



# Mapping and analysis of blue economy policy and legislative arrangements

5.20.007

## Final Project Report

The Blue Economy CRC is funded in part under the Australian Government's CRC Program,  
administered by the Department of Industry, Science, Energy and Resources.

The CRC Program supports industry-led collaborations between industry, researchers and the community.

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## Executive Summary

Blue economy uses, activities and resources are traditionally managed on a sectoral basis involving independent entities pertaining to different jurisdictions. As a result, current efforts towards seafood and renewable energy production systems and other integrated blue economy activities will need to contend with a complex and fragmented policy and legislative environment, which may not be entirely fit-for-purpose.

Considering the complex and fragmented Australian blue economy regulatory framework, the Blue Economy CRC's Scoping Study "Developing a policy and regulatory research plan for Australia's emerging Blue Economy" (5.20.004) suggested the following priority areas for further investigation: (i) mapping of blue economy arrangements; and (ii) analysis of gaps and overlaps that may hinder the development and operation of blue economy activities.

In the context above, the objectives of this project were to:

- (i) map the existing policy and legislative environment (i.e., policies and legislation and responsible agencies) as they relate to blue economy uses, activities and resources across multiple sectors and jurisdictions;
- (ii) undertake cross-sector analyses to identify gaps and overlaps that may hinder the development and operation of blue economy activities, with a focus on those relating to integrated seafood and energy production systems; and
- (iii) develop a searchable online database of the policy and regulatory environment mapped in objective (i).

Between 05 October 2020 and 15 March 2021, we collected 2,028 documents from official legislation databases and government department websites. The scope was limited to international, federal, and state arrangements that are applicable to coastal and marine areas within the continental shelf around Tasmania. Documents were included in the project's searchable online database, which is available at <https://ausbluepolicy.net/>. Data analysis was performed using the software MINOE v1.10 and Node XL and involved text mining based on key terms defined for two blue economy topics of interest (aquaculture and renewable energy), as well as the development and analysis of network graphs.

For aquaculture, 23 references for this topic were identified in 12 documents representing international arrangements (e.g., agreements, treaties and conventions); 1,006 references in 73 documents for federal arrangements, and 886 references in 52 documents for state arrangements. These were linked to 12 government departments. The Australian Department of Agriculture, Water and the Environment (DAWE) and the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) emerged as the potentially most relevant responsible authorities. Results showed that most federal arrangements are classified as policies (75%), which are generally not legally enforceable. They also revealed that the regulatory framework in Tasmania has a higher number of arrangements classified as acts (16) when compared to the federal level (6). Results indicate that the State Government has likely played a more active role in aquaculture regulation, given that its regulatory framework is more statute-based.

For renewable energy, 29 references for this topic were identified in 6 documents representing international arrangements, 1,776 references in 71 documents for federal arrangements and 368 references in 17 documents for state arrangements. These arrangements were linked to 11 government departments. The

Australian Department of Industry, Science, Energy and Resources (DISER) and the Tasmanian Department of State Growth (DSG) emerged as the potentially most relevant responsible authorities. Results suggest that offshore renewable energy production is still an activity with relatively little presence in the blue economy regulatory framework. 94% of all references were made to the term “renewable energy”, while the terms “offshore energy” and “offshore renewable energy” accounted for only six references.

With regards to the intersection between aquaculture and renewable energy, there were 23 documents with references to key terms of both topics (15 federal arrangements and eight state arrangements), of which 20 were policies. This suggests a gap in the regulatory framework concerning the integration of aquaculture and renewable energy. It is noteworthy that some arrangements in this group (e.g., Australia’s National Hydrogen Strategy and the Tasmanian Renewable Hydrogen Action Plan) highlight the work that the Blue Economy CRC has done in this field. This suggests that the Blue Economy CRC has helped to inform policy in this area.

This research improves the understanding of the blue economy policy and legislative environment in the jurisdiction analysed and, more broadly, provides insights on how to advance blue economy policy and legislative studies. It is the first initiative in Australia aimed at mapping blue economy arrangements, thus contributing to ongoing efforts towards reducing the uncertainty of industry, government, and researchers in relation to what, when, how, and by whom blue economy activities are possible. The approach adopted in this research can be expanded to other jurisdictions aiming to develop their blue economy and adapted for policy and legislative analysis of different topics of interest.

Future studies to complement this research should include:

- Qualitative studies to further understand policy and legislative gaps and overlaps identified in this project that may hinder the deployment of integrated and renewable energy production systems in Australia. Future research may build on our database and network graphs to identify opportunities for streamlining or modernising regulatory processes, promoting coordination among government departments and agencies, and improving communication between government, industry and the community;
- Exploration of additional blue economy topics of interest (e.g., addition of new forms of aquaculture or integration with other potential industries, such as tourism) using our text mining and mapping approaches in accordance with BE CRC priorities and industry needs, allowing the design of new qualitative studies at a further stage;
- Consultation with current and prospective BE CRC Participants, to identify priorities relating to the expansion of our database to include other jurisdictions (e.g., other Australian states), arrangement types (e.g., developing legislation) and stakeholders (e.g., government agencies and non-government organisations);
- Exploration of options to expand user and community awareness of this tool (e.g., via academic training and legislative development networks); and
- Development of processes that enable regular updating and maintenance of the database, as well as strategies for its improvement.

## 1. Introduction

The growing scarcity of space and viable sources to harness natural resources on land, as well as technological advances achieved over the last decades, have triggered an unprecedented interest in expanding the development of economic activities in the oceans (Jouffray et al., 2020; Rudge, 2021; Novalglio et al., 2021). However, there are legitimate concerns that this new economic frontier may also pose significant social and environmental risks (Oliveira Neto et al., 2021; Bennett et al., 2021). The term “blue economy” was first introduced at the United Nations Conference on Sustainable Development in 2012 (Rio+20) as a response to ocean governance challenges that emerged in the 21<sup>st</sup> century (Silver et al., 2015). Although there is still no consensus on the exact meaning and scope of the term (Voyer et al., 2018; Fabinyi et al., 2021), it is now generally understood as a framework for boosting economic growth, improving quality of life, and increasing social equality, while ensuring the sustainability of ocean and coastal environments (Martínez-Vázquez et al., 2021; European Commission, 2021). Its aim is to promote the sustainable industrialisation of the oceans in a manner that ensures the benefits can be shared across the global society (Smith-Godfrey, 2016).

The blue economy has recently gained momentum in the political and policy-making arenas (Haward, 2019). The United Nations has declared the current decade (2021-2030) as the Decade of Ocean Science for Sustainable Development, with the objective of strengthening international cooperation on scientific research and technological innovation for the management of oceans and coasts (IOC, 2020). Actions to underpin the blue economy have also flourished recently in several nations. For example, in Australia, the country with the world’s third largest Exclusive Economic Zone, the Blue Economy CRC (BE CRC) was established in 2019, as a ten-year initiative supported by A\$70 million in funding by the Australian Government (BE CRC, 2021a). The BE CRC brings together industry, government and researchers with expertise in such areas as aquaculture, offshore renewable energy, maritime engineering, environmental management, and policy and planning (BE CRC, 2021b).

One of the key objectives of the BE CRC is overcoming technical challenges hampering seafood and renewable energy production systems (BE CRC, 2021c). Moving aquaculture and renewable energy offshore, through the development of multi-purpose offshore platforms (by which such activities are either co-located, or physically integrated) can result in several advantages, including increased operational scales, improved water quality and waste management, and a lower risk of diseases in fish farms (Aryai et al., 2021).

However, marine uses, activities and resources are traditionally managed on a sectoral basis involving independent entities pertaining to different jurisdictions (Haward and Vince, 2008; Haward, 2014). In this sense, current efforts towards seafood and renewable energy production systems and other integrated blue economy activities will need to contend with a complex and fragmented policy and legislative environment, which may not be entirely fit-for-purpose (Firestone et al., 2004; Leary and Esteban, 2009; Stuiver et al., 2016; Salvador et al., 2019). Such a challenge is exacerbated by the limited knowledge of how blue economy-related uses, activities and resources are managed across multiple marine sectors and jurisdictions (Ekstrom, 2009).

Research in this field of inquiry has predominantly used qualitative methods, which are generally time-consuming and conducted on a small-scale, ad-hoc basis; therefore, challenges may arise when large-scale and holistic evaluations of complex and dynamic policy and legislative systems are required (Ekstrom and Lau, 2008; Ekstrom et al., 2009; Ekstrom and Young, 2009). Quantitative and semi-quantitative methods may complement such traditional approaches by offering a broad and integrated view of policy and legislative systems, particularly at the early stages of analysis (Ekstrom et al., 2018). In

this context, informatics and big data-styled research present enormous potential for improving scientific knowledge, but few empirical policy and legal studies have adopted such tools (Ruhl et al., 2017).

