BLUE ECONOMY
COOPERATIVE RESEARCH CENTRE

Australian Government
Department of Industry, Science, Energy and Resources

AusIndustry
Cooperative Research Centres Program

SHORT SUMMARY

4.20.001 Monitoring and Assessing Offshore/High Energy Production Structures

INTRODUCTION

This study aimed to undertake a comprehensive review of literature and current knowledge to:

- Understand the scientific basis of site selection criteria, indicators of ecosystem health and reference points/baselines against which environmental performance can be evaluated; and
- Identify state of the art techniques for resource and habitat characterisation and the mapping of impacts of potential aquaculture and energy production, and selection of control sites to support an ongoing monitoring design.

KEY POINTS

Coastal seas are used by a wide variety of stakeholders and have cultural and historic significance. Development of activities in these areas needs to be carefully planned with respect to existing users and to ensure environmental, social and economic sustainability. Marine spatial planning has the potential to manage conflicts and develop sustainable approaches but both a recognised common framework and key data/understanding are currently missing.

A major challenge for offshore sites is high natural variability with sites subject to wide scale and long-term drivers of change such as global heating. It is thus difficult to establish a clear baseline state against which to assess changes in monitoring data.

The adoption of approaches which use a limited suite of simple, cost effective metrics that if triggered will initiate further investigations to establish the true extent and cause of the problems, instead of triggering a potentially inappropriate direct management response, is seen as having potential.

THE CHALLENGE

For many countries the marine estate (as represented by the Exclusive Economic Zone) is vastly greater than the land area and so provides opportunities for sustainable economic growth. However, the marine environment is a much more physically challenging environment and levels of knowledge are much lower than for terrestrial systems. Providing knowledge to underpin the development of sustainable activities in the marine environment is the big challenge for the Blue Economy.

It was noted during the project (and in a series of strategic planning meetings following completion of the project) that the currently available information platforms (such as the renewable energy atlas) do not always match industry needs regarding resolution so considerable duplication of effort occurs proponent to proponent as they do their own downscaling. It was also noted that overseas there has been a tendency to ask for very extensive baseline surveys given the greenfields nature of offshore production, which may be beyond what is actually required for decision making and can be prohibitive for new entrants.

THE OPPORTUNITY

This project sought to identify the most pressing knowledge gaps and research priorities associated with site selection, and environmental assessment and monitoring, in order to guide the BE CRC in addressing the development of economic activities in offshore water.

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OUR RESEARCH

The opinions of 23 Australian and international industry, research and government representatives from 14 organisations were sought to identify key knowledge gaps associated with aquaculture and renewable energy site selection procedures, and environmental assessment and monitoring practices.

Policy and legal frameworks
Stakeholders recognised the immediate requirement for a consistent and definitive regulatory framework which extends beyond State territorial boundaries. This should include the development of comprehensive assessment and monitoring guidelines to reduce regulatory uncertainty.

Site Selection
There remains a lack of data for comprehensively assessing offshore site suitability, particularly in respect of benthic environments.

The long-term goal should be to link all physical, environmental, cultural and heritage, resource potential, operational logistics and risks into a comprehensive decision support tool. Site selection should also consider other users and how offshore projects may impact them. These risks may be mitigated through developed marine spatial planning tools through and accessibility to geospatial databases.

Environmental Effects
Research is required to address the cumulative impacts linked to large scale offshore development and co-located activities including but not limited to renewable energy and aquaculture operations. Stakeholders identified the need for research data in order to improve modelling that can accurately predict offshore impacts and risks including occurrences of algal and jellyfish blooms, spread of pathogens, noise pollution and dispersion of nutrients. Stakeholders also identified the need for further work on preventive measures to avoid marine megafauna entanglements.

Assessment and Monitoring
Interviewees recognised as a priority, the need to standardise assessment and monitoring practices and develop government endorsed guidelines. There is a need to identify appropriate sentinel indicators for offshore environments and to provide guidance on correct use of statistical models.

