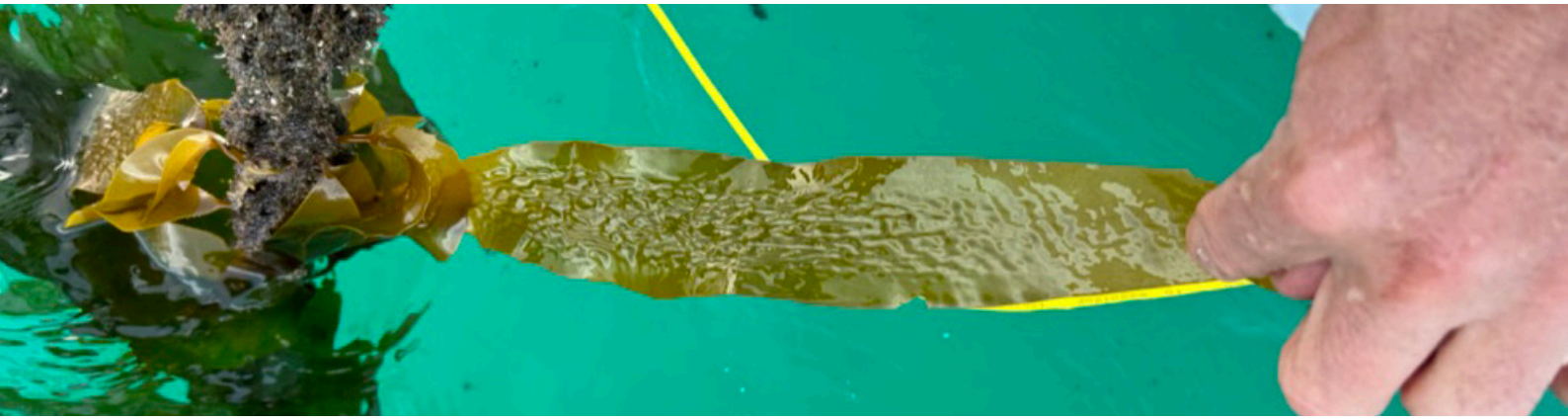
Auskelp

Productivity Commission Review

29 Oct 2024

AusKelp Pty Ltd

Bega Circular Valley Eden visit
30 October 2024



Kelp Farming - offshore NSW waters

Auskelp seeks offshore kelp testing locations in Australian Commonwealth Waters, and regulatory approval for Eden 1 offshore kelp farm located in Disaster Bay NSW (designated AL21/004).

Kelp farming has the potential to be one of Australia's great industries. It will create jobs in coastal communities, is good for the environment, and delivers healthy and innovative products. Kelp can readily replace resource-intensive products like meat, plastics, fossil fuels and conventional fertilisers - without emissions of CO2.

It is increasingly clear that rising ocean temperatures are destroying wild kelp populations, in Australia and globally. This has a detrimental effect of wild fish populations as well as the industries that rely on kelp products. Thankfully, a native Australian kelp found in our southern waters, known as **Golden Kelp**, may prove to be one of the world's best candidates for ocean farming.

Auskelp have been working for more than five years to prove the viability of growing Golden Kelp in high-energy, open-ocean conditions. Since 2019, Auskelp has developed a comprehensive seeding, hatchery and ocean testing program for Golden Kelp.

With the approval of the NSW government we have been testing in open ocean conditions in Twofold Bay and Disaster Bay NSW. The results of our testing program have been ground-breaking and prove that a viable business model exists to develop commercial scale Golden Kelp ocean farms.

The more we learn about Golden Kelp, the clearer it has become that this hardy Australian kelp can withstand (and even benefit) from exposed, high-energy ocean environments.

Currently, no clear regulatory pathway exists for the approval of offshore test or farming locations in either State or Commonwealth Waters. We hope this **Productivity Commission Review** will provide the basis for further collaboration and approval of these important initiatives.

Sincerely,

Christopher Ride
Managing Director

AusKelp

1. About Auskelp

Auskelp is an early-stage developer of commercial kelp farms. Founded in 2019, Auskelp's objective is to create a viable kelp industry in southern-NSW and eastern-Victoria. There is currently NO KELP FARMING in Australian waters, necessitating that the processes, procedures and government approvals must be developed for the first time.

Auskelp was founded by Christopher Ride, a former IT executive who built Australia's largest privately-owned IT company, Interactive, for more than 25 years. Chief scientist for Auskelp is Job Schipper, recognised as one of the world's leading seaweed experts. Job has been farming seaweed since 2008 and was the founder of Hortimare BV which is one of the world's leading seaweed propagation companies.