To help address the gap outlined above, Project 5.20.007 “Mapping and Analysis of Blue Economy Policy and Legislative Arrangements”, was developed as part of the Research Program #5 (Sustainable Offshore Developments) of the BE CRC.

This Final Project Report presents the results of Project 5.20.007, which objectives were to:

- (i) map the existing policy and legislative environment (i.e., policies and legislation, as well as their responsible authorities) as they relate to blue economy uses, activities and resources across multiple sectors and jurisdictions;
- (ii) undertake cross-sector analyses to identify gaps and overlaps that may hinder the development and operation of blue economy activities, with a focus on those relating to integrated seafood and energy production systems; and
- (iii) develop a searchable online database of the policy and regulatory environment mapped in objective (i).

This research improves the understanding of the blue economy policy and legislative environment in the jurisdiction analysed and, more broadly, provides insights on how to advance blue economy policy and legislative studies. As the first initiative in Australia aimed at mapping blue economy arrangements, it contributes to ongoing efforts towards reducing the uncertainty of industry, government, and researchers in relation to what, when, how, and by whom blue economy activities are possible.

## **2. Materials and Methods**

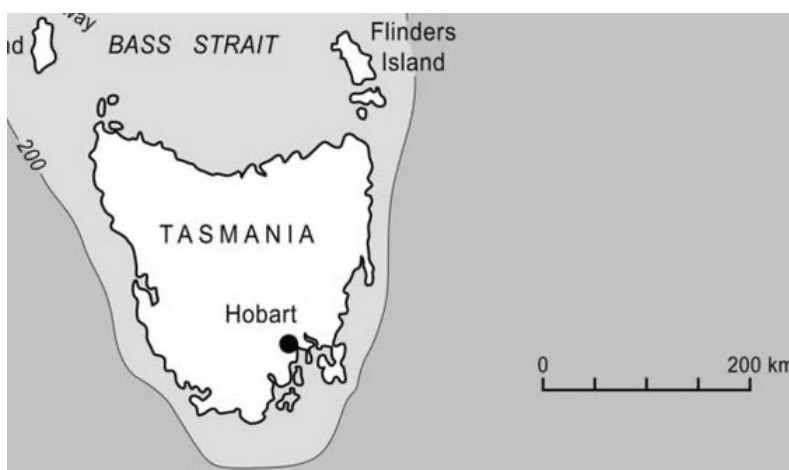
We used an innovative approach based on computer-generated graphs, drawing on the methods described in Ekstrom (2009) and Ekstrom et al. (2009). These proved useful in producing quick and easy access to baseline information on policy and legislative arrangements relating to ocean management (see, e.g., Fidelman and Ekstrom, 2012; Fidelman et al., 2019). Our protocols for data collection and data analysis are detailed below.

### **2.1. Data Collection**

We developed a database compiling international, federal, and state arrangements (e.g., policies, legislation and treaties) related to the blue economy. To ensure data collection consistency, we adopted the following criteria for the inclusion and exclusion of arrangements in the database:

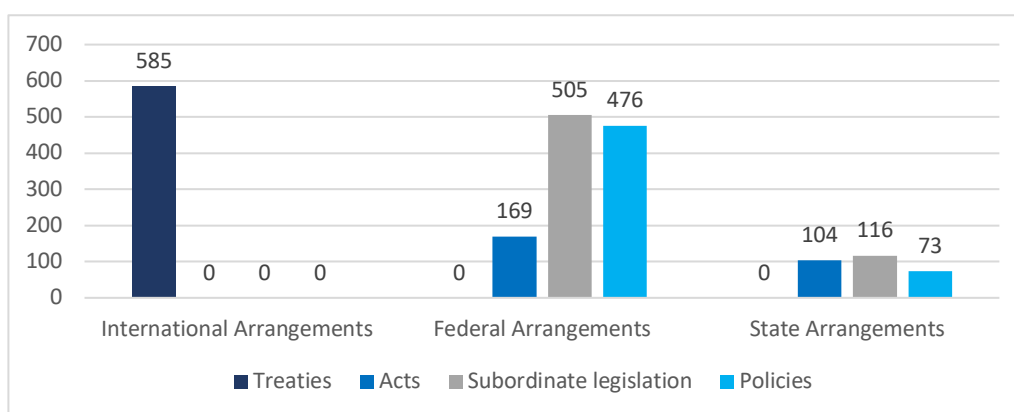
- (i) the arrangement had to apply to coastal and marine areas within the seaward boundaries of the continental shelf around Tasmania where blue economy activities are expected to occur (Figure 1). Tasmania were selected based on the research team’s knowledge of the existing policy and legislative arrangements in the state;
- (ii) the arrangement had to cover issues relevant to one or more blue economy sectors or concerns (e.g., fisheries and aquaculture, offshore renewable energy, maritime transport, climate change, and marine protected areas);

- (iii) the arrangement had to fall under one of the categories described in Table 1 (overleaf); and
- (iv) a copy of the arrangement had to be available on official government websites and legislation databases.



**Figure 1. Tasmanian continental shelf.**

Between 5 October 2020 and 15 March 2021, we retrieved 2,028 arrangements (Figure 2). Arrangements were retrieved in PDF and subsequently converted to TXT, which was the file format required for the analysis using the software MINOE v1.10, as described below. Four additional arrangements were included in the database after the data collection period and, therefore, were not included in the analysis.



**Figure 2. Number of arrangements included in the database.**

A metadata spreadsheet (Appendix C) was populated with the following information of each arrangement retrieved: (i) file identification; (ii) arrangement title; (iii) arrangement responsible authority; (iv) retrieval date; (v) retrieval source; (vi) arrangement jurisdiction; (vii) arrangement type; (viii) arrangement subtype; (ix) arrangement predominant theme; (x) authorising or related arrangement. This spreadsheet is available for download on the project’s website (<https://ausbluepolicy.net/>).



