



OLLSCOIL NA GAILLIMHIE  
UNIVERSITY OF GALWAY



## PhD Scholarship Advertisement



Fully Funded PhD Scholarship in Integrated land use modelling for net-zero GHG emissions  
[Ryan Institute]

Application(s) are invited from suitably qualified candidates for full-time funded PhD scholarship(s) starting in May, 2023 affiliated to the Ryan Institute at the University of Galway.

### University of Galway

Located in the vibrant cultural city of Galway in the west of Ireland, the University of Galway has a distinguished reputation for teaching and [research excellence](#)

For information on moving to Ireland please see [www.euraxess.ie](http://www.euraxess.ie)

### Detailed Project Description

Three exciting new PhD Scholarships are available to undertake state-of-the-art biophysical and econometric model development and scenario analysis to inform policies on food production, land use and the bioeconomy in Ireland – an example country at the forefront of the food-bioeconomy-climate change nexus. The successful candidates will join a world-class group of LCA practitioners, biophysical & econometric modellers, learning and building on state-of-the-art modelling frameworks in the *LandingZONES* project (***Land integrated modelling*** for net ***Zero*** emissions, ***Nutrient*** efficiency and ***Ecosystem Services***). This EPA-funded project builds directly on the academic excellence, innovative modelling frameworks, and policy impact of recent projects: [SeQUESTER](#) and [WaterMARKE](#).

Meeting ambitious climate action targets, in particular “net-zero” GHG emissions by 2050, implies transformative change for food production and the wider land sector. Recent research in the [SeQUESTER](#) project has highlighted that net-zero can only be achieved through concerted action across agriculture, forestry and organic soils<sup>1</sup>. Furthermore, a net-zero GHG emission balance is only likely to be sustained through ongoing forestry expansion, or cascading uses of wood culminating in bioenergy carbon capture & storage in the future<sup>2</sup>. But the agriculture sector will also need to reduce nutrient leakage to air and water whilst delivering a wider range of ecosystem services and food in the face of a changing climate. There is an urgent need for robust and independent evidence to inform how this multifaceted challenge can be delivered. Producing such evidence will require integration of economic, biophysical and catchment modelling frameworks and metrics.

*LandingZONES* will develop an Integrated Land Use Model for Ireland that enables policy makers, researchers and industry stakeholders to consider the overall sustainability of alternative land use planning scenarios – identifying appropriate long-term “landing zones” for policy pertaining to agriculture, land use and the bioeconomy. The starting point will be the state-of-the-art biophysical land use emission model “GOBLIN”<sup>3</sup> and the Input-Output model of the bioeconomy “BIO”<sup>4</sup>. Specific model development will include:



- Inclusion of technical abatement coefficients, cascading uses of harvested wood and bioenergy in the GOBLIN model to refine identification of net-zero GHG land configurations
- Recalibration of the BIO model with latest economic data to estimate macro-economic effects of (net zero GHG) land use scenarios, including consequences in downstream sectors
- Coupling of GOBLIN & BIO with farm-level economics and spatial data to estimate regional- and catchment-level distributions of land use changes

The multi-disciplinary supervisory team includes [Dr David Styles](#), [Prof. Cathal O'Donoghue](#) & [Eoghan Clifford](#). Successful candidates will join a dynamic and growing research network applying advanced modelling approaches to assess the sustainability of a wide range of systems. In addition to extensive opportunities for professional development within [University of Galway](#) and the [Ryan Institute](#), successful candidates will engage with a wider research team working on cutting-edge sustainability topics such as: plant-based proteins<sup>5</sup>, livestock systems<sup>6</sup>, cascading wood value chains<sup>2</sup>, net zero land uses<sup>1</sup>, advanced construction materials, bioplastics<sup>7,8</sup>, grass biorefineries, bioenergy carbon capture & storage and renewable-powered hydroponic food production<sup>9</sup>.

These are full time PhD positions, and require attendance at University of Galway for the first year of the project. Remote working may be accommodated, where relevant, following successful PhD initiation.

<sup>1</sup>Duffy, C. et al. Randomized national land management strategies for net-zero emissions. *Nature Sustainability* 2022 1–8 (2022) doi:10.1038/s41893-022-00946-0; <sup>2</sup>Forster, E. J., Healey, J. R., Dymond, C. & Styles, D. Commercial afforestation can deliver effective climate change mitigation under multiple decarbonisation pathways. *Nature Communications* 2021 12:1 12, 1–12 (2021); <sup>3</sup>Duffy, C. et al. GOBLIN: A land-balance model to identify national agriculture and land use pathways to climate neutrality via backcasting. *Geoscientific Model Development Discussions* 1–37 (2021) doi:10.5194/GMD-2021-228; <sup>4</sup>Grealish, E. & O'Donoghue, C. The Economic Impact of the Irish Bio-Economy - The Bio-Economy Input Output Model: Development and Uses. <https://www.teagasc.ie/publications/2015/the-economic-impact-of-the-irish-bio-economy---the-bio-economy-input-output-model-development-and-uses.php> (2015); <sup>5</sup>Costa, M. P. et al. Legume-Modified Rotations Deliver Nutrition With Lower Environmental Impact. *Front Sustain Food Syst* 5, 113 (2021); <sup>6</sup>Duffy, C. et al. Marginal Abatement Cost Curves for Latin American dairy production: A Costa Rica case study. *J Clean Prod* 311, 127556 (2021); <sup>7</sup>Bishop, G., Styles, D. & Lens, P. N. L. Environmental performance comparison of bioplastics and petrochemical plastics: A review of life cycle assessment (LCA) methodological decisions. *Resour Conserv Recycl* 168, 105451 (2021); <sup>8</sup>Bishop, G., Styles, D. & Lens, P. N. L. Environmental performance of bioplastic packaging on fresh food produce: A consequential life cycle assessment. *J Clean Prod* 317, 128377 (2021); <sup>9</sup>Casey, L. et al. Comparative environmental footprints of lettuce supplied by hydroponic controlled-environment agriculture and field-based supply chains. *J Clean Prod* 369, 133214 (2022).

**Living allowance (Stipend):** €18,500 per annum, [tax-exempt scholarship award]

**University fees:** €5750 per annum [paid by scholarship]

**Start date:** 01.05.2023

**Academic Entry Requirements:** Good primary degree in a related discipline (Science, Engineering, Economics, Computer modelling, etc.); Excellent numerical skills; Excellent communication in English; Knowledge of agri-food, land or bioeconomy systems



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HR EXCELLENCE IN RESEARCH

**To Apply for the Scholarship:** Submit an electronic copy of your Curriculum Vitae and a letter of interest to Dr David Styles at [david.styles@universityofgalway.ie](mailto:david.styles@universityofgalway.ie). Please indicate your preference to work on scientific or economic modelling.

**Contact Name:** Dr David Styles

**Contact Email:** [david.styles@universityofgalway.ie](mailto:david.styles@universityofgalway.ie)

**Application Deadline:** 02/04 /2023 and time 23:59 (Irish time 24hr format)

**Primary Supervisor name** (if applicable): David Styles