

# THE CARBON FOOTPRINT OF THE NSW OYSTER INDUSTRY

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# THE **CARBON FOOTPRINT** OF THE NSW OYSTER INDUSTRY

CO<sub>2</sub> / Methane / Nitrous oxide = Greenhouse gases

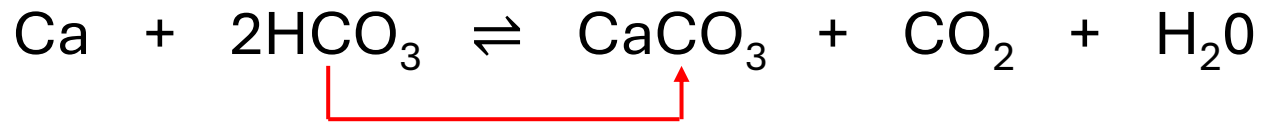
Converted in carbon dioxide equivalent, CO<sub>2</sub>e

Emission reductions  
Climate change mitigation } Atmospheric GHG



# Shell Carbon

- Does oyster farming significantly reduce CO<sub>2</sub> levels in the atmosphere? **No**
- Oyster shells are ~92% calcium carbonate (CaCO<sub>3</sub>)

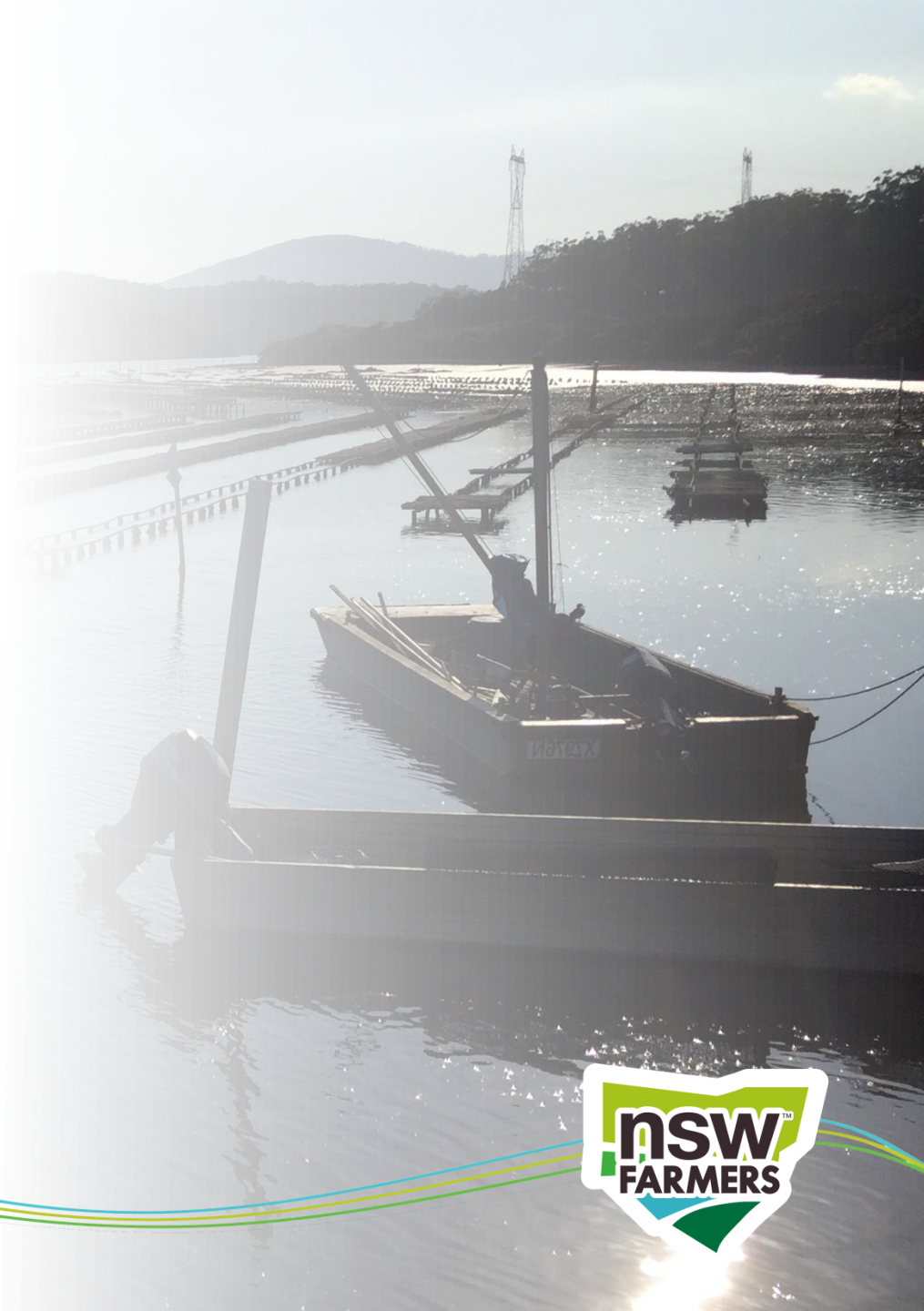


- Bicarbonate ions formed by chemical weathering of rocks over 10'000's of years (Pernet et. al. 2025)
- Sequesters carbon, not a CO<sub>2</sub> sink  
Shell formation does not reduce atmospheric CO<sub>2</sub>