Auskelp conducts the most advanced open-ocean Ecklonia radiata testing program in Australia. Through trial-and-error research, we have built a reliable laboratory, field-development and high-energy ocean testing program with an aim to create a new aquaculture industry. We currently have two test locations in NSW. Our objective is to protect marine eco-systems as well as create permanent coastal jobs not affected by drought, bushfire and other environmental factors.

Kelp farms are generally deployed above 'ocean deserts' and can be grown in either State or Commonwealth waters. Ocean deserts are characterised by a shale or sandy bottom with no coral areas, reefs or underwater structures.

Australia's southern waters may be the ideal environment for the deployment of open-ocean kelp farming. Current testing programs prove the viability of growing golden kelp in high-energy ocean conditions.

- Successful Ecklonia radiata breeding program
- Successful early-stage Ecklonia radiata ocean testing (ongoing)
- Development of proprietary Ecklonia radiata breeding practices and protocols
- Ongoing development of ocean testing rigs and high-energy ocean infrastructure designs
- Current lease holder of 200-hectare ocean lease (pending SSD); holds 2 x high-energy ocean testing leases; holder of a Class-A aquaculture licence

Auskelp, Golden Kelp - 86 days old

Auskelp, Disaster Bay - Southern NSW

2. Eden 1

Eden 1 is currently the only commercial-scale seaweed farm undergoing regulatory approval in NSW marine waters. The farm is located in Disaster Bay approximately 23km south-west of Eden in an area zoned as "available for aquaculture" by NSW Department of Planning and Industry (NSW DPI). Auskelp have completed a rigorous evaluation and submission process whereby we have successfully obtained the requisite aquaculture permit and have also obtained a marine aquaculture lease (designated: AL21/004) from NSW DPI [contingent on State Significant Development consent].

Auskelp are currently doing open-ocean testing in Twofold Bay (since 2022) and Disaster Bay (2024).

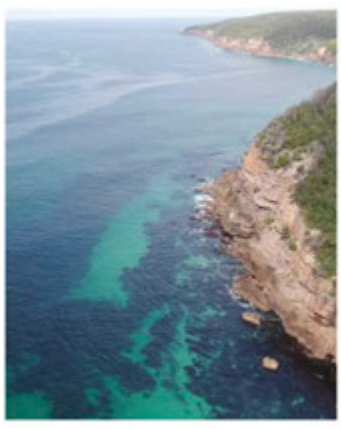
Seeding program

Auskelp's seeding program (commenced March 2021) was propagated from wild kelp harvested from local Ecklonia radiata kelp beds located in Disaster Bay, southern NSW. Mature (Stage 3) kelp was collected and the 20+ unique specimens have been propagated in dedicated laboratory conditions to generate 12+ individual gametophyte cultures which form the basis of our testing program. The gametophyte biomass cultures are individually multiplied in red-light incubators using biosafe processes.

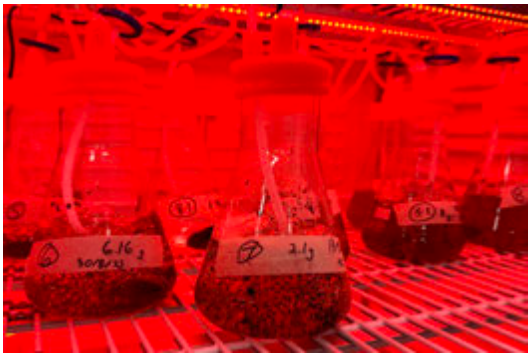
Dual testing locations

Auskelp have been successfully testing growth rates and mortality parameters for Golden Kelp in Twofold Bay (Eden 1 Test Area) and we have now deployed a second test area in Disaster Bay (Eden 2 Test Area), which was commissioned on 1 March 2024. The Eden 2 test Area is the first open-ocean Golden kelp test area located in pristine ocean waters (with no sewerage runoff or artificial nutrient loading). The Eden 2 Test Area is expected to provide similar offshore conditions, however ocean temperatures are expected to be higher further offshore and nutrient levels are expected to be lower.

Disaster Bay NSW: Eden 1 Project & Test Areas



Technical program



Gametophyte production

Auskelp have developed a purpose-built hatchery and seeding program unique to kelp populations in southern NSW. Auskelp utilise purpose-built water filtration systems and red-light incubators with proven protocols for the propagation of healthy gametophytes utilising laboratory grade biosafety practices.

Sporophyte production

White-light incubators and associated processes and protocols have been developed for the maturation of sporophytes that are used for direct ocean seeding. Proven transportation processes and low mortality handling protocols have been developed allowing for risk-free on-water deployment.