**Table 1. Types of arrangements collected for analysis.**

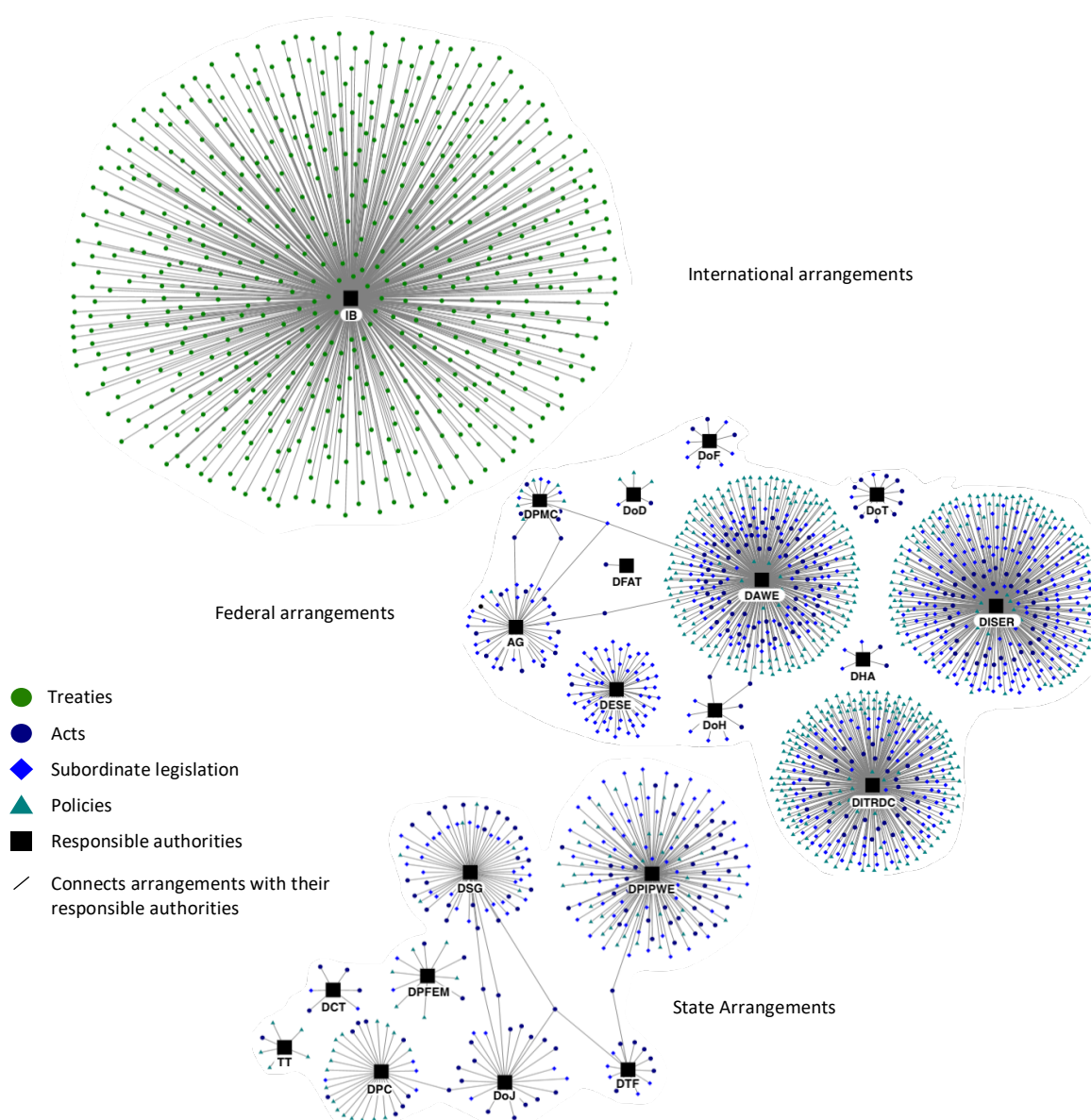
Arrangement category	Description	Source	Observations
Treaty	A written international agreement between Australia and one or more States (or international organisations).	<a href="#">Australian Treaty Series</a>	Treaties included in the database had to be in force at the time of retrieval. The official database used in this research does not make available compilations of treaties; therefore, treaties and their amendments were considered as separate arrangements.
Act	A law passed by both Houses of the Australian Parliament or the Tasmanian Parliament that has received Royal Assent. Acts are also known as statutes or primary legislation.	<a href="#">Federal Register of Legislation</a>  <a href="#">Tasmanian Legislation Online</a>	Acts included in the database had to be in force at the time of retrieval. When existent, compilations of acts were retrieved rather than principal and amending legislation as separate files.
Subordinate legislation	A legal instrument (e.g., regulations, orders, directions, and determinations) enabled or authorised by an Australian or Tasmanian act. Subordinate legislation is also known as delegated or secondary legislation.	<a href="#">Federal Register of Legislation</a>  <a href="#">Tasmanian Legislation Online</a>	Subordinate legislation included in the database included federal legislative instruments (but not federal notifiable instruments) and Tasmanian statutory rules in force at the time of retrieval.
Policy	A policy document (e.g., strategies, plans, guidelines, procedures, and statements) prepared by the Australian or Tasmanian government.	Websites of Australian and Tasmanian government departments	Links to government departments websites are found in Table 2. A policy document produced by a government agency or related organisation was retrieved as belonging to its parent government department.

We acknowledge that our database may not be totally comprehensive. For example, new arrangements that entered into force during or after the data collection period may not have been retrieved for analysis. Arrangements included in the database may have been repealed after their retrieval dates. Also, arrangements available in sources not used in this research, or that do not explicitly or directly cover blue economy issues (e.g., some pieces of tax legislation), may not have been retrieved. Another limitation was that many websites of government departments do not offer tools to access policy documents in a systematic way. Lastly, it is noteworthy that some of the retrieved arrangements may cover issues which are not part of the core of the blue economy discussions at present but may in future (e.g. nuclear energy).

Despite these limitations, our database provides a meaningful sample of arrangements governing and regulating the blue economy in Tasmania, including Commonwealth waters.

## 2.2. Data Analysis

Our data analysis protocol drew on the approach developed in Ekstrom and Young (2009) and employed in Fidelman and Ekstrom (2012) and Fidelman et al. (2019). Firstly, foundational arrangement network graphs were produced in NodeXL (Smith et al., 2010) (Figure 3) to map international, federal, and state blue economy arrangements and their links with the responsible authorities (Table 2).



**Figure 3. Foundational arrangement network graphs illustrating retrieved arrangements and their responsible authorities. Acronyms of responsible authorities are presented in Table 2.**

**Table 2. Acronyms of responsible authorities responsible for blue economy arrangements.**

Arrangement levels	Responsible authorities	Acronyms
International	International bodies*	IB
Federal	<a href="#">Attorney-General's Department</a>	AG
	<a href="#">Department of Agriculture, Water and Environment</a>	DAWE
	<a href="#">Department of Defence</a>	DoD
	<a href="#">Department of Education, Skills and Employment</a>	DESE
	<a href="#">Department of Finance</a>	DoF
	<a href="#">Department of Foreign Affairs and Trade</a>	DFAT
	<a href="#">Department of Health</a>	DoH
	<a href="#">Department of Home Affairs</a>	DHA
	<a href="#">Department of Industry, Science, Energy and Resources</a>	DISER
	<a href="#">Department of Infrastructure, Transport and Regional Development and Communications</a>	DITRDC
	<a href="#">Department of the Prime Minister and Cabinet</a>	DPMC
	<a href="#">Department of Treasury</a>	DoT
	State	<a href="#">Department of Communities Tasmania</a>
<a href="#">Department of Justice</a>		DoJ
<a href="#">Department of Police, Fire and Emergency Management</a>		DPFEM
<a href="#">Department of Premier and Cabinet</a>		DPC
<a href="#">Department of Primary Industries, Parks, Water and Environment</a>		DPIPWE
<a href="#">Department of State Growth</a>		DSG
<a href="#">Department of Treasury and Finance</a>		DTF
	<a href="#">Tourism Tasmania</a>	TT

\* Note: International bodies refer to international organisations linked to treaties or responsible for their administration, as well as signatory countries. At the domestic level, DFAT is the responsible authority of treaties entered into by Australia.

To analyse the existing institutional landscape pertaining to aquaculture and renewable energy, the database of arrangements was analysed in MINOE v1.10, a software tool developed for analysing documents related to ocean management (Ekstrom et al., 2010). The analysis consisted of counting the number of times key terms appeared in arrangements included in the database. Such key terms were organised and aggregated into two topics of interest: (i) aquaculture; and (ii) renewable energy (Table 3).

**Table 3. Key terms used in the text analysis.**

Topic of interest	Key terms used to represent the topics
Aquaculture	aquaculture – aquafarm* – fish farm* – fish hatcher* – mariculture – marine farm* – pisciculture – seafood – sea food
Renewable energy	marine energy – marine power – offshore energy – offshore renewable energy – offshore solar energy – offshore solar power – offshore wind energy – offshore wind power – renewable energy – solar energy – solar power – tidal energy – tidal power – wave energy – wave power – wind energy – wind power

\* Note: the asterisk symbol (\*) was used to instruct the software to return alternative spelling for a word at the point that the asterisk appears.

The key term frequency was used as a proxy indicator of the extent to which arrangements relate to one or both topics of interest. Building on the analysis performed in MINOE, the size of arrangement nodes in the foundational arrangement network graphs was adjusted in the Node XL software to illustrate the variation in key term frequency. The bigger the size of the node, the larger the number of references to key terms (see Figures 4, 5, 6, and 7).

It is important to note a few limitations of our data analysis. For example, issues with file conversions from PDF to TXT may have resulted in minor text corruptions, which may have partially prevented identifying every single key term in a few of the arrangements. When arrangement compilations were not available, key terms may have been counted multiple times in principal and amending arrangements. Other terms that could represent our selected topics of interest may not be part of the set of defined key terms, and such unused terms could create variations in our research results. These are not believed to have compromised the integrity of our findings. Importantly, the approach used in this study provides a rapid and simple form to visualise large and complex policy and legislative landscapes, such as the myriad of arrangements related to the blue economy in Tasmania. In addition, it allows the identification of arrangement clusters around responsible authorities, relationships between responsible authorities and arrangements, as well as gaps and overlaps in the existing such policy and legislative landscapes.

### 3. Results

This section presents the results of our queries for the two selected blue economy topics of interest: (i) aquaculture; and (ii) renewable energy. Results are presented separately for each topic. At the end of this section, arrangements that intersect both topics of interest and involved responsible authorities are also analysed.