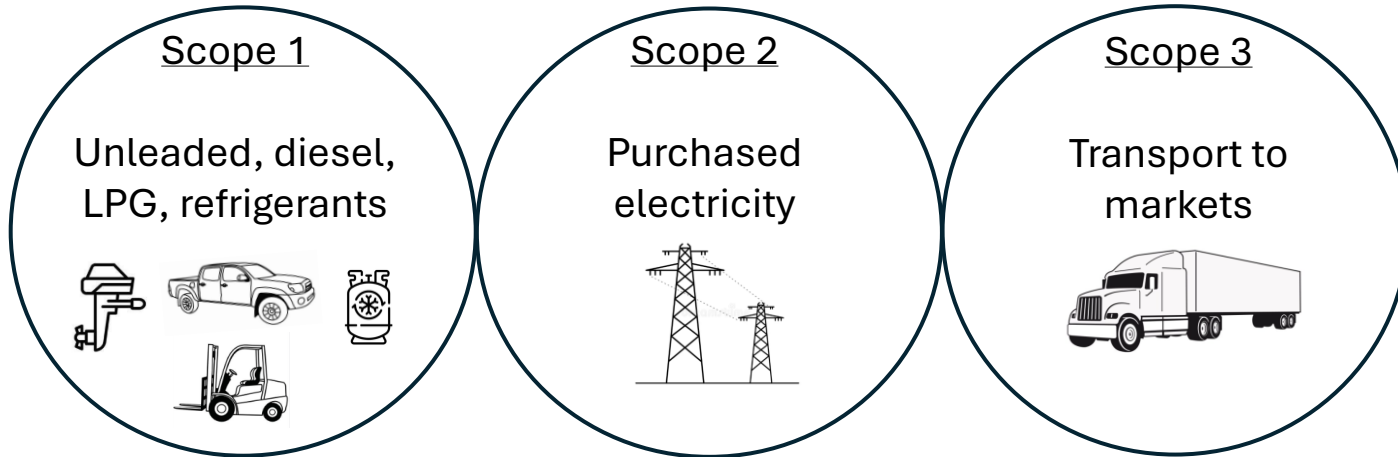
Property	Value
pH	9.34
Total calcium	328,500 mg/kg
Calcium carbonate	<b>92.1%</b>
Total magnesium	2,750 mg/kg
Total nitrogen	1,962 mg/kg
Total phosphorus	318.5 mg/kg
Total sulphur	137.5 mg/kg
Total potassium	35.26 mg/kg

# Audit - Key Questions

- Where are the main emission sources on a farm?
- What does this add up to statewide?
- How does our footprint compare to other products?
- What can we do to reduce emissions?
- If we looked at buying offset, how much would this cost?



# Farm Assessments: Cradle to gate (1<sup>st</sup> receiver)



Notable exclusions (through lack of data):

- Emissions from hatcheries.
- Manufacture of equipment & growing infrastructure  
(NZ assessment =1.6% of total emissions)



# Farm Assessments

31 farms participated



Individual carbon footprint report



25 representative farms used for statewide extrapolation (6 farms removed as not representative)

10% of industry. Good spread of small, medium, large farms – SRO & PAC – various levels of technology adoption.

**Carbon, Nitrogen & Phosphorus Assessment ABC Oyster Farm: 2022-23 FY**

### CARBON EMISSIONS

Table 1. Emissions profile

Emission Type	Scope	Annual Emissions (kg CO <sub>2</sub> e)
Fuel (Diesel)	1	5,027
Fuel (LPG)	1	900
Electricity	2	2,759
Transport to 1st receiver: Farm → Sydney	3	227
<b>TOTAL EMISSIONS</b>		<b>10,913 kg CO<sub>2</sub>e</b>
Based on oyster harvest of 50,389 kg (17,096 tSS)		

Figure 1. Emissions breakdown by source

Table 2. Comparison to other marine proteins

Other Marine Protein	Annual CO <sub>2</sub> e per tSS of product
ABC Oyster Farm	1.87
Wild-caught oysters	8.70
Non-caught prawns	8.50
Farmed salmonids	9.88
Australian farmed prawns	11.20
Black lobster	12 to 14
Imported farmed prawns	13.30
Farmed turbot	17.90

Net emissions & indicative offset cost

- Net emissions of 12.21 tonnes CO<sub>2</sub>e
- One Australian Carbon Credit Unit (ACCU) represents one tonne of carbon dioxide equivalent (CO<sub>2</sub>e)
- Using a Feb-2025 spot price of \$34 per ACCU, annual emissions of 12.21 CO<sub>2</sub>e could be offset for approximately \$415.

### OPTIONS TO DECREASE EMISSIONS

- 75% of business emissions arise from fuel burnt on the farm.
- Consider fuel efficiency when upgrading engines, and stay informed about advancements in electric outboards and battery technology.
- Plan punt use to minimise the number of trips required, and maintain punts and outboards in optimal condition to ensure efficient operation.
- Consider installation of a solar system. kW solar panels produce ~4kWh/day. You use ~10 kWh/day, so just a small solar system should suffice if you are considering this to power daytime shed operations.

