BLUE ECONOMY
COOPERATIVE RESEARCH CENTRE

Australian Government
Department of Industry, Science and Resources

Cooperative Research Centres Program

SHORT SUMMARY

4.22.001 - Data Infrastructure Design for the Blue Economy

INTRODUCTION

The Data Infrastructure Design for the Blue Economy (DIDBE) aimed to identify a scalable, secure, and interoperable data infrastructure framework, tailored to the needs of the Blue Economy CRC, that could also support the Blue Economy beyond the life of the CRC.

KEY POINTS

- **Scalable Data Infrastructure Framework:** to support evidence-based decision-making, ensuring longevity for the CRC and beyond
- **Federated, Integrated Platforms:** to provide trusted identity services, data stores, open data API services, and sensitive encrypted data API services. This ensures secure and efficient data management and collaboration.
- **Open Data Philosophy:** enabling evidence-based decision-making for sustainable growth in the blue economy, including guidelines for ongoing data stewardship and development of a prototype analytics platform for a blue economy case study.
- **Collaboration and Knowledge Sharing:** between research programs and across various project, data, and technology outcomes are essential for the CRC's success. The project involved digital experts, data scientists, strategists, engineers, and engagement specialists.

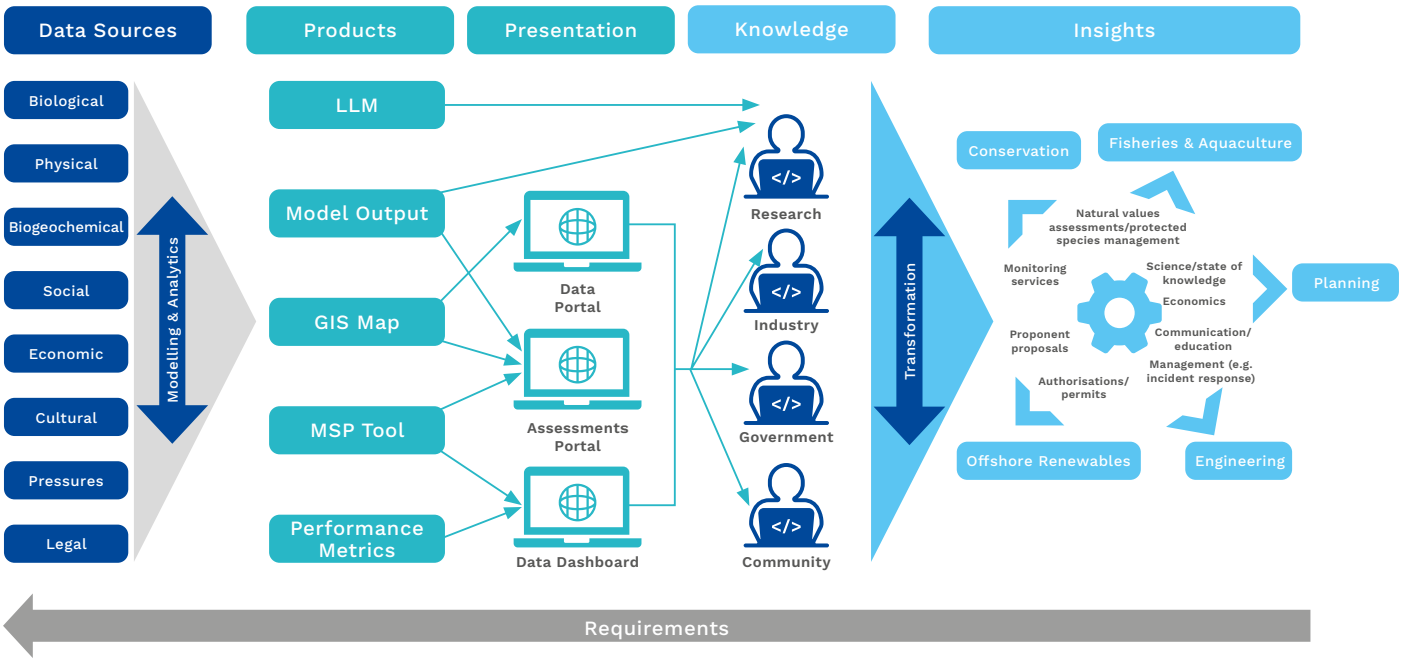

Figure 1: Data workflow from source to insights.

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THE CHALLENGE

The DIDBE project addressed the challenge of designing a scalable, robust data infrastructure to support evidence-based decision-making for the Blue Economy CRC. It addressed the complexities of managing diverse data sources and ensuring secure, efficient access for research, industry, and government, while balancing open and secure data to enable collaboration among a broad range of stakeholders.

THE OPPORTUNITY

The DIDBE project aimed to deliver path forward for secure, federated platforms and open data principles to enhance data stewardship and sustainability. The initiative also fostered cross-disciplinary collaboration while respecting Traditional Owner rights and protecting marine ecosystems.