Ocean test lines

We have developed simple ocean rig designs that allow for cost-effective deployment of multi-protocol seeded lines, including twine and direct seeding methodology. We have also pioneered the measurement of Golden kelp growth rates and mortality parameters.

Picture 1: Auskelp laboratory

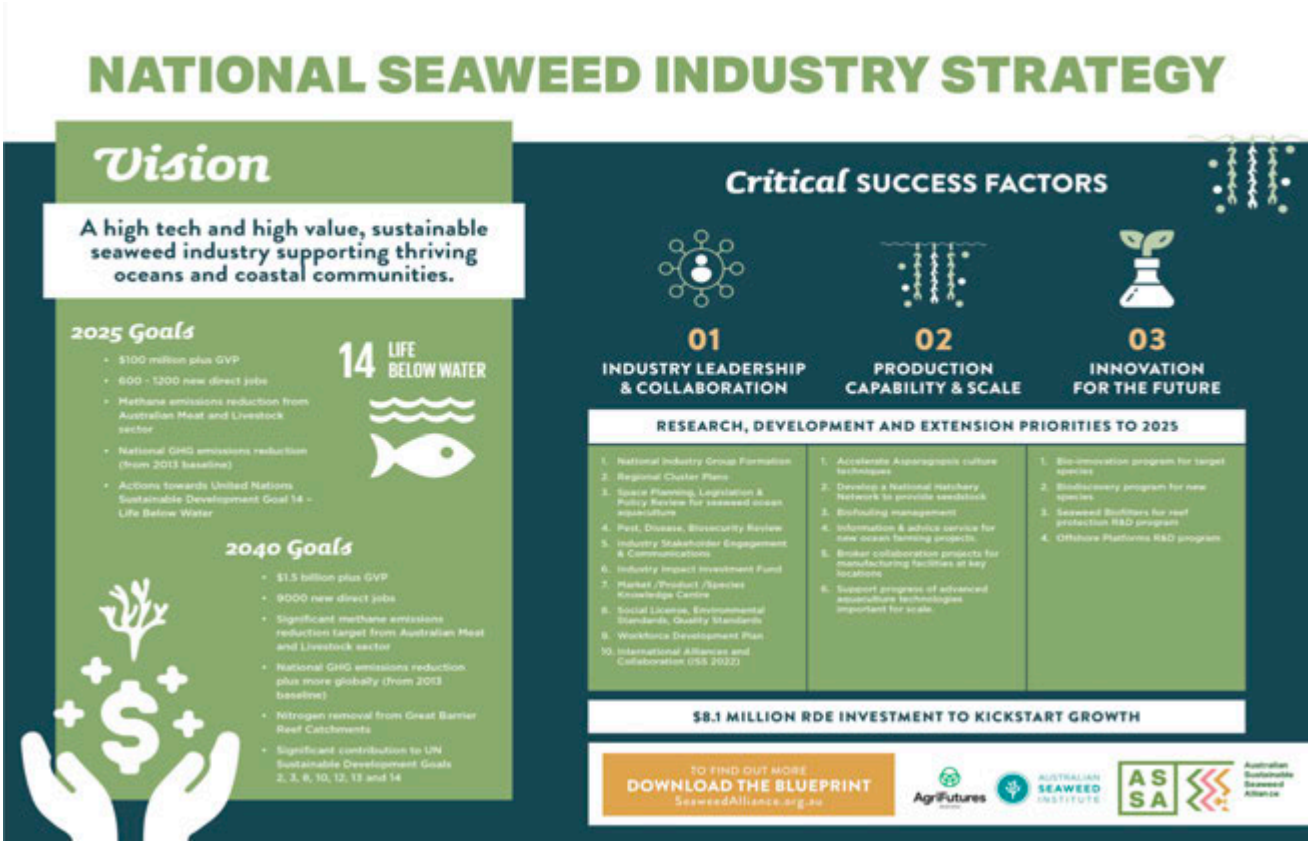
Picture 2: Auskelp red-light incubator and kelp gametophytes

Picture 3: Auskelp technical staff

3. Seaweed industry

Seaweed is a global industry of over **USD $16.5 billion** and is growing rapidly. Development of a seaweed industry is aligned to the Australian National Aquaculture Strategy [with the objective to double the current value of Australia's aquaculture industry], and the National Marine Science Plan 2015-2025 which aims to drive the development of Australia's blue economy.

It is expected that **9,000 direct jobs** will be created in Australia by 2040 directly linked to seaweed farming, with a total **GVP of $1.5b**. Kelp farms are categorised as non-intensive aquaculture and does not introduce feed, fertilisers or pesticides to ocean waters. Kelp farms (globally) utilise standard long line structures and native Australian seaweeds are to be grown from locally sourced seedstock. Ecklonia radiata (Golden kelp) has not been farmed commercially in Australia or globally before. Development of an Australian-based seaweed industry is consistent with government requirements to enhance domestic food and feed production to ensure greater self-sufficiency.