### NUTRIENT REMOVAL

Table 3. Nutrient removal & indicative value of service

Value of nutrient removal service (\$)	Nitrogen	Phosphorus
100 kg	7.93	17.05
\$5,000	793	1,705

Table 4. Key data provided for assessment

Data	Additional Information	
Harvested – Small	1,800 dz	Weight of stock estimated as 10,359 kg
Harvested – Medium	7,251 dz	100% on wild-caught stock.
Harvested – Large	8,745 dz	Based on \$3,000 expense. Based on \$1,000 expense. 12 x 5kg tanks x 1.50 t/L.
Stock	1,823 litres of uncollected	Ordn. Based on \$1,500 expense.
Stock	508 litres of diesel	Stock weight (8,237kg) x 18 pellets, 10 shipments
Stock	423 litres LPO	Fuel use accounted for above.
Stock	3,500 kWh	
Stock	8,367 kg cargo weight	
Stock	402 kg	
Stock	2,152 kg cargo weight	

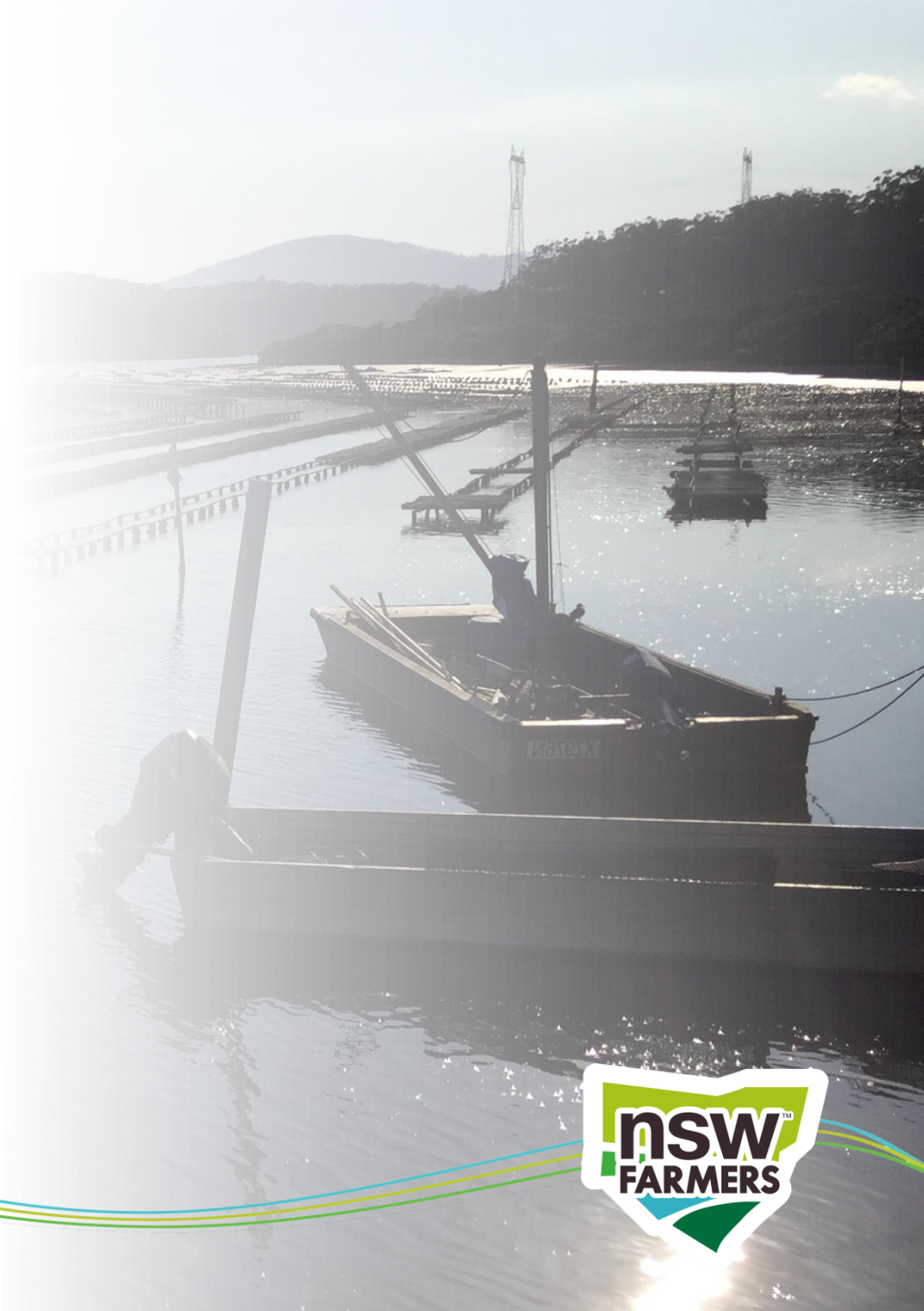


# The Headlines

*Oysters produced in NSW are one of the lowest carbon proteins produced anywhere*