OUR RESEARCH

METHODOLOGY

The project used a strategic, iterative, and participatory approach to design a fit-for-purpose data infrastructure for the CRC. A multidisciplinary Core Design Team from five partner organisations led the effort, structured into five work packages covering architecture, audits, stakeholder engagement, and reporting. Using a flexible "Define, Align, Design, Refine" process, the team gathered and validated stakeholder input through various surveys, interviews, and workshops. A data workflow diagram guided design discussion, while reviews of existing platforms, CRC needs, and global standards informed the development of a scalable, secure, and interoperable infrastructure.

DESIGN CONCEPT

The DIDBE project delivered a comprehensive infrastructure design that meets both functional and non-functional requirements for the Blue Economy CRC.

The scalable, secure, and interoperable framework aligns with FAIR (Findable, Accessible, Interoperable, Reusable) data principles and builds on platforms like AODN and IMOS. It supports robust data storage, metadata standards, analytics, intuitive interfaces, and long-term sustainability, with federated identity management and IDSA standards enabling secure data exchange.

Stakeholder input (gathered through the surveys, interviews, and workshops) was key to shaping the design, highlighting needs for intuitive access, better metadata, and secure sharing. Reviews of existing platforms (e.g. SEAF, BMT Deep, AADX) informed the adoption of a federated, standards-based model. The resulting prototype supports diverse data workflows and is built to evolve with the CRC.

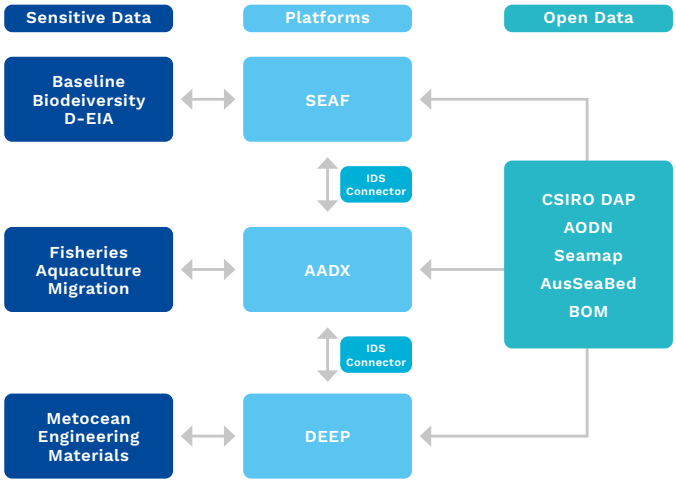

Figure 2. Conceptual design of CRC data infrastructure using federated platforms, identity services, and ISDA standards to link environmental, fisheries, and wind farm data.

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CRC RESEARCH PROJECT DATA NEEDS

Surveys and interviews with CRC project leaders revealed diverse data types (e.g. tabular, time series, spatial, image) and storage needs from megabytes to terabytes. Most relied on university servers, cloud storage, and tools like Excel, MATLAB, R, and Python. A key insight was the need for scalable infrastructure to handle real-time data and advanced analytics.

Common challenges included inconsistent metadata, limited sharing, and fragmented storage. There was a strong call for better data access, secure sharing, visualisation tools, and filtering features. The findings emphasised the need for a flexible governance framework that balances open data with protection of sensitive information, including commercial and Indigenous data, directly shaping the infrastructure design.

OUTCOMES

The current state of knowledge, as captured through extensive stakeholder engagement, surveys, and platform reviews, revealed a diverse and fragmented data landscape across CRC projects. Researchers and industry partners highlighted challenges such as inconsistent metadata, limited data sharing, and varying storage practices. The DIDBE project addressed these by proposing a federated infrastructure model that integrates existing platforms (e.g., AODN, IMOS) and supports open and sensitive data, advanced analytics, secure access, and user-friendly interfaces. The project also produced a prototype design, a data workflow model, and a set of functional and non-functional requirements to guide future implementation. These outcomes position the CRC to manage its data assets effectively and support evidence-based decision-making for the CRC and future sustainable growth in the blue economy.

Another key outcome was the recommendation to adopt internationally recognised standards, particularly those from the International Data Spaces Association (IDSA), to ensure secure data exchange and interoperability across platforms.

NEXT STEPS

The following recommendations were made to set out the next steps in developing a robust data governance framework and service provision for the CRC:

1. Include mandatory step by step guidelines in the CRC data management plan for Research Programs to follow to ensure standards for data collection, storage, sharing identity and, where appropriate, an ultimate resting place in an approved open data platform.
2. Conduct an inventory of data generated from past and current research projects.
3. Contribute CRC generated data to a standards-based data catalogue that aggregates to the Australian Ocean Data Network (AODN).
4. Push past and current data to an approved data platform with embargo management as needed and a plan for when it will be released as open data, if appropriate.
5. Establish the rules of CRC data exchange to ensure standards based, secure, trusted and timely and efficient collaboration.
6. Develop and expand on existing technology to prototype data repository and analytics platform(s) for a blue economy case study with interoperability to a regulatory platform and freely available cloud-based research computing services. e.g. NeCTAR. (Figure 2)
7. Execute a Capacity Building Program for the use of marine and maritime data and analytics tools targeted at Blue Economy growth and awareness to including on-line training modules and in-person training workshops.

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