Cullen Scholarship: Development and verification of a sound propagation model for predicting effects of Offshore Renewable Energy in Irish waters (PhD Award).

Background

Driven by ambitious and essential de-carbonisation targets, and in the context of the Climate Action and Low Carbon Development (Amendment) Bill 2021, Ireland is now in the initial stages of a major expansion in offshore renewable energy generation to achieve targets of 7 GW by 2030 and 30 GW by 2050. The primary strategic and economic drivers for this are stark and clear, and their realisation will also bring important economic co-benefits to coastal communities involved in the supply chain. However, the scale and duration of development operations required to establish fixed and floating wind turbines and their associated moorings and infrastructure are orders of magnitude greater than any previously seen in Irish waters. The distribution and extent of development zones and consents involve a significant proportion of Ireland's shelf sea area. Ensuring the sustained health and productivity of these important ecosystems requires a detailed understanding of the potential impacts to marine life including underwater noise, habitat displacement, and exposure to electromagnetic fields, across all stages of the development life cycle. The negative impacts and environmental risks associated with anthropogenic underwater noise, are now a recognised cause for concern on a global basis [1]. There is currently a severe lack of acoustic modelling and monitoring capacity in Ireland, and a marked absence of a coherent national approach to managing acoustic risk in the marine environment. The research work undertaken through this PhD directly addresses this challenge by focusing on key aspects in the field of passive marine acoustics & underwater sound modelling.

Proposal

We propose **a structured four-year PhD project** on a full-time basis to set up and run an advanced high fidelity sound propagation model for priority area(s) of the Irish continental shelf, and demonstrate how the model outputs can be used to inform critical decision making regarding the level of environmental risk posed by the acoustic impact of offshore energy development.

The project will aim to:

- Establish and operate a high fidelity sound propagation modelling framework suitable for investigating and predicting acoustic impacts from offshore energy devices and associated marine traffic at key stages in the development cycle.
- Test and verify the quality and reliability of the modelled outputs against in-situ field measurements through the development and application of innovative "field-calibration" techniques.
- Explore coupling of three dimensional noise fields created from the sound propagation model with advanced ecological modelling tools e.g. incorporating life-like animal movement

modalities for selected species in order to derive exposure metrics of use for risk assessment purposes.

Location of Scholar

The scholar will be based for circa 50% of their time over the four years at the Marine Institute HQ Rinville, Galway and 50% of their time at the academic host institution.

Outcome

The expected outcomes from the project will be an operational sound propagation modelling framework capable of generating reliable predictive sound maps and associated standard and innovative acoustic metrics and statistical quantities suitable for the assessment of environmental risk associated with the development of ORE in Irish waters.

A focal point for awareness around the topic of acoustic pollution and the creation of objective information to inform discussion and guide policy and programme development.

Links with the Marine Institute Strategic Plan 2023-2027

This proposal falls under Strategic Priority "Delivering impact through research and innovation" with strong links to Strategic Priority "Transforming our knowledge, advice and services".

Specific Requirements

The scholar should have a primary degree in physical oceanography with evidence of strong numerical modelling and statistical skills; or applied physics (with acoustics/signal processing major); or marine/coastal engineering (mechanical with acoustics/vibration/acoustics major).

Financial Details

Scholarships will be up to €27,500 per annum (maximum funding of €110,000 over four years). This amount comprises a maintenance award of €18,500 (Irish Research Council rate effective 1-Jan-21*) to the student as well as payment of fees to the host higher education institution (HEI). The maximum fees payable to the HEI will be €6,000 per annum. The scholarship award also includes a budget of up to €3,000 per annum for eligible research costs (travel & subsistence, publication costs, consumables and other costs e.g. laptop) for the sole use of the student, and are payable on a reimbursement basis direct to the host institution where the postgraduate student (scholar) is registered. There are no overheads payable on the scholarship. Publication costs are intended to cover publications on which the scholar is listed as first author and are published under Open Access. Scholars can also supplement this funding by applying to the Marine Institute's Networking & Marine Research Communication Awards annual call.

*There is a national review underway of the PhD annual student stipend payment, which is expected to result in a rate increase, and the Marine Institute will adjust the total funding accordingly following the completion of this review.

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References

- Climate Action and Low Carbon Development Amendment Bill 2021

- Duarte et al., Science 371, 583 (2021) https://www.science.org/doi/10.1126/science.aba4658