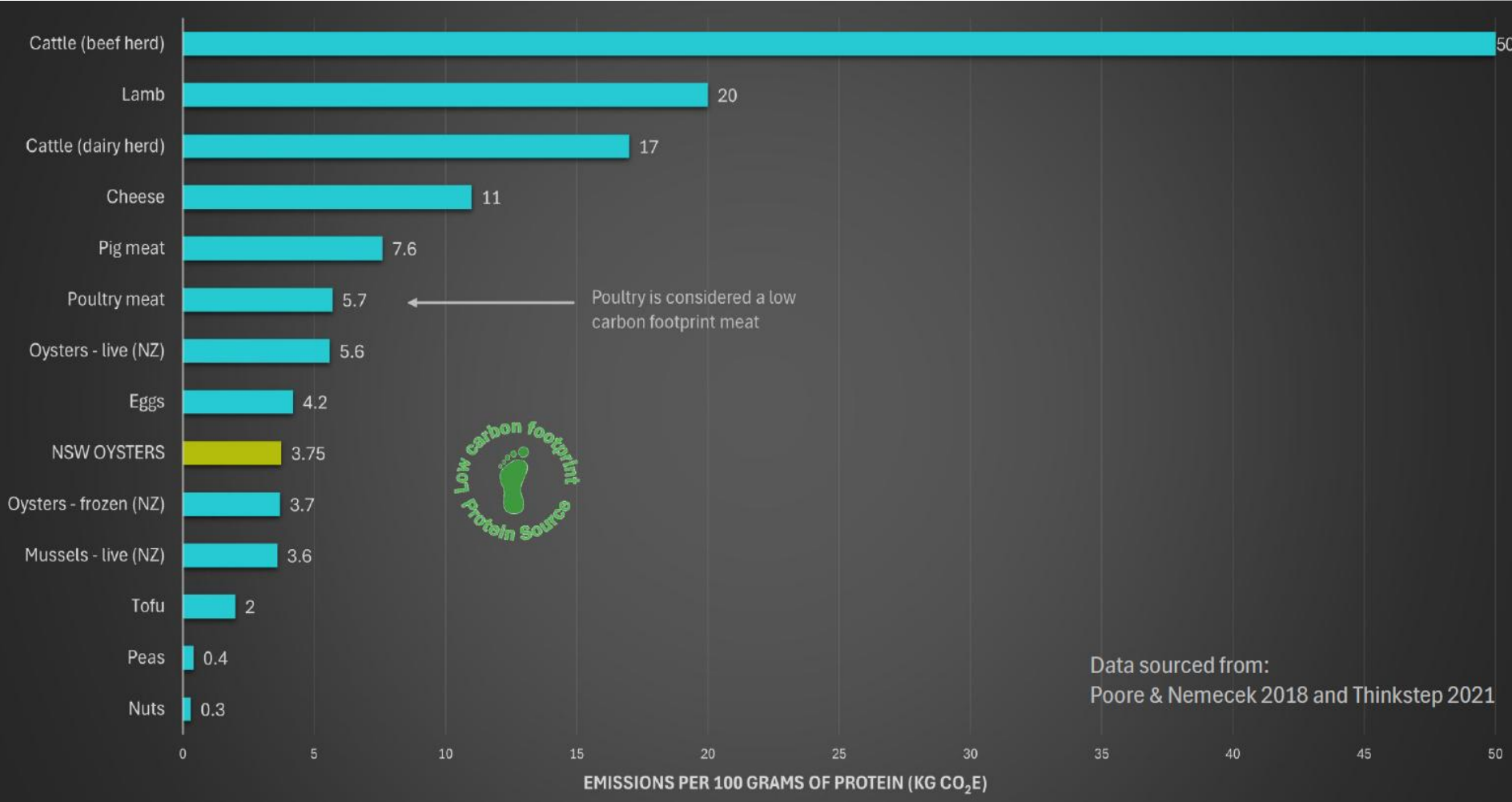
3.75 kg CO<sub>2</sub>e  
per 100g of protein

2,640 tonnes CO<sub>2</sub>e  
entire NSW industry in 22/23



# How you compare to other proteins?

3.75 kg CO<sub>2</sub>e  
per 100g of protein



# What would carbon neutrality cost?

2,640 tonnes CO<sub>2</sub>e  
entire NSW industry in 22/23



Price (AUD) of one Australian Carbon Credit Unit (ACCU)