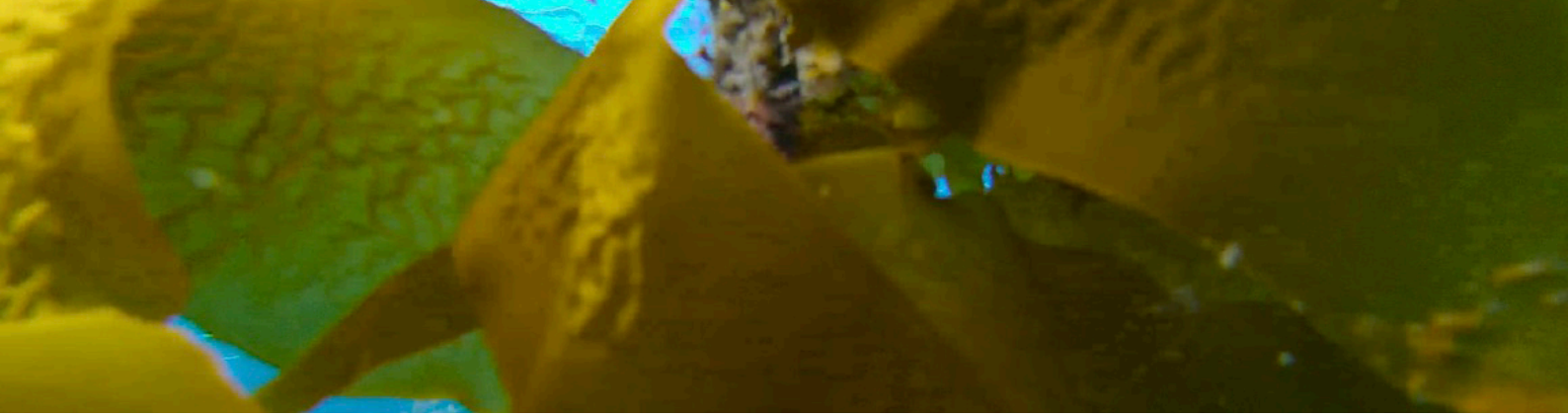


Blue Economy

Seaweed farming plays an important role in the Blue Economy and the achievement of the United Nations Sustainable Development Goals, which includes contributing to climate change mitigation and adaptation. Seaweed is one of the fastest growing plants on the planet and absorbs significant amounts of carbon dioxide and nitrogen from the oceans. By sustainably using the marine resources for sustainable aquaculture we can contribute to the UN's Sustainable Development Goals - 8 [Decent work and economic growth], 9 [Industry, innovation and infrastructure], 12 [responsible consumption and production], 13 [Climate action] and [14 Life below water].

Because ocean farms require no freshwater, no deforestation, no pesticides or fertiliser, this process is significantly more sustainable than any land based farming.

The Australian coastline, specifically the southern regions, appear to have ideal growing conditions for high-value, commercially-grown native kelps. The question remains, can native Australian kelps be grown in high energy offshore environments and are the necessary nutrients naturally available in the water column to produce the required biomass.



