

Transport and Infrastructure Net Zero Consultation Roadmap

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Department of Climate Change, Energy, Environment and Water

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Organisation
- 10 Organisation name
Not answered
- 11 What best describes you or your organisation?
Not answered
- 12 What sector do you represent?
Not answered
- 13 What state or territory do you live in?
New South Wales
- 14 Postcode
2102
- 15 What area best describes where you live?
City
- 16 1. Do you support the proposed guiding principles?
Yes
- 17 1.1 Please add details to your response.
We think that DITRDCA have selected an excellent set of guiding principles for this purpose. The only one we would query is Maximise economic opportunity, as we think it is important to ensure we do not ignore the potential of negative economic effects when making systemic change. We

think that a small but important change would be to rephrase this as Maximise economic optionality. This speaks to ensuring that the roadmap does indeed maximise positive economic changes, but that it also limits the impact of negative economic changes.

18 2. Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?

Yes

19 2.1 Please add details to your response.

We think that the avoid-shift-improve framework will be ideally suited to the sorts of changes required.

One point we do want to make is that current transport planning in Australia often sees maritime transport as a potential mode only where it has always been used. For example, ATAP has this to say in their M6 Air and Sea Transport guideline¹

:

The ATAP Guidelines focus specifically on land transport, covering road, rail, public transport and active travel. The other key forms of transport are air and sea transport. The Guidelines do not provide mode-specific guidance on these modes.

We would like to emphasise that new and innovative types of maritime transport should be more often considered for cargo and passenger transport options, as they may offer less emissive solutions in some cases.

20 3. Do you agree the development of a national policy framework for active and public transport will support emissions reduction?

Yes

21 3.1 Please add details to your response.

We think the systemic issues that limit the use of active and public transport requires a strategic response from the Australian Government. As is noted in the Consultation Roadmap, the

role of state, territory and local governments requires working closely together. In that sense, the national policy framework is a supporting piece of work, it may well not be the most influential in actually delivering greater uptake of active and public transport by the public.

22 4. What should be included in a national policy framework for active and public transport and how should it be developed?

One item that might be under-appreciated is the potential for waterborne public transport to offer innovative options for helping communities divided by waterways. In many countries ferries offer a way to extend active transport routes across waterways that might otherwise require significant extra distances, across busy bridges. We see this with new electric ferry designs that make significant space for bikes and scooters. They also support densification of waterside suburbs, without putting more pressure on existing public transport routes. Another advantage of urban ferry commutes is that they offer opportunities for the public to experience interactions with waterways that can boost general health² and help people feel less stressed³

With national regulation of domestic commercial vessels there is an opportunity for the Australian Government to influence how attractive urban ferry options can become.

23 5. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the movement of people contributes to transport emissions reduction?

It is vitally important that public transport options continue to decarbonise, which in nearly all cases means electrify. This maximises the gains from shifting electricity production to more renewable sources, but also puts pressure on the grid to provide more energy. For these reasons we need to promote local production via solar panels, with local battery storage, and

make it easier for the transport industry as a whole to access the energy they need. With regards to maritime transport one of the greatest blockers to lower emissions engines is the poor quality of Australian marine diesel fuel. In part this may be the ability that suppliers have to add biodiesel to automotive diesel (up to 5% is allowed without notification to the consumer), which can be detrimental in many marine fast diesel engines and their fuel systems⁴.

Unfortunately, whilst there is a standard for automotive diesel, there is no equivalent standard for marine diesel. That coupled with the fact that the marine engine emission standards only cover spark ignition (i.e., petrol) engines⁵ means that the status quo for domestic maritime transportation is hard to change. European studies have shown that traditional and high-speed craft (HSC) ferries are far more emissions intensive than other public transportation modes⁶ (see Figure 1 below). For this reason, a highly effective decarbonisation action is to address the emissions of ferries.

24 6.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure that the movement of goods contributes to transport