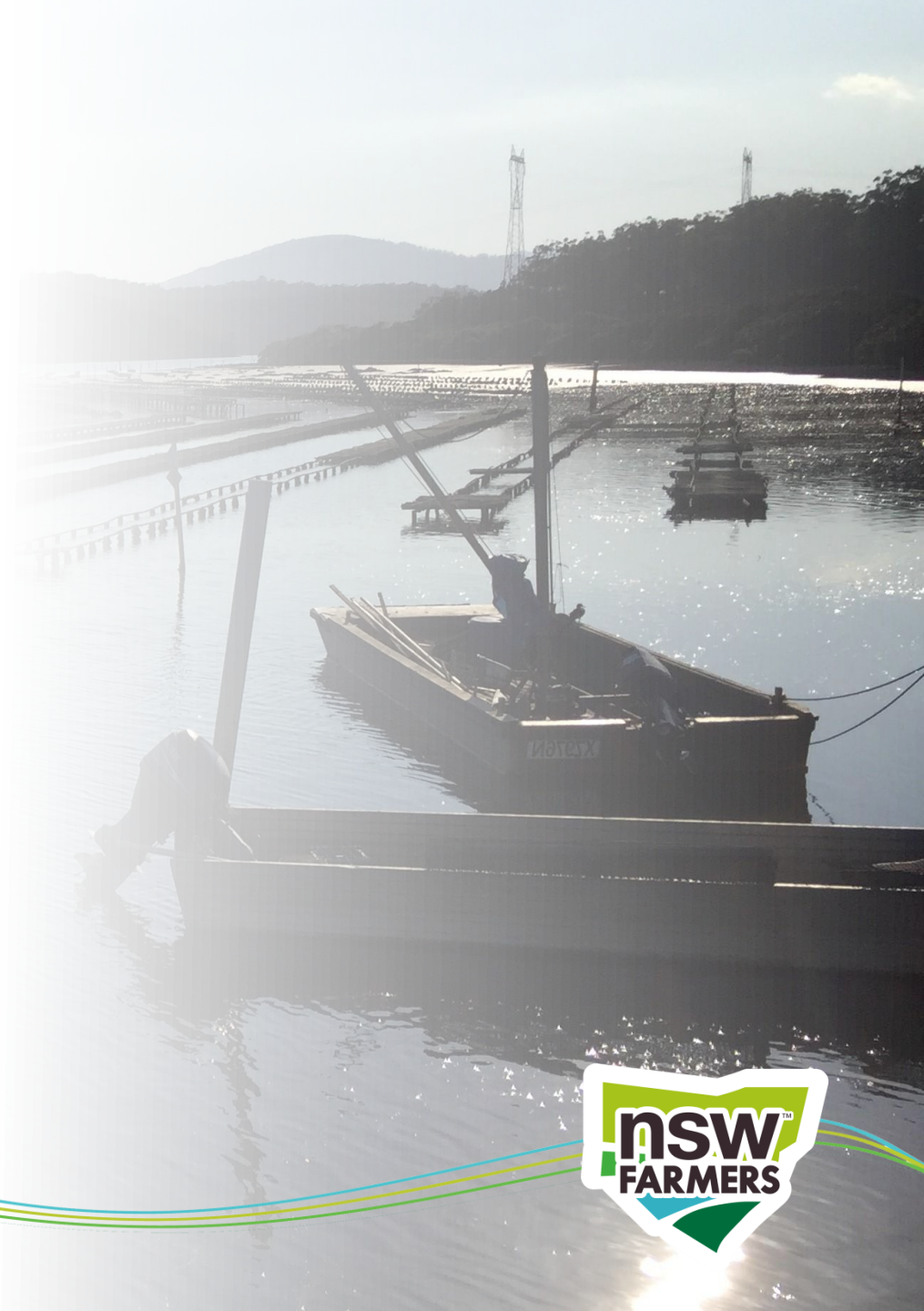
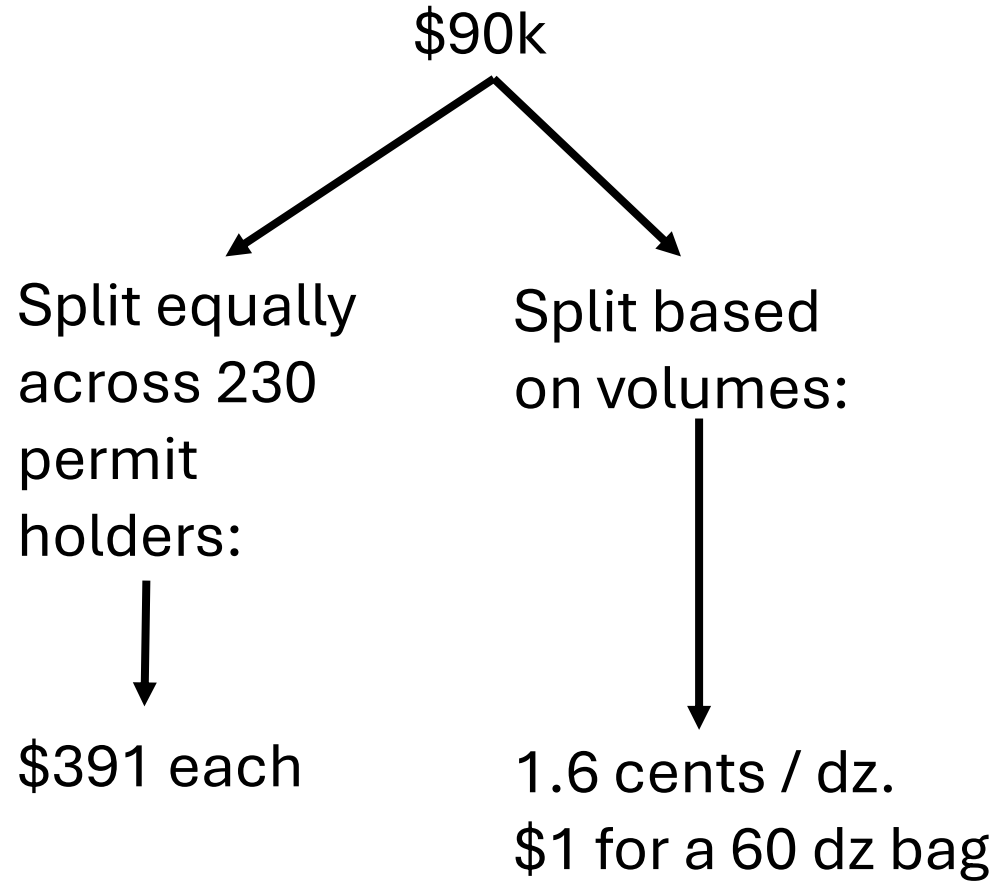
1 ACCU = 1 t CO<sub>2</sub>e.