4. Australian kelps

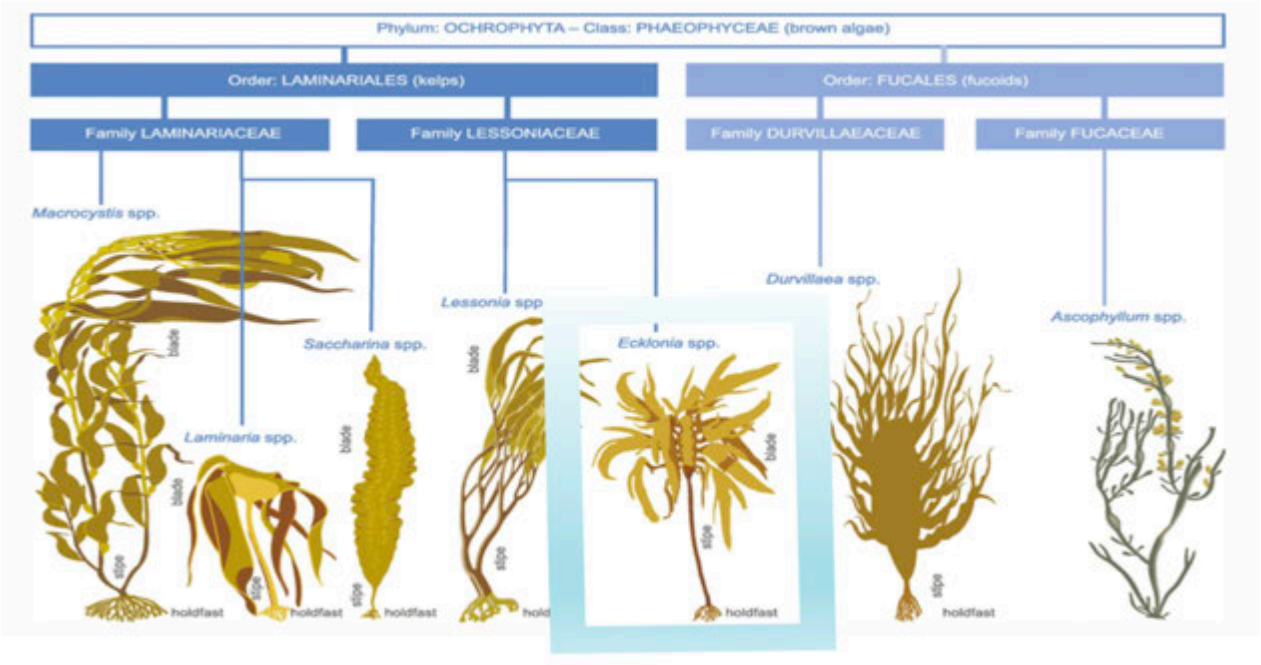
Southern Australian waters are dominated primarily by **Golden Kelp** known as *Ecklonia radiata* (Victoria, NSW and South Australia), Macrocystis (Tas) and Durvillaea brown kelps along the southern coastlines. Ocean testing programs conducted by Auskelp have successfully grown **Golden Kelp** in high-energy, open-ocean environments in Southern NSW waters.

Ecklonia radiata is proven to be fast-growing, high in nutrients, and is capable of being grown on longlines which are suitable for commercial kelp farm applications. **Golden Kelp** grows to approximately 2.5m in length and shows remarkable elasticity, which makes it ideal for deployment in high-energy environments. Brown kelps can be used for a diverse range of end-user products, which includes the following:

- **Food for human consumption**: high in protein and nutrients
- **Feed for livestock**: feed supplement and growth enabler, potentially a methane inhibitor
- **Fertiliser for farming**: high nutrient plant supplements
- **Pharmaceuticals, cosmetics and food additives**: rich in fucoidan, iodine, antioxidants and alginates
- **Bio-fuels and bio-plastics**: ideal for environmentally-friendly protein based products
- **Carbon storage, bio-char and carbon sink**: sequesters carbon and delivers low carbon enablers

With storm-cast wild kelp numbers significantly reducing, the demand for brown kelp-based biomass is increasing, globally. It is expected that demand for brown kelp biomass will exceed supply for the foreseeable future. Due to increased global populations, the world must produce 50% more food by 2050 - this will most likely be sourced from ocean aquaculture such as kelp farming.

Ecklonia radiata (Laminariales family)



40% WILD KELP LOST IN LAST 50 YEARS

5. Wild kelp losses

Kelp forests range along 25% of the world's coastlines, providing invaluable resources and habitats. In the past half century, threats to kelp forests have increased in cause and severity, leading to a global average decline of kelp abundances of 2% per year. These changes have significant impacts on marine biodiversity and ecosystem functioning, because kelps are a foundation habitat.

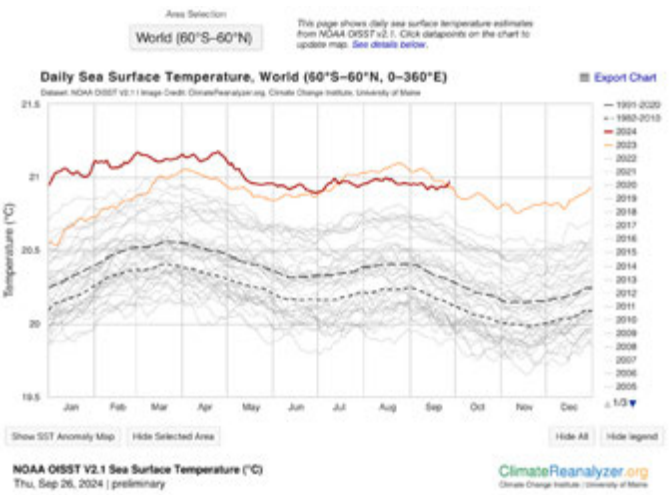
Kelp forests are found on the rocky coasts of temperate Australia and are the basis of the **Great Southern Reef**. Much like terrestrial forests, these marine forests create complex three-dimensional shelters for diverse communities of flora and fauna.

