# Developing risk-based methodology for co-locating offshore aquaculture and renewable energy systems

## *The research 'Impact' on Blue Economy Development*

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***The development of the Blue Economy focuses on the sustainable use of ocean resources. As ocean activities expand, competition for space and resources intensifies, necessitating innovative solutions like multi-purpose offshore platforms (MPOPs) to integrate various sectors and generate mutual benefits. This research aims to address the knowledge gaps in MPOP design and operation, develop a risk-based framework for system integration and site selection. By considering environmental, economic, and technological factors, this study contributes to the sustainable growth of the Blue Economy and provides valuable insights for industry stakeholders. In addition, the project's impact will enable informed decision-making and risk mitigation in MPOP development, fostering collaboration, innovation, and sustainable management of marine resources.***

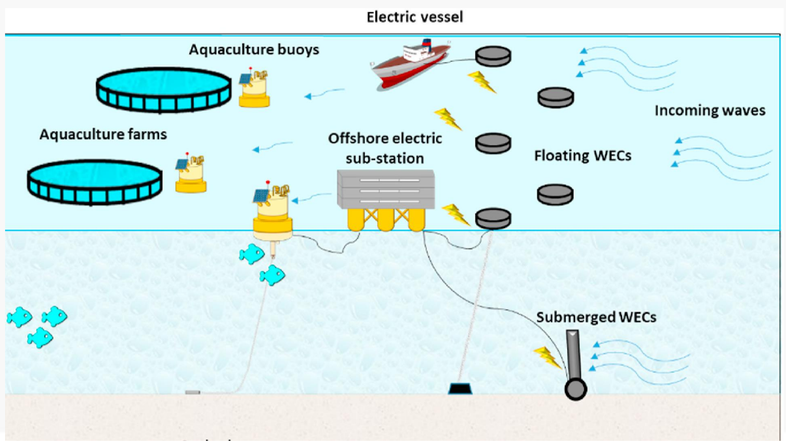
## Background:

Recently, energy shortages and environmental pollution issues have escalated globally. As a result, the exploration of renewable energy resources has become increasingly vital to decrease dependence on fossil fuels and reduce greenhouse gas emissions. Among the various resources available, the significant potential for energy harvesting and food production in ocean areas has led to heightened interest in the sustainable utilization of marine resources.

Hence, the development of Blue Economy is investigated by industry and researchers to address the sustainable use of ocean resources for economic growth, livelihood improvement and job creation. Under the expansion of ocean activities in the coastal area, the competition for ocean space and resources has intensified. Thus, to meet the increasing demand for food and energy, multi-purpose offshore platforms (MPOPs) have been proposed as a solution to integrate various sectors and create mutual benefit.

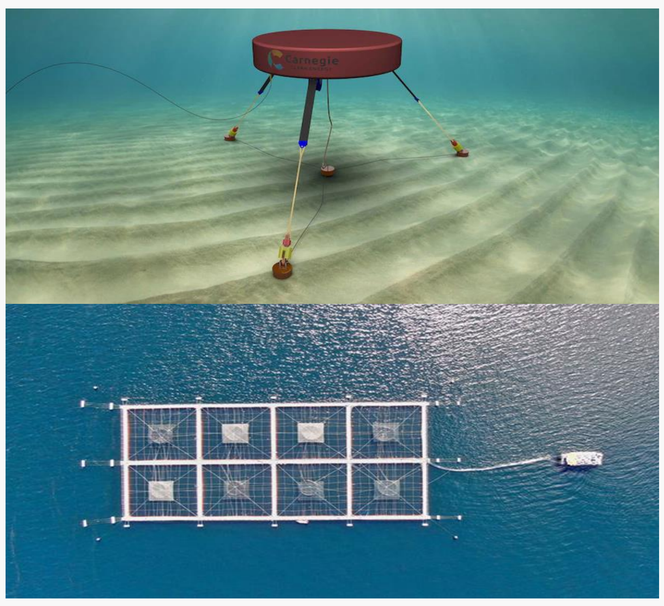
## Multi-purpose offshore platforms :

Multi-purpose platforms (MPOPs) refer to offshore platforms designed to fulfil the needs of multiple offshore industries. The primary objective of MPOPs is to leverage synergies and manage any tensions that arise from co-locating systems. To address the challenges in offshore aquaculture and renewable energy systems, the multi-use approaches that integrate the two sectors can sustainably improve the environment and economically benefit offshore systems




## Research rationale:

Despite the growing interest in developing the MPOPs, there are significant gaps in the existing knowledge regarding the platform design, operation and maintenance activities, especially in the Australian context. For example, there is a lack of knowledge about the environmental data assessments and available ocean resources integration for co-locating systems around Australia. Moreover, there is an urgent need for a decision-making framework to help the government and industries in MPOPs system integration and site selection while considering the potential risks and consequences of the system.



## Research significance:

The significance of the research lies in filling the knowledge gaps in MPOP design and operation, which will benefit both offshore energy and aquaculture industries, as the project outcome will:

- Enhance the understanding of MPOPs, leading to a more effective, reliable, and sustainable system.
- Provide stimulations for assessing motion responses and damage propagation in MPOPs based on site-specific metocean data, enabling better site selection and platform arrangement.
- Develop a quantitative risk assessment that accounts for technical, environmental, and cost criteria, which can be used to optimise MPOP system integration.
- Establish a risk-based decision-making framework for site selection, improving overall efficiency and reliability of MPOPs throughout their life cycle.

## Research Impact:

- ***Support for sustainable development***

The research will contribute to the global shift towards renewable energy and sustainable use of marine resources, helping reduce dependence on fossil fuels and minimize greenhouse gas emissions

- ***Foster growth in the blue economy***

The research aligns with the Blue Economy CRC's goals, promoting the growth of offshore renewable energy and aquaculture while exploring the potential of sharing benefits between different marine sectors.

- ***Industry collaboration and innovation***

By working with partners like Carnegie Clean Energy and Cawthron Institute, the research encourages collaboration and knowledge sharing, driving innovation in offshore infrastructure and marine resource management.

- ***Decision-making for MPOP site selection***

The risk-based framework provides a structured approach to evaluating and comparing potential MPOP locations, enabling better-informed decisions for platform development by industries.

- ***Risk mitigation for co-located MPOPs***

The systemic risk assessment offers valuable insights into potential risks and consequences associated with co-locating MPOPs, enabling stakeholders to develop mitigation strategies and make informed decisions about platform design and operations.

- ***Integrating environmental and economic criteria into MPOP risk profile.***

By considering environmental and economic factors in MPOP risk assessment, the research supports the development of designs that minimize environmental harm while maintaining cost-effectiveness and operational efficiency.

- ***Improving reliability of MPOPs mooring system***

The reliability analysis of platforms, like the WECs from Carnegie Clean Energy, helps identify areas of improvement in the mooring system, ultimately enhancing performance and reducing downtime.

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