1 ACCU = \$34

- Industry wide emissions could be offset for ~\$90k.

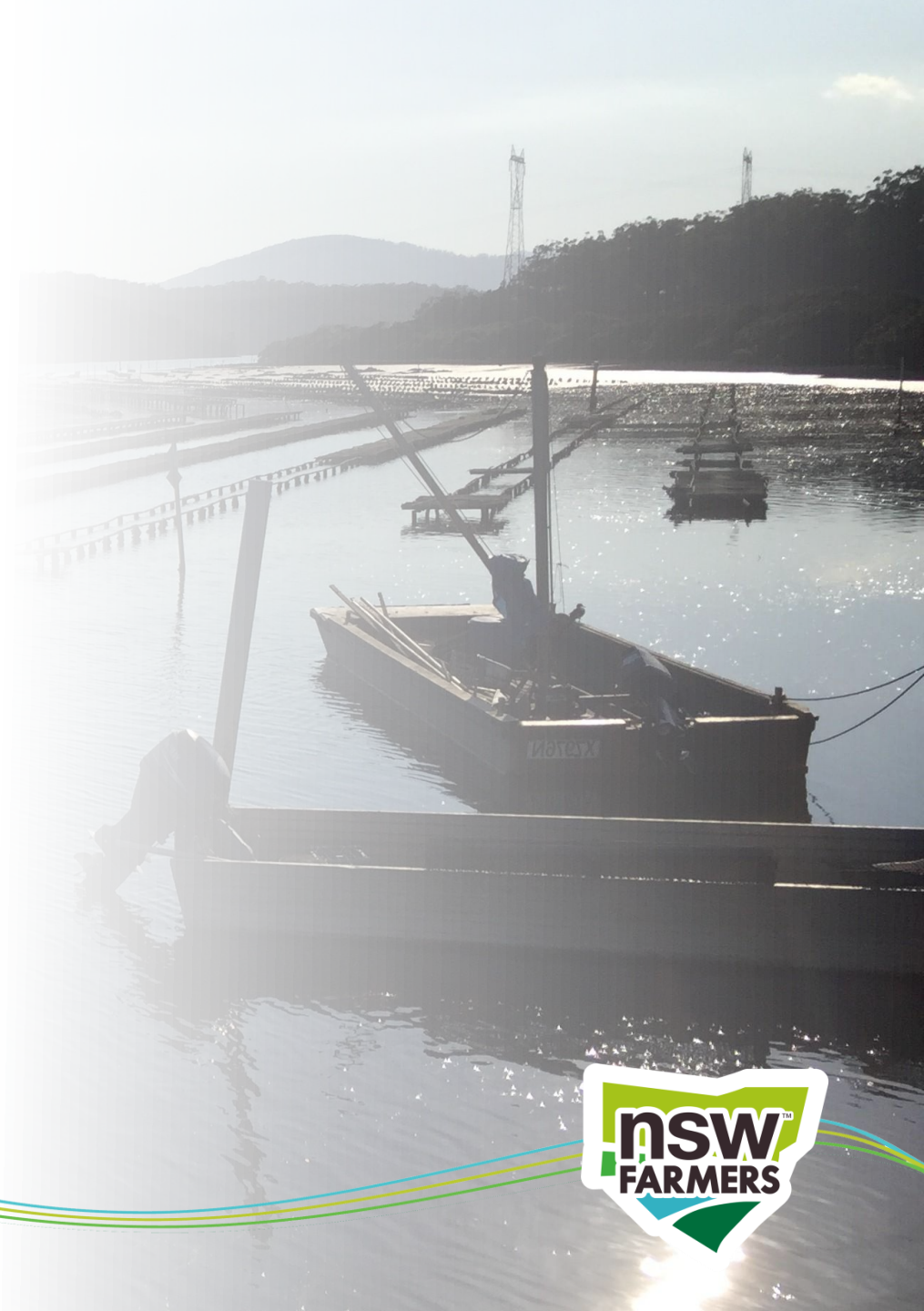


# What would carbon neutrality cost?

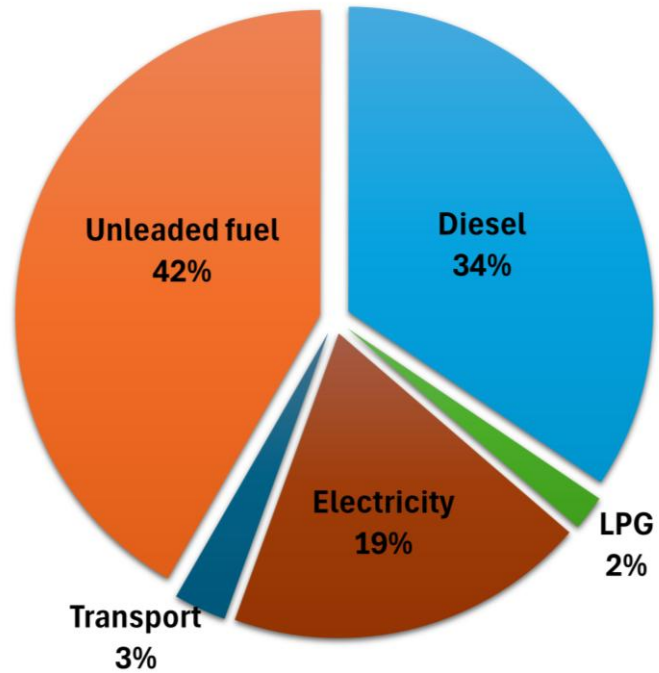


The logo features a dark green graphic of two overlapping curved segments forming a partial circle above the text. The text "Climate" is on the top line and "Active" is on the bottom line, both in a bold, dark green sans-serif font.

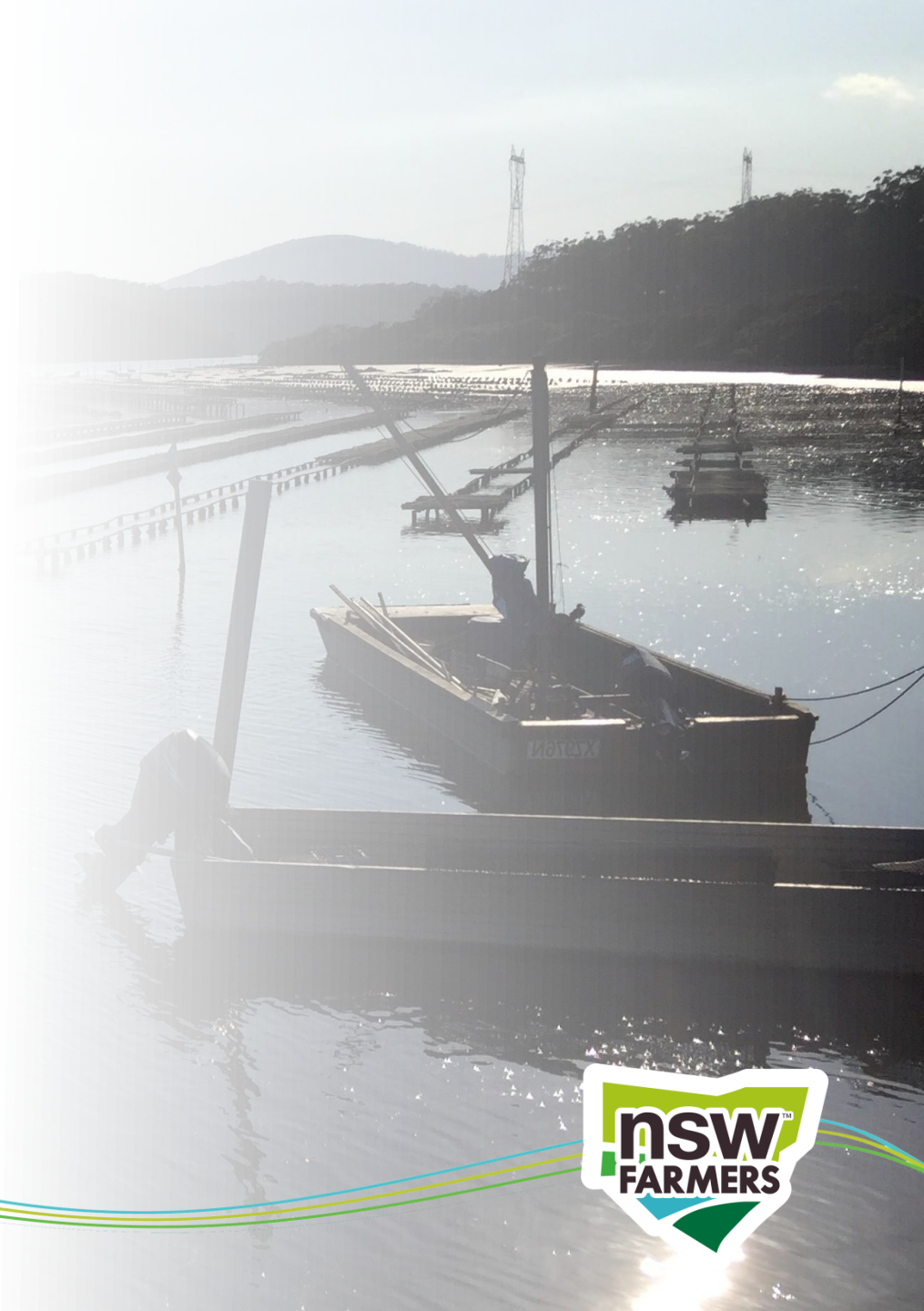
**Climate  
Active**



# Where do emissions come from?



- Scope 1 emissions primary source GHG
- 19% emissions from purchased electricity.
- Transport to market 3%.



# Options to reduce emissions

## Lever #1: Solar systems

- 19% of GHG emissions from electricity
- 6 kW solar system sufficient most farms
- Small-scale Renewable Energy Scheme (SRES)
- 3 year pay-off in most cases
- SRES now expanded to cover batteries

## Lever #2: The outboard question

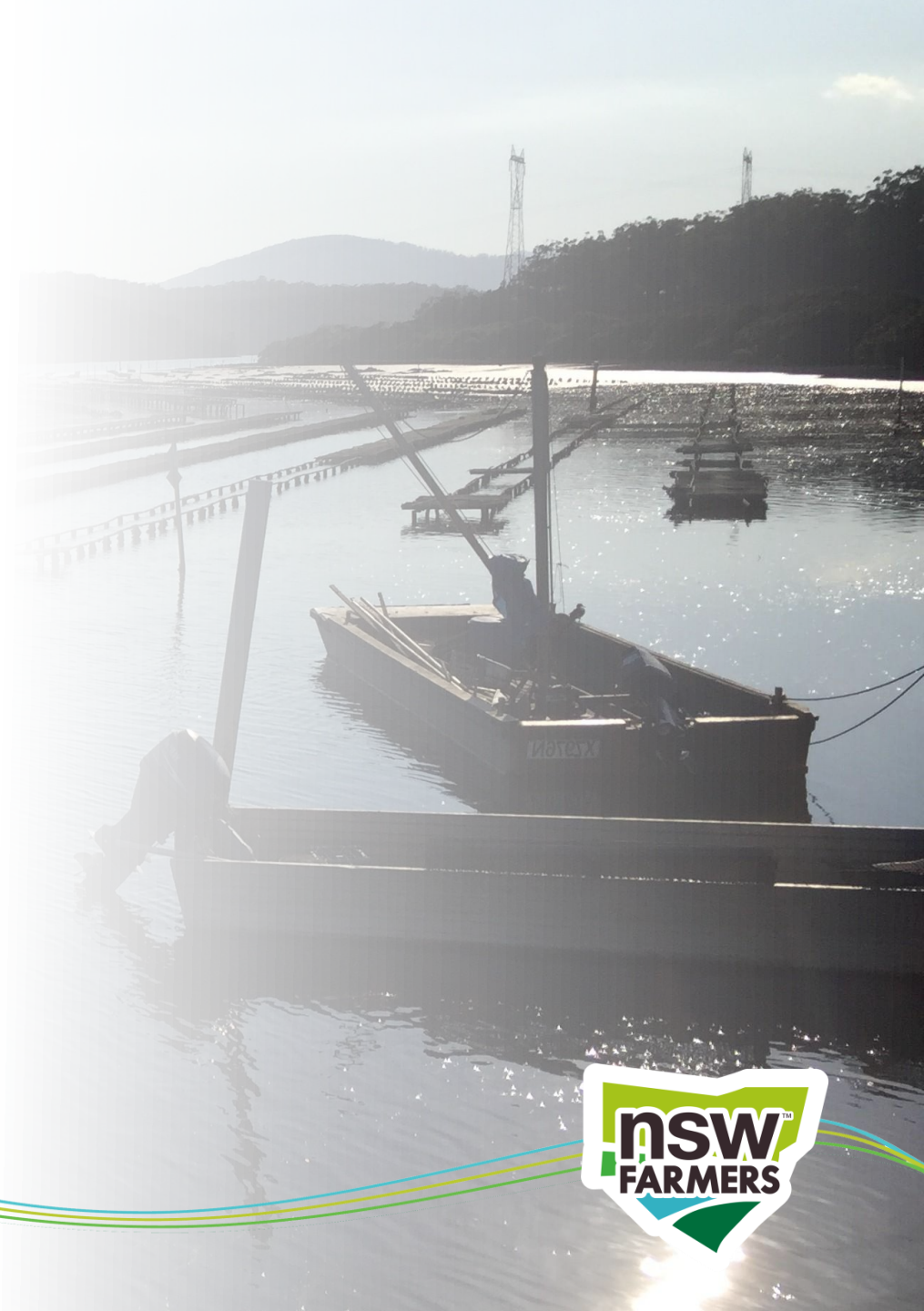
- 42% of GHG emissions from unleaded (outboards)
- Farmers in Maine running full electric workboats
- No commercial trials in NSW. Interest in WA
- Electrification projects funded through AIDP

*Combination of both*



# Wrap-Up

- Oysters farmed in NSW are one of the lowest carbon proteins on the planet.
- Don't expect carbon credits for your shell.
- Biggest wins to reduce emissions are by installing solar and batteries, and evolution of electric/hybrid outboards.
- Offsets are affordable. Certification is possible.



# Nutrient Removal – Nitrogen & Phosphorus

- Established N & P removal rates based on meat and shell content

Component	Sydney rock oysters (SRO)	Pacific oysters (PAC)
Kg TN / t oysters harvested	5.58	4.46
Kg TP / t oysters harvested	0.69	0.55

- Total nitrogen removal of 15,444 kg in 22/23
- Total phosphorus removal of 1,909 kg in 22/23
- Reef Credit Scheme: 1kg nutrient removal worth ~\$100
- NSW oyster harvest in 22/23 was worth \$1.74m as a nutrient removal service.

Recommendation 9: Collaborate with the NSW EPA and a willing nutrient emitter to trial an offset initiative that reduces nutrient impacts through assimilation in farmed oysters.

This project was funded by the Australian and NSW Governments  
Storm and Flood Industry Recovery Program



**Australian Government**