Globally, sea surface temperatures have shown consistent increases over the last 40+ years. Higher ocean temperatures hamper the upwelling process that delivers cool, nutrient-rich waters to the ocean surface, which supply kelp with carbon, nitrogen, ammonium and phosphorus that kelp require to produce photosynthesis.

Alarmingly, it has been reported that more than 40-60% of Australia's wild kelp populations have been lost in the last 50 years*. Research shows that once the kelp forests are lost, they do not easily recover; leaving baron and lifeless landscapes in once rich and healthy ocean areas.

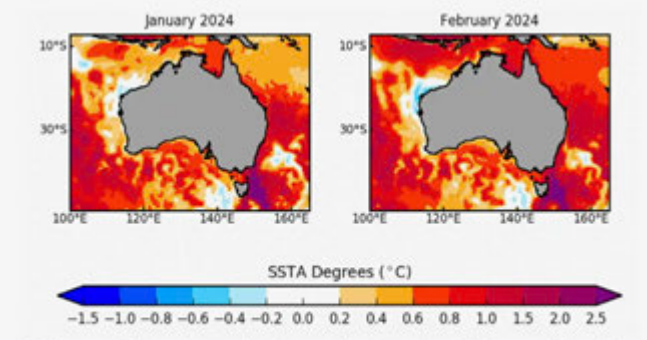
*** University of Western Australia 2021**

Global Sea Surface Temperatures 1981 - 2024



Throughout 2023, and into 2024, the Bureau of Meteorology reported a marine heatwave for Australian eastern waters - with temperatures estimated to be >2.5 degrees Celsius above average. Increasing ocean temperatures energises the East Australian Current which assists in driving warmer waters from Queensland, down the east coast towards

AU Marine Heatwave Sept 2023 - Feb 2024



A Bureau of Meteorology map showing sea surface temperatures. The Bureau of Meteorology expects a patch of the Tasman Sea off Tasmania and Victoria will be at least 2.5C above average from September to February.

6. Problem and Solution

Developing a Kelp industry in Australia is an opportunity and a responsibility

7. Barriers & Risks vs Benefit & Outcome

Reasons for commercial kelp farming in Australia

8. Commonwealth Waters

Testing in Commonwealth Waters is critical to validating a robust model for at-scale commercial kelp farming in Australia. It will create hundreds of coastal jobs, and will have a net-positive environmental impact. Importantly, this opportunity is underpinned by environmental factors such as global warming and sea-surface temperature increases.

Objective

We propose an offshore test area located 12 km offshore from Eden NSW (to be known as Eden 3 Test Area). This site will be in addition to current Auskelp test locations in Twofold Bay (Eden 1 Test Area) and Disaster Bay (Eden 2 Test Area). The objective of Eden 3 Test Area is to determine the growth rates and mortality parameters for Golden Kelp (*Ecklonia radiata*) farming in high-energy, open ocean, offshore "over the horizon" environment. Little is known about the availability off nutrients and nutrient upwelling characteristics in these offshore conditions.

Testing parameters

1. Seeding location (12km offshore)
2. Seeding date [time of year]
3. Ocean wave heights
4. Water temperature on health
5. Nutrient level requirements
6. Water depth effects
7. Seeding protocol

Reporting outputs (12/24 moth report)

1. Growth rates
2. Biomass calculations
3. Mortality parameters
4. Nutrient requirements
5. Ocean swell and temperature effects
6. Economic viability

Testing outline

Species: Golden Kelp (*Ecklonia radiata*)