#### 3.1. Aquaculture

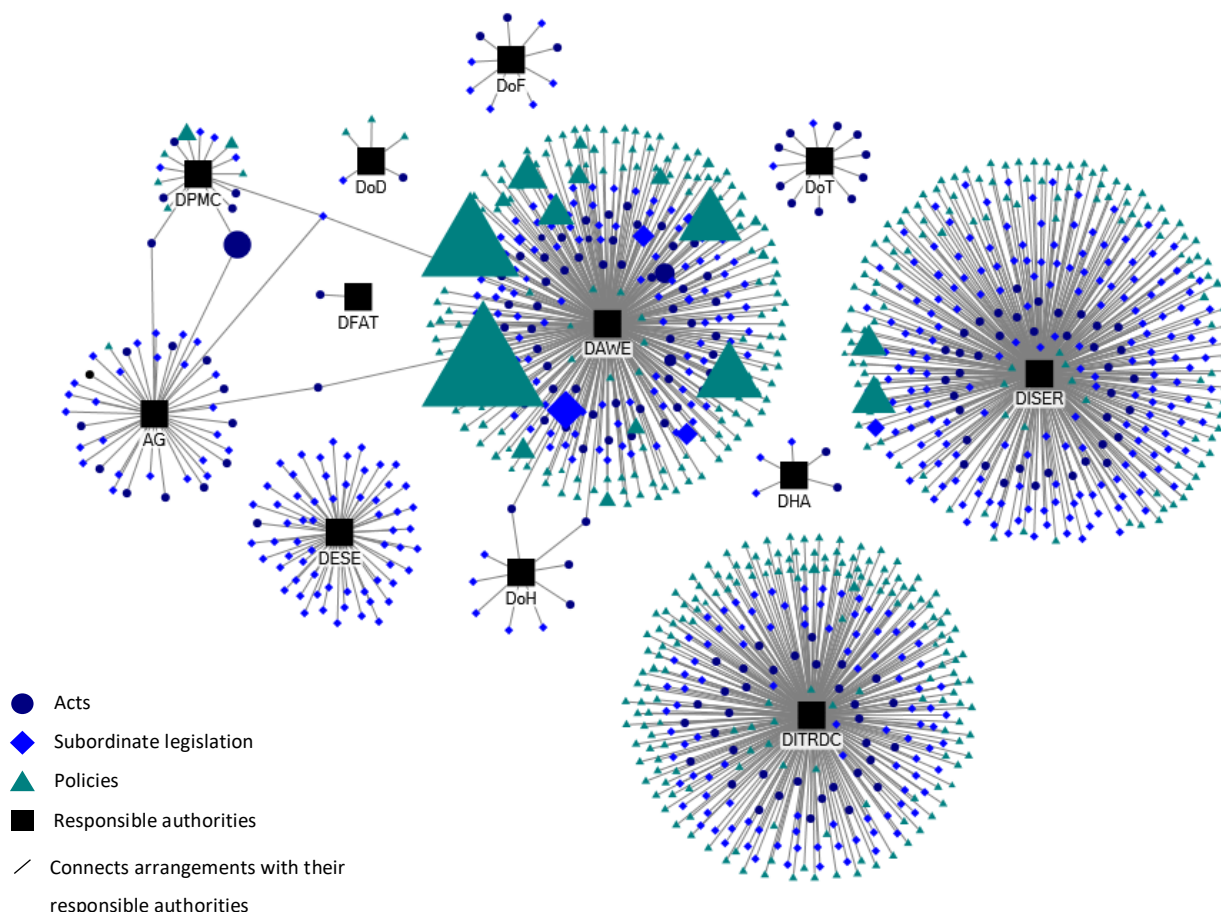
Our defined key terms for aquaculture are contained in arrangements across all three levels analysed (international, federal and state). However, the topic was more predominant in domestic rather than international arrangements. At the international level, our query only captured 12 treaties and 23 references to aquaculture. No international treaty had more than four references to this topic.

Conversely, at the federal level, our defined aquaculture key terms were referenced in 73 arrangements, with a total frequency count of 1,006 – the highest number of arrangements and references among the three levels analysed. Federal arrangements were mostly policies (75.34%), followed by subordinate legislation (16.44%) and acts (8.22%). The federal arrangement containing most references to aquaculture was the National Fishing and Aquaculture Research, Development and Extension (RD&E) Strategy 2010, followed by the National Fishing and Aquaculture Research, Development and Extension Strategy (RD&E) 2016. These are both policy documents prepared by the Fisheries Research and Development Corporation (FRDC), a statutory corporation within the portfolio of the Department of Agriculture, Water and the Environment (DAWE) (Table 4). The federal act with the highest number of references to aquaculture was the *Native Title Act 1993* (Cth) (15 references), an arrangement jointly administered by the Attorney General's Department (AG) and the Department of the Prime Minister and Cabinet (DPMC), that we classified as predominantly pertaining to the "Aboriginal Peoples" theme.

**Table 4. Top 10 arrangements with the highest number of references to the topic 'Aquaculture'**

Arrangement name	Jurisdiction	Arrangement type	Responsible authority	Arrangement theme	Term Count
National Fishing and Aquaculture RD&E Strategy 2010	Australia	Policy	DAWE	Fisheries and Aquaculture	297
Marine Farming Planning Act 1995	Tasmania	Act	DPIPWE	Fisheries and Aquaculture	206
National Fishing and Aquaculture RD&E Strategy 2016	Australia	Policy	DAWE	Fisheries and Aquaculture	190
Inland Fisheries Act 1995	Tasmania	Act	DPIPWE	Fisheries and Aquaculture	129
Living Marine Resources Management Act 1995	Tasmania	Act	DPIPWE	Fisheries and Aquaculture	94
EPBC Act Policy Statement 2.2 - Industry: Offshore Aquaculture	Australia	Policy	DAWE	Marine and Coastal Planning and Environmental Protection	87
The Fisheries Research and Development Corporation R&D Plan 2020-2025	Australia	Policy	DAWE	Fisheries and Aquaculture	79
Environmental Management and Pollution Control (Environmental Licences) Regulations 2019	Tasmania	Subordinate legislation	DPIPWE	Marine and Coastal Planning and Environmental Protection	74
Environmental Management and Pollution Control Act 1994	Tasmania	Act	DPIPWE	Marine and Coastal Planning and Environmental Protection	59
National Marine Science Plan 2015-2025	Australia	Policy	DISER	Miscellaneous	38

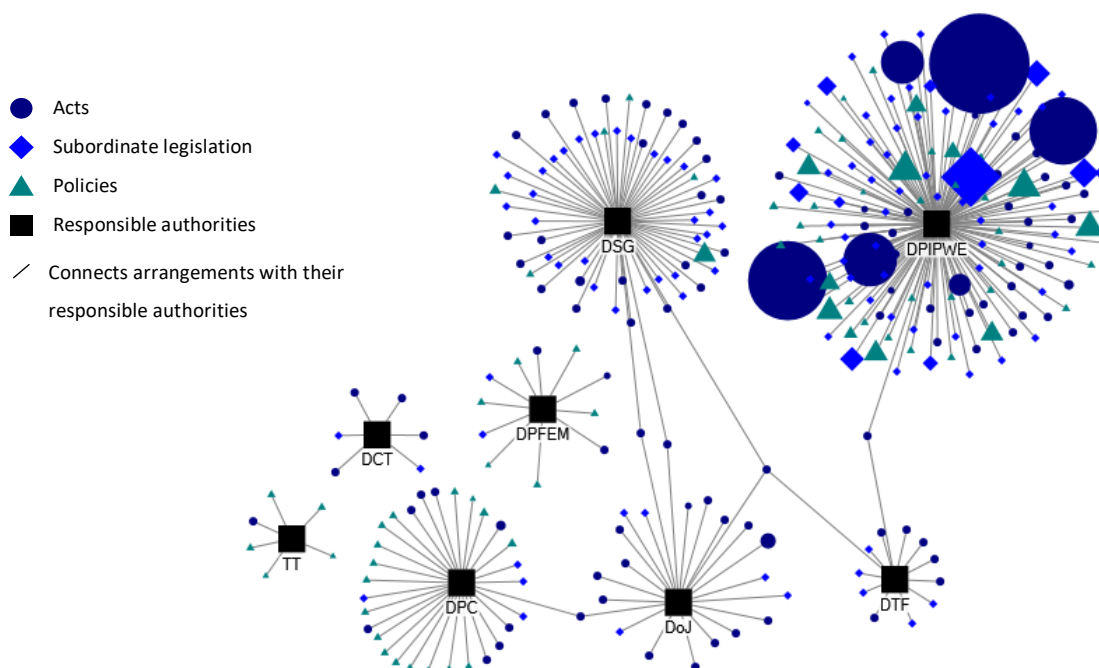
As illustrated by the network graph of federal arrangements (Figure 4), DAWE was by far the department with the most arrangements (a total of 50 arrangements comprising 36 policies, nine pieces of subordinate legislation and five acts), with a total of 879 references to aquaculture. The Department of Industry, Science, Energy and Resources (DISER) appeared in the second position with ten arrangements (eight policies and two pieces of subordinate legislation) containing 84 references, followed by the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) also with ten arrangements (nine policies and one piece of subordinate legislation), but only 16 references.