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OUTCOMES

Site Selection

Site selection criteria commonly used in Multi Criteria Decision Making methods need to be developed specifically for offshore sites. Furthermore, consideration should be given to multi-use platforms (Aquaculture and Renewable Energy). New emerging technologies can alter the requirements of offshore structures and therefore the site selection criteria. Cross disciplinary research is recommended to update site selection parameters and model inputs. The participation, acceptance and support of all stakeholders – including other industry sectors and community members - is necessary to ensure sustainable offshore expansion. Processes to engage all parties during the marine spatial planning process need to be addressed.

Assessment and Monitoring

The requirements of environmental monitoring will differ depending on the type of aquaculture and energy system deployed. Both renewable energy and aquaculture offshore platforms have the potential to impact on local marine organisms including large predators and those in benthic habitats, and so monitoring programs must focus on detecting and quantifying the nature of these interactions. Aquaculture platforms have the additional environmental concerns of sedimentation, nutrients changing planktonic dynamics, spread of diseases, and for finfish aquaculture, depending on the species and region, the interbreeding of escapees with native populations. Environmental monitoring can reduce the risk of adverse effects, operational costs and maintain public confidence in the associated industries.

Advances in monitoring approaches will see development of autonomous and remote monitoring platforms (e.g. ROVS, AUVs, SUVs, vertical profilers) to improve monitoring efficiency and reduce health and safety risks.

Standardisation of monitoring systems is desirable to ensure comparability between related projects/ industries, with the added benefit improved data sharing and accessibility to historical datasets.

Barriers to the adoption of ecosystem-level monitoring approaches and indicators (including eDNA) need to be identified and eliminated, so that new approaches can be used where they have a cost, health, safety or environmental advantages, or are better suited to monitoring targets.

Monitoring requirements should be linked to clear management responses and trigger values. The focus should be on a limited suite of robust indicators not on blanket measurements of ‘everything we can’. There is an urgent need to provide regulators with a critical evaluation of the appropriate suite of metrics and advise on the development of (location specific) trigger values.

To ensure workforce health and safety, the focus for offshore sites should be automated and remote sensor technology ideally supported by AI systems.

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NEXT STEPS

The BE CRC Research Program 4: Ecosystems and Environment should initially focus research effort on:

- Identifying key metrics of environmental performance in offshore waters and designing cost-efficient monitoring strategies for offshore platforms that are suitable to assess environmental impact and satisfy regulatory requirements;
- Developing a MCDM site selection framework. This should be capable of providing information on single sector and of multi-use platforms;
- Developing approaches and data layers to underpin a Marine Spatial Planning tool;
- Data collection for feeding into bio-geochemical models to assess environmental interactions and impact on ecosystem services; and
- Continually examine the extent to which emerging approaches and new technical equipment for monitoring strategies can contribute to environmental monitoring and specifically reduce workplace Health and Safety risks to operators.

PROJECT TEAM

- Prof Chris Frid (Griffith University)
- Dr Chris Brown (Griffith University)
- Ainsley Leaning (Griffith University)
- Dr Remo Cossu (University of Queensland)
- Ryan Beecroft (University of Queensland)
- Assoc Prof Jeff Ross (University of Tasmania)
- Dr Beth Strain (University of Tasmania)
- Dr Camille White (University of Tasmania)
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PROJECT REPORTS/PUBLICATIONS

Beecroft, R., L. Bodrossy, M. Brasier, C. Brown, R. Cossu, G. Fisk, D. Foo, C. Gaudin, D. Guihen, S. Hook, M. Lacharite, M.-A. Lea, A. Leaning, M. Moutel, S. Riley, J. Ross, J. Semmens, E. Strain, S. Ugalde, C. White & C. Frid (2020). Monitoring and assessing offshore/high energy production structures. A report from the Blue Economy Cooperative Research Centre.

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