Test area required: 100m x 100m

Testing period: 24 months

Location: 12km East of Eden NSW

Position: S 37.0760, E 150.0156

Depth: 70 meters

Classification area: Ocean desert with soft sediment, sand and shale bottom

Number lines: 4

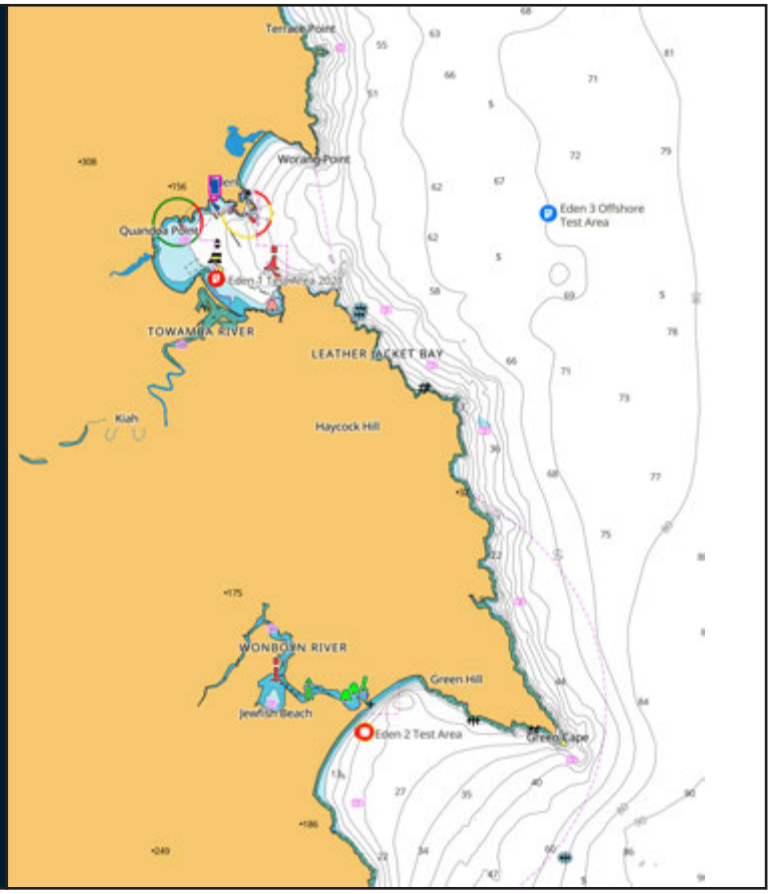
Rig description: Single horizontal subsurface line set 5m below surface with up to 20 x vertical test lines.

Seedstock origin: Disaster Bay NSW

Marine Park: **No**

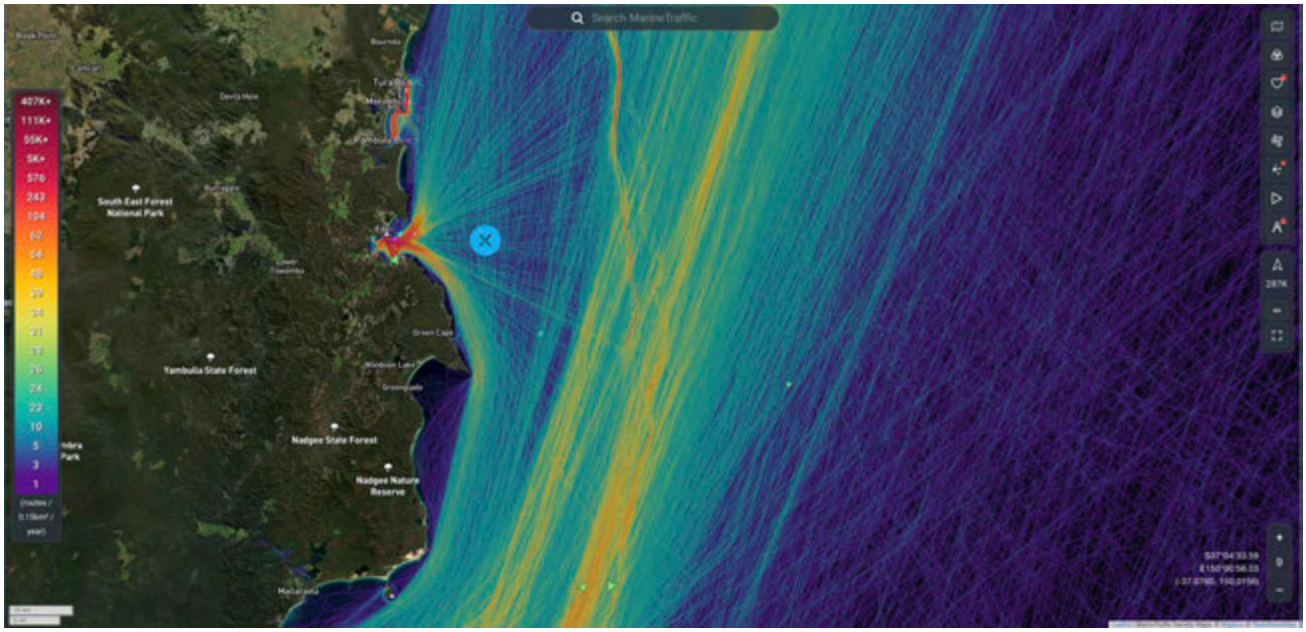
Marine Conservation area: **No**

Negative effect on Threatened Species: **Not expected**



9. Marine shipping

By locating the proposed Eden 3 Test Area in Commonwealth Waters, east of Eden NSW, the majority of offshore shipping lanes are avoided. The below map provides the movements of all registered shipping in NSW waters from 2022 to 2023 inclusive. Directly east of Eden is a relatively unused entry/exit from the Port of Eden.