**Figure 4. Network graph of federal arrangements. Arrangement sizes vary according to the frequency of defined aquaculture key terms.**

For the most part, Tasmanian arrangements captured by our 'aquaculture' query were also policies (46.15%). However, state acts (16 arrangements) accounted for 30.77% of the arrangements with reference to aquaculture. This contrasts with the federal level where, as noted above, six arrangements contained references to aquaculture. In fact, out of the five state arrangements with the highest number of references, four were state acts. The Tasmanian arrangement containing the most references to aquaculture was the *Marine Farming Planning Act 1995*, followed by the *Island Fisheries Act 1995* and the *Living Marine Resources Management Act 1995*, all of which are acts administered by the Department of Primary Industries, Parks, Water and Environment (DPIPWE).

At the state level, DPIPWE ranked as the topmost department involved in aquaculture, being connected with 39 arrangements (16 policies, 12 pieces of subordinate legislation and 11 acts) with a total of 853 references (Figure 5). Other state departments in Tasmania associated with aquaculture are the Department State Growth (DSG) with three arrangements (two policies and one act) containing 16 references, and the Department of Premier and Cabinet (DPC) with four arrangements (three policies and one act) containing seven references.



**Figure 5. Network graph of state arrangements. Arrangement sizes vary according to the frequency of defined aquaculture key terms.**

It is noteworthy that we found a difference in the aquaculture terminology adopted in federal and state jurisdictions. While federal arrangements prefer the term “aquaculture”, Tasmanian arrangements often refer to it as “marine farming”.

### 3.2. Renewable energy

Similarly to our results for aquaculture, the topic of renewable energy was also present in treaties, but it was considerably more frequent in domestic arrangements. Our query only returned six international arrangements containing 29 references to at least one of our defined key terms for renewable energy. The *Statute of the International Renewable Energy Agency* [2011] ATS 12 had the most significant frequency count among retrieved international agreements, with 17 references.

Seventy one federal arrangements referenced our defined renewable energy key terms 1,766 times. Most of these arrangements were policies (53.52%), followed by subordinate legislation (33.80%) and acts (12.68%). However, when the frequency count was considered, the *Renewable Energy (Electricity) Act 2000* (Cth) and its associated regulations emerged as the most relevant arrangements (Table 5), being responsible for more than half of the references to our defined renewable energy key terms at the federal level.

DISER was the federal department responsible for most of the federal arrangements referencing renewable energy with 1,721 references in 50 arrangements (21 policies, 20 pieces of subordinate legislation and nine acts) (Figure 6). In contrast, DAWE and DITRDC had only nine (all policies) and seven (six policies and one piece of subordinate legislation) arrangements, respectively. Together, these federal departments had only 38 references matching our renewable energy topic.

**Table 5. Top 10 arrangements with the highest number of references to the topic 'Renewable energy'**

Arrangement name	Jurisdiction	Arrangement type	Responsible authority	Arrangement theme	Term Count
Renewable Energy (Electricity) Act 2000	Australia	Act	DISER	Energy	465
Renewable Energy (Electricity) Regulations 2001	Australia	Subordinate legislation	DISER	Energy	427
Draft Tasmanian Renewable Energy Action Plan 2020	Tasmania	Policy	DSG	Energy	160
Prospering in a low-emissions world: An updated climate policy toolkit for Australia	Australia	Policy	DISER	Marine and Coastal Planning and Environmental Protection	117
Tasmanian Renewable Hydrogen Action Plan	Tasmania	Policy	DSG	Energy	107
ARENA Corporate Plan 2020-21-2023-24	Australia	Policy	DISER	Energy	90
Australia's National Hydrogen Strategy	Australia	Policy	DISER	Energy	80
Australian Renewable Energy Agency Act 2011	Australia	Act	DISER	Energy	76
Australian Renewable Energy Agency (Consequential Amendments and Transitional Provisions) Act 2011	Australia	Act	DISER	Energy	51
ARENA Investment Plan 2019	Australia	Policy	DISER	Energy	51

In Tasmania, we found 368 references to the topic 'renewable energy' in 17 state arrangements (11 policies, two pieces of subordinate legislation and four acts). Two policies had the most significant number of references: the Draft Tasmanian Renewable Energy Action Plan 2020 and the Tasmanian Renewable Hydrogen Action Plan (Table 5). Both have been prepared by DSG, the Tasmanian department most associated with renewable energy when considering the key term frequency count (297 references) (Figure 7).



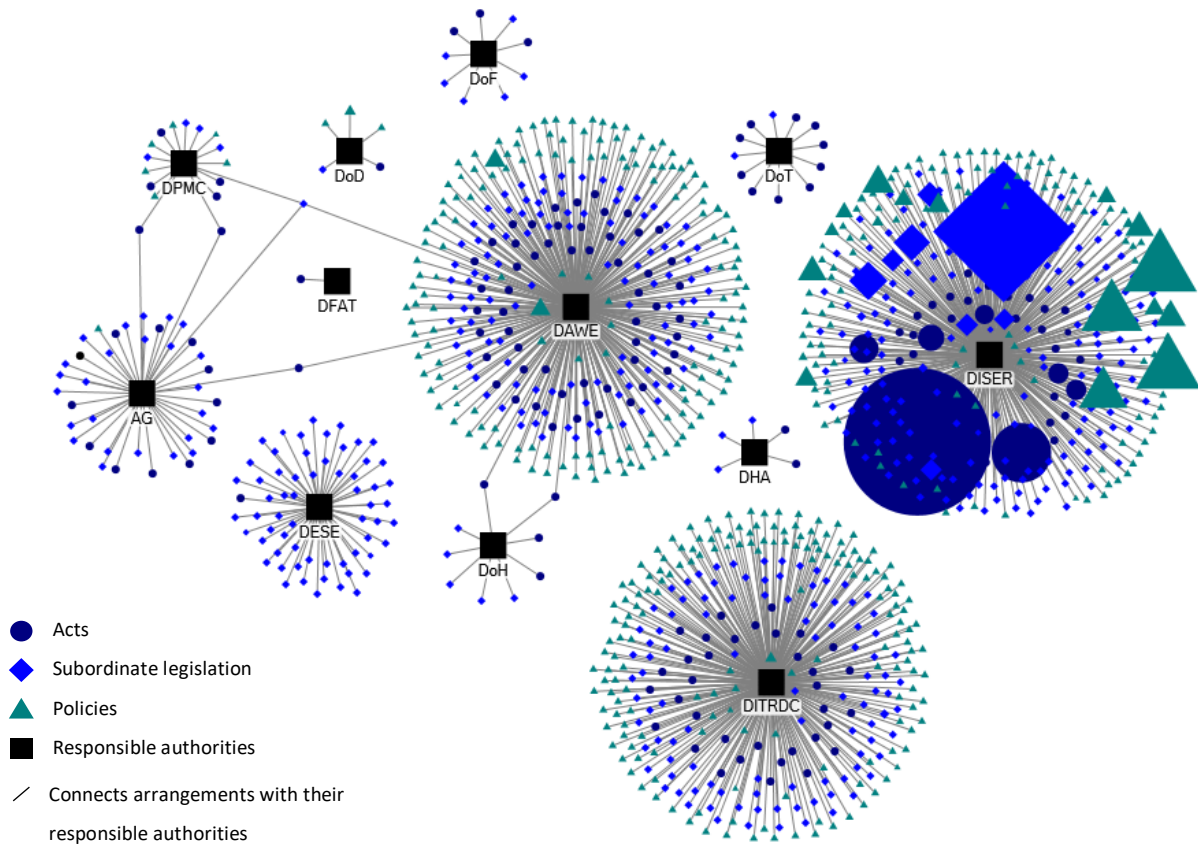


Figure 6. Network graph of federal arrangements. Arrangement sizes vary according to the frequency of defined renewable energy key terms.

