research will include new and revised catchment managements tools focused on connectivity, sediment, phosphorus and pesticides.
- Project outputs will be incorporated into the existing modelling framework used by Irish catchment managers and include technical documentation.

Acknowledgements

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References

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