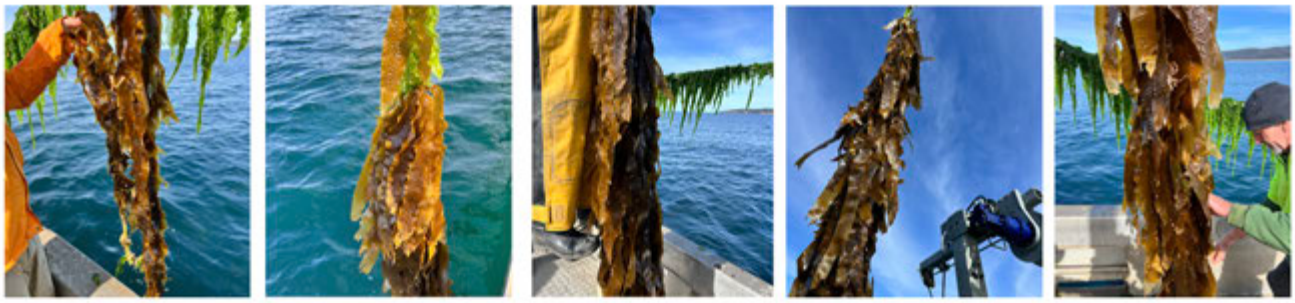


2022-2023 Marine Traffic maps Eden NSW

Photo credit: Marine Traffic Density Maps

10. Current testing

Auskelp is currently conducting one of the most successful testing programs globally for the propagation of Golden Kelp in offshore ocean environments. Located in highly exposed ocean areas, our testing programs have proven that Golden Kelp can survive, and even thrives, in even the roughest waters.



Hagrid – 58 days | Nancy – 107 days | Jonah – 125 days | Andrews' Friend – 142 days | Belinda – 156 days

11. Summary

Proposed Eden 3 Test Area

If the growing of Golden Kelp in high-energy offshore conditions can be validated, this opens the possibility of building commercial kelp farms in Commonwealth Waters. The building of commercial kelp farms is not expected to impede vessel navigation or disrupt whale migration pathways. Coupled with Auskelp's current testing programs in NSW state waters, the addition of an offshore program in Commonwealth Waters provides the necessary test environment to determine the viability of an "over the horizon" commercial ocean farming program off the east coast of Australia.

We seek approval from the Minister or DCCEEW to conduct a 24-month offshore testing program in Commonwealth Waters. We hope you see the merits of this program and can assist in identifying the approval pathway required.

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Photo credit: Auskelp, Eden 2 Test Area, Disaster Bay NSW
Ocean deployment 1 March 2024

Photo credit: Auskelp, Disaster Bay NSW September 2024

Kelp Farming Executive Summary

Business

Auskelp is a private early-stage developer of kelp farms in NSW waters. We have been developing the protocols for growing kelp in open-ocean conditions for the last 5-years.

Objective

Build sustainable environmentally-friendly kelp farms in NSW offshore waters, commencing with Eden 1 project (Disaster Bay), then expand into NSW Commonwealth Waters (east of Eden).

- Can create up to 900 jobs in Bega area
- Revenue of up to $400m
- Delivers products critical to circular economy

Kelp farming

Globally recognised as the most environmentally-friendly form of agriculture or aquaculture. No feed, fertilisers, pesticides used in this **blue economy**. Seedstock propagated from locally acquired wild kelp. Minimal environmental risk.

Market opportunity

Wild kelp numbers globally being reduced due to climate change (rising ocean temperatures). Demand exceeds supply for kelp products into the foreseeable future both locally and for export. Kelp is a key input for new industries like bio-plastics and existing bio-stimulants, food, feed and nutraceuticals.

Investment

Investment is available, but hampered by lack of regulatory certainty.

Obstacles

NSW or Commonwealth waters:

No regulatory pathway.

Triggers a State Significant Development (SSD), Secretary's Environmental Assessment Requirements (SEARs), Environmental Impact Statement (EIS), EPBC Act 1999, Matters of National Environmental Significance (MNES).

Compliance requirements:

- 17 Acts
- 15 Agencies
- 12 Policies
- 9 Regulations
- 32 Guidelines and Strategies
- 15 other requirements (studies, charters etc)

Regulatory approval estimates:

- Minimum 3 years & +$1m in costs

- No certainty of approval

Assistance required

1. Approval of offshore kelp test licenses in Commonwealth waters
2. Independent review of Eden 1 (Disaster Bay) offshore kelp farm by the Minister (Federal and State).
3. Alternate approval process to allow for kelp farming in NSW and Commonwealth waters.

AusKelp