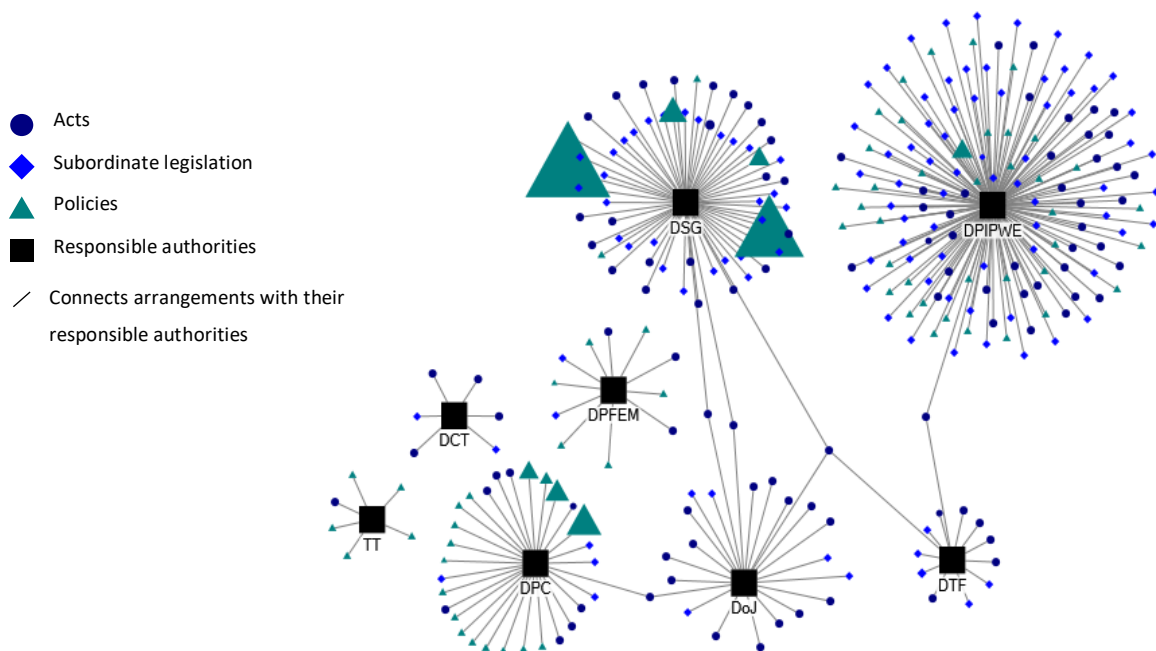


Figure 7. Network graph of state arrangements. Arrangement sizes vary according to the frequency of defined renewable energy key terms.

In terms of number of arrangements, DPC had six arrangements containing our defined renewable energy key terms – one more than DSG and three more than DPIPWE. Of these six arrangements, five were policies and one was an act. However, despite having the highest number of arrangements found in our query at the state level, DSG had only 55 references to the renewable energy topic, 27 of which came from Tasmania’s Climate Change Action Plan 2017-2027.

The term “renewable energy” accounted for 94.54% of all references to our defined renewable energy key terms; therefore, references in retrieved arrangements may not necessarily apply to the development of such activities in the marine environment. Indeed, the term “offshore renewable energy” was only identified once through our query. This reference was found in Australia’s National Hydrogen Strategy, a federal policy of DISER’s portfolio launched on 23 November 2019 by the Council of Australian Governments (COAG) Energy Council. The term “offshore energy” appeared five times on our query, all of them in three federal policies. Yet, apart from the National Marine Science Plan 2015-2015, which mentions the terms “offshore energy” and “marine energy” one time each, other references to the term “offshore energy” appeared to be connected to arrangements dealing with oil and gas activities, and not renewable resources. For example, the HSR Handbook: A Guide for Health and Safety Representatives in Australia’s Offshore Petroleum Industry 2019, prepared by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

### **3.3. The intersection between aquaculture and renewable energy**

Based on the results of our queries presented above, we were also able to identify arrangements that reference the defined key terms for *both* aquaculture and renewable energy. This exercise provided an indication of not only the arrangements that may potentially address these topics of interest in an integrated manner, but also the responsible authorities for such arrangements that may be involved in the development of seafood and renewable energy production systems.

In total, only 23 arrangements referred to both topics. All of them were domestic arrangements: 15 federal arrangements (14 policies and one piece of subordinate legislation) and eight state arrangements (six policies and two acts). Federal government departments with the highest number of arrangements with references to both topics are DAWE (7 arrangements accounting for 144 references) and DISER (5 arrangements with a total of 291 references). In Tasmania, three state government departments are noteworthy: DPC (four arrangements and 52 references), DSG (two arrangements accounting for 281 references) and DPIPWE (two arrangements and 95 references).

On the top 10 list of arrangements with the highest number of references to both topics of interest, only one was an act, while the other nine were classified as policies (Table 6). The *Environmental Management and Pollution Control Act 1994* (Tas) contains 11 references to “fish farm”, nine references to “fish farming” and 39 references to “marine farming”, which may also cover land-based aquaculture, but only mentions a defined renewable energy key term (“wind energy”) once, without an explicit link to the aquaculture industry. However, recent policies have started to explore more closely the intersection between aquaculture and renewable energy. For example, Australia’s National Hydrogen Strategy, the Draft Tasmanian Renewable Energy Action Plan 2020, and the Tasmanian Renewable Hydrogen Action Plan, all highlight the possibility of using renewable hydrogen to support aquaculture activities (e.g., as a shipping fuel to vessels, as a renewable source for offshore operations, and by using the oxygen co-product of hydrogen production). These policies stress the key role the BE CRC is playing in improving scientific knowledge to enable integrated seafood and renewable energy production systems.

**Table 6. Top 10 arrangements with the highest number of references to the defined Aquaculture key terms and the Renewable energy key terms, combined.**

Arrangement name	Jurisdiction	Arrang. type	Resp. authority	Arrangement theme	AQ term Count	RE term count
Draft Tasmanian Renewable Energy Action Plan 2020	Tasmania	Policy	DSG	Energy	3	160
Tasmanian Renewable Hydrogen Action Plan	Tasmania	Policy	DSG	Energy	11	107
Prospering in a low-emissions world: An updated climate policy toolkit for Australia	Australia	Policy	DISER	Marine and Coastal Planning and Environmental Protection	2	117
Australia's National Hydrogen Strategy	Australia	Policy	DISER	Energy	2	80
The Fisheries Research and Development Corporation R&D Plan 2020-2025	Australia	Policy	DAWE	Fisheries and Aquaculture	79	1
Environmental Management and Pollution Control Act 1994	Tasmania	Act	DPIPWE	Marine and Coastal Planning and Environmental Protection	59	1
National Marine Science Plan 2015-2025	Australia	Policy	DISER	Miscellaneous	38	11
South-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region	Australia	Policy	DAWE	Fisheries and Aquaculture	27	10
Tasmanian Coastal Works Manual	Tasmania	Policy	DPIPWE	Marine and Coastal Planning and Environmental Protection	25	10
Tasmania's Climate Change Action Plan 2017-2021	Tasmania	Policy	DPC	Marine and Coastal Planning and Environmental Protection	2	27

Note: AQ = aquaculture; RE = renewable energy

A direct connection between aquaculture and renewable energy is equally made by the National Marine Science Plan 2015-2025, which indicates that future investments should prioritise innovation in several areas of the blue economy, including aquaculture and ocean renewable energy. This plan also calls attention to the

need for more scientific research orienting the development of leading practice regulatory frameworks for the exploitation of emerging marine energy sources.

## 4. Discussion

We discuss below the potential gaps and overlaps in relation to policy and legislative arrangements relating to aquaculture and renewable energy in the context of Australia's blue economy, as well as future research opportunities in this area.

### 4.1. Gaps and overlaps

The gap seen in international arrangements in addressing aquaculture and renewable energy is consistent with previous research. This demonstrates that, apart from scarce generic provisions included in a handful of international arrangements (e.g., articles 56 and 60 of the *United Nations Convention on the Law of the Sea* [1994] ATS 12), there is a lack of legal mechanisms to regulate fish farms, in both exclusive economic zones and international waters (Ben-Yami, 2011; Hawes, 2014). While national waters still offer suitable locations for new marine farms, operations have gradually been moving further offshore. As a result, the Food and Agriculture Organisation of the United Nations (FAO) has been called to develop international principles and governance instruments for regulating aquaculture activities in the high seas (FAO, 2010). In relation to offshore renewable energy, the International Renewable Energy Agency (IRENA) has actively supported initiatives to accelerate offshore renewable energy projects, while acknowledging that such projects may help the aquaculture sector to reduce its carbon footprint (IRENA, 2020).

Overall, our research points to the need for increased collaboration between FAO, IRENA and other international organisations, to strengthen the international policy and legislative environment for the sustainable deployment of seafood and renewable energy production systems. In addition to treaties (the only international arrangement type included in our database), soft international policy instruments may also contribute to this objective. For example, the High-Level Panel for a Sustainable Ocean Economy (Ocean Panel), an initiative established in 2018 by 14 countries (including Australia), has recently developed an action agenda for boosting a sustainable ocean economy. This involves voluntary commitments to explore and incentivise cross-sectoral and co-located activities, such as those pertaining to ocean-based renewable energy and aquaculture (Ocean Panel, 2020).

At the domestic level (i.e. the Commonwealth of Australia and the State of Tasmania), we identified multiple responsible authorities that would need to be involved in the development of integrated seafood and renewable energy production systems. Our network arrangement graphs suggest that overlaps exist between government department responsibilities. On the one hand, DAWE and DPIPW emerged as the most relevant government departments for aquaculture activities. On the other, DISER and DSG were identified as the most important authorities with responsibilities over renewable energy. In addition to these departments, several other government agencies also have a role to play in this area, such as NOPSEMA and the Australian Fisheries Management Authority (AFMA). This fragmented governance may pose significant challenges to projects combining aquaculture and renewable energy activities, as the greatest impediments to action over the marine domain in Australia are frequently related to the jurisdictional issues between the Commonwealth and the States (Vince, 2018). It is noteworthy that even projects located in Commonwealth waters (e.g. offshore wind farms) will typically require associated infrastructure (e.g. submarine cables) along the first three nautical miles where the States have jurisdiction (Briggs et al., 2021).

Another important gap is the lack of a specific regulatory framework for offshore renewable energy at the federal level. This is inferred from the small number of references to key terms for offshore renewable energy in the federal legislation. In this context, the Commonwealth Government released for public comment a discussion paper outlining a proposed regulatory framework for offshore renewable energy in January 2020 (DISER, 2020). It is expected that two bills – the Offshore Renewable Energy Infrastructure Bill (Cth) and the Offshore Renewable Energy Infrastructure (Regulatory Levies) Bill (Cth) – will be introduced to the Australian Parliament in the second semester of 2021 (DPMC, 2021). However, whether this new framework will address projects covering both Commonwealth and State waters remains uncertain (Schlink and Rutherford, 2021).

In relation to aquaculture, the Commonwealth Government has preferred to support aquaculture operations through soft policy instruments, leaving the actual regulation of such activities with the States. While we found a significant number of federal arrangements classified as policies (75.34%), we also noticed that the State of Tasmania has a more statute-based regulatory framework for aquaculture. Considering this regulatory gap, and the fact that technological advances have increased the feasibility of aquaculture activities in Commonwealth waters, the National Aquaculture Strategy has proposed changes in the *Fisheries Management Act 1991* (Cth) to allow States to extend their existing aquaculture regulatory framework to cover adjoining Commonwealth waters (DAWE, 2017).

These legislative initiatives may contribute to reducing existing gaps in aquaculture and offshore renewable energy legislation, but regulatory complexity and fragmentation may persist in relation to co-located projects. Our results suggest that aquaculture and renewable energy have been dealt with in isolation. As legislative proposals commented above also intend to separately address aquaculture and offshore renewable energy, integrated seafood and renewable energy production systems will need to contend with multiple permitting systems and different authorities responsible for authorising different activities of co-located projects. They will also face different state regulatory frameworks, which may eventually influence decisions regarding where projects should be located. In this context, intergovernmental collaboration – that may eventually entail formal intergovernmental agreements – may be a way forward. By bringing together participants from government, industry and academia, the BE CRC is well-positioned to play the bridging role in negotiations to streamline and modernise federal and state regulatory frameworks.

#### **4.2. Future opportunities identified by this research**

The network-based, semi-quantitative approach adopted in this research provides a powerful means to undertake analysis of large databases of policy and legislative arrangements relating to the blue economy (and ocean governance, more broadly). Multiple queries can be performed for single or multiple levels of governance, enabling the identification of what arrangements and responsible authorities are involved in the management of a topic selected for analysis (in this project, aquaculture and renewable energy). This approach also contributes to the identification of policy and legislative gaps and overlaps that may hinder aquaculture and renewable energy development. While this research project focused on arrangements pertaining to these two sectors, the same approach can be applied to our database by BE CRC participants to perform analyses involving other topics relevant to the blue economy.

Having conducted similar research in California, Ekstrom (2009) listed the following potential applications for this semi-quantitative approach:

- Educational: our database and arrangement network graphs may be used for teaching and learning. Students and early career researchers can consult the database and develop their own arrangement network graphs to investigate and visualise various topics of interest within Australia's fragmented blue economy policy and legislative environment.

- Management and policy: public servants and private consultants can access the arrangements available in the database and make their own queries and network graphs. These exercises may be undertaken in the early stages of policy-making and development assessment processes, to quickly identify relevant arrangements and their responsible authorities, as well as potential gaps and overlaps.
- Governance and management effectiveness evaluation research: our database may be used by researchers for conducting quantitative and semi-quantitative studies on blue economy issues. In addition, results from new database queries and analyses of network graphs may inform the design and implementation of deeper qualitative studies.

In this regard, a potential follow-up research project could qualitatively assess the aquaculture and renewable energy arrangements identified through our semi-quantitative approach. This would result in more detailed information of not only arrangements and responsible authorities involved in these activities, but also of what licences, permits and authorisations are currently required for integrated seafood and renewable energy projects. Also, successful identification of gaps and overlaps may require in-depth analysis of other existing arrangements, as there may be additional approvals that are not specifically prescribed in the regulatory framework as an “aquaculture” or “offshore energy” provision.

Building on the analysis above, surveys, interviews and/or focus groups with BE CRC participants could be conducted for identifying opportunities to streamline and simplify policy and regulatory processes applicable to co-located projects. This suggestion is aligned with both the milestones of Research Program #5 (Sustainable Offshore Developments) of the BE CRC (BE CRC, 2021a), and the recommendations made in the final report of the BE CRC project “Developing a policy and regulatory research plan for Australia’s emerging Blue Economy” (5.20.004) (Rissik et al., 2020).

On 26 July 2021, we presented the results of this project to BE CRC participants in a webinar (recording available at: <https://www.youtube.com/watch?v=zCmZ9YWHZrU>). In this opportunity, we also received suggestions for future studies that may build on the outcomes of this research project, such as the mapping of spatial-explicit gaps and overlaps (e.g. the analysis of what arrangements apply to a specific geographic location where a blue economy project is being planned). Webinar participants welcomed the development of the database and suggested it should be expanded to other jurisdictions (e.g., other Australian States), as well as periodically maintained and updated.

## 5. Acknowledgements

The authors acknowledge the financial support of the Blue Economy Cooperative Research Centre, established and supported under the Australian Government’s Cooperative Research Centres Program, grant number CRC-20180101.

We thank the participants of the webinar held on 26 July 2021, who provided feedback on this research project.

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## Appendix A – Project Synopsis

Project Leader	Project Team
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Date Reported to the BE CRC	
08/2021	
Approved by the BE CRC	
<b>Dr John Whittington,</b> BE CRC CEO	
Project Objective(s)	BE CRC Milestones
<ol style="list-style-type: none"> <li>Map the existing policy and legislative environment (i.e., policies and legislation and responsible agencies) as they relate to blue economy uses, activities and resources across multiple sectors and jurisdictions;</li> <li>Undertake cross-sector analyses to identify gaps and overlaps that may hinder the development and operation of blue economy activities with a focus on those relating to integrated seafood and energy production systems; and</li> <li>Develop a searchable online database of the policy and regulatory environment mapped in Objective 1.</li> </ol>	<p>BE CRC Milestone 5.1 BE CRC Milestone 5.5</p>
Utilisation/Commercialisation Opportunities	
The online database of blue economy policy and legislative arrangements that was developed in this project can be used by industry, government, and researchers in their decision-making and planning. It can also be used for the development of network graphs for other blue economy topics of interest.	
Intellectual Property	
No IP resulting from the research needs protection.	
Confidentiality	
Does this report include confidential information? Yes <input type="checkbox"/> or No <input checked="" type="checkbox"/>	

## Appendix B – Short Science Summary

A short science summary for this project is provided on the following page(s).

## 5.20.007 - Mapping and analysis of blue economy policy and legislative arrangements

### SHORT SCIENCE SUMMARY

#### KEY POINTS

- We developed a searchable online database of international, federal, and state blue economy policy and legislative arrangements (available at <https://ausbluepolicy.net/>).
- Based on arrangements included in the database, we developed network arrangement graphs to facilitate analysis and visualisation of relevant arrangements for aquaculture and renewable energy and their corresponding responsible authorities.
- Our semi-quantitative approach allowed the identification of potential gaps and overlaps that may hinder the deployment of integrated and renewable energy production systems.

#### THE CHALLENGE

Blue economy uses, activities and resources are traditionally managed on a sectoral basis, involving independent entities pertaining to different jurisdictions. In this sense, current efforts towards seafood and renewable energy production systems and other integrated blue economy activities will need to contend with a complex and fragmented policy and legislative environment, which may not be entirely fit-for-purpose.

#### THE OPPORTUNITY

Policy research has predominantly used qualitative methods, which are generally time-consuming and conducted on a small-scale, ad-hoc basis; therefore, challenges may arise when large-scale and holistic evaluations of complex and dynamic policy and legislative systems are required. Quantitative and semi-quantitative methods may complement such traditional approaches by offering a broad and integrated view of institutional landscapes, particularly

at the initial stages of the policy and legislative analysis process.

#### OUR RESEARCH

##### OBJECTIVES

The objectives of this project were to:

- (i) map the existing policy and legislative environment (i.e., policies and legislation and responsible agencies) as they relate to blue economy uses, activities and resources across multiple sectors and jurisdictions;
- (ii) undertake cross-sector analyses to identify gaps and overlaps that may hinder the development and operation of blue economy activities with a focus on those relating to integrated seafood and energy production systems; and
- (iii) develop a searchable online database of the policy and regulatory environment mapped in objective (i).

##### MATERIALS AND METHODS

The database develop consisted of arrangements pertaining to coastal and marine areas within the seaward boundaries of the continental shelf around Tasmania. We collected international treaties, federal and state acts, subordinate legislation, and policies from official government websites and legislation databases as they related to aquaculture and renewable energy. Data analysis was performed using the software MINOE v1.10 and NodeXL and involved text mining based on key terms defined for aquaculture and renewable energy, as well as the development and analysis of network graphs.

##### RESULTS

We identified 1,915 references to aquaculture in 137 arrangements as follows: (i) international level: 12

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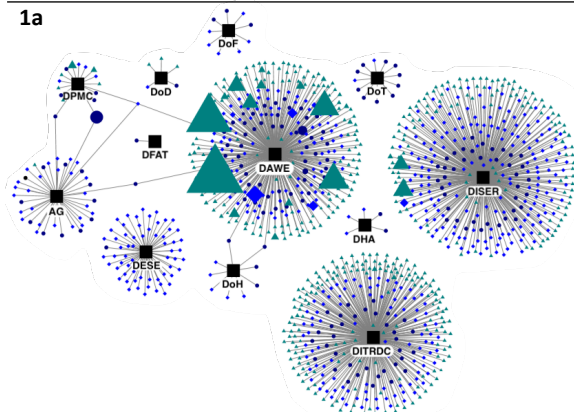
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## 5.20.007 - Mapping and analysis of blue economy policy and legislative arrangements

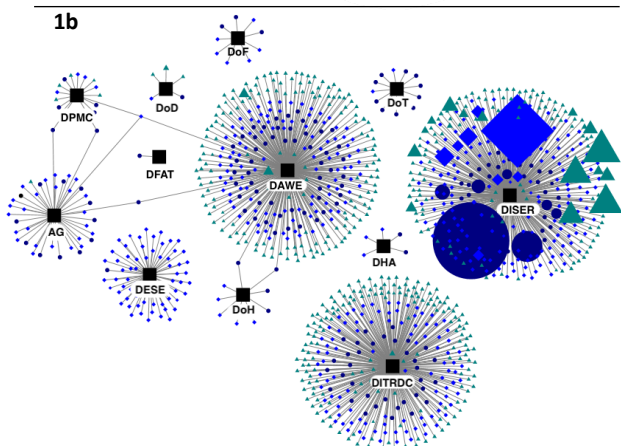
### SHORT SCIENCE SUMMARY

arrangements and 23 references; (ii) federal level: 73 arrangements and 1,006 references; (iii) state level: 52 arrangements and 886 references.

1a



1b



**ACRONYMS**

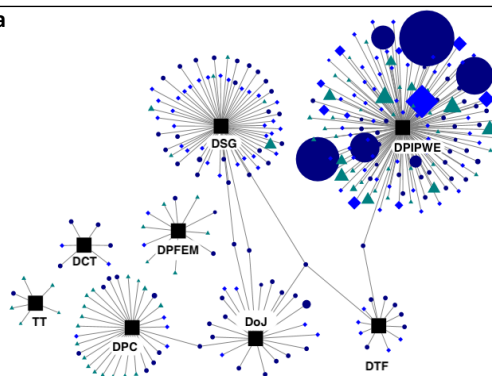
AG: Attorney-General's Department  
DAWE: Department of Agriculture, Water and the Environment  
DoD: Department of Defence  
DESE: Department of Educations, Skills and Employment  
DoF: Department of Finance  
DFAT: Department of Foreign Affairs and Trade  
DoH: Department of Health  
DHA: Department of Home Affairs  
DISER: Department of Industry, Science, Energy and Resources  
DITRDC: Department of Infrastructure, Transport, Regional Development and Communications  
DPMC: Department of the Prime Minister and Cabinet  
DoT: Department of Treasury

- Acts
- ◆ Subordinate legislation
- ▲ Policies
- Responsible authorities
- Connects arrangements with their responsible authorities

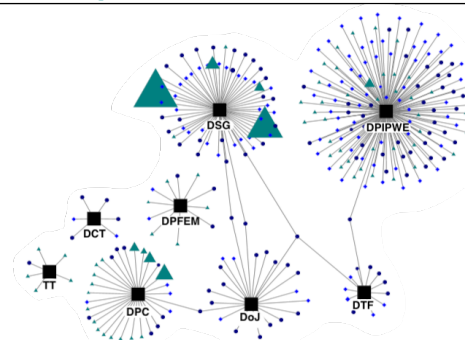
**Figure 1.** Network graph of federal arrangements for aquaculture (1a) and renewable energy (1b). Arrangement sizes vary according to the frequency of defined terms. Aquaculture arrangements were linked to 12 government departments. The Australian Department

of Agriculture, Water and the Environment (DAWE) and the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) emerged as the potentially most relevant responsible authorities. Results showed that most federal arrangements relating to aquaculture were policies (approximately 75%). They also revealed that the regulatory framework in Tasmania has a higher number of aquaculture arrangements classified as acts when compared to the federal level (see Figures 1a and 2a).

2a



2b



**ACRONYMS**

DCT: Department of Communities Tasmania  
DoJ: Department of Justice  
DPPEM: Department of Police, Fire and Emergency Management  
DPC: Department of Premier and Cabinet  
DPIPWE: Department of Primary Industries, Water and Environment  
DSG: Department of State Growth  
DTF: Department of Treasury and Finance  
TT: Tourism Tasmania

- Acts
- ◆ Subordinate legislation
- ▲ Policies
- Responsible authorities
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**Figure 2.** Network graph of state arrangements for aquaculture (2a) and renewable energy (2b). Arrangement nodes sizes vary according to the frequency of defined terms.

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## 5.20.007 - Mapping and analysis of blue economy policy and legislative arrangements

### SHORT SCIENCE SUMMARY

In relation to renewable energy, we identified 2,163 references in 94 arrangements divided as follows: (i) international level: 6 arrangements and 29 references; (ii) federal level: 71 arrangements and 1,766 references; and (iii) state level: 17 arrangements and 368 references.

Renewable energy arrangements were linked to 11 government departments. The Australian Department of Industry, Science, Energy and Resources (DISER) and the Tasmanian Department of State Growth (DSG) emerged as the potentially most relevant responsible authorities (see Figures 1b and 2b). Ninety four percent of all references were made to the term “renewable energy”, while the terms “offshore energy” and “offshore renewable energy” accounted for only six references.

We only identified 23 arrangements that made reference to both aquaculture and renewable energy topics (15 federal arrangements and eight state arrangements), of which 20 were policies.

#### OUTCOMES

Our network arrangement graphs identify overlap of responsibilities between government departments. On the one hand, DAWE and DPIPW emerged as the most relevant government departments for aquaculture activities. On the other hand, DISER and DSG were identified as the most important responsible authorities in the field of renewable energy.

In addition, a gap exists in the blue economy regulatory framework of arrangements that cover aquaculture and renewable energy in an integrated manner. Findings indicate that the creation of the Blue Economy CRC has helped to inform policy in this area.

#### NEXT STEPS

The next steps of this research project include (i) the development of qualitative studies to further investigate policy and legislative gaps and overlaps hindering integrated seafood and renewable energy productions systems with the aim of streamlining regulatory processes and improving coordination among government departments and other blue economy stakeholders; (ii) the identification of new blue economy topics of interest that could be explored with our text mining and network mapping approaches; (iii) the identification of priorities relating to the expansion of our database; and (iv) the exploration of options to allow regular maintenance and update of the database, as well as strategies for its improvement.

#### PROJECT TEAM

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#### PROJECT REPORTS/PUBLICATIONS

Frohlich, M., Fidelman, P., Dutton, I., Haward, M., Head, B.W., Rissik, D. & Vince, J. (2021). *Mapping and analysis of blue economy policy and legislative arrangements 5.20.007 – Final Project Report*. Hobart: Blue Economy Cooperative Research Centre.

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## Appendix C – Supporting Material(s)

The metadata spreadsheet can be downloaded at <https://ausbluepolicy.net/files/policyDB.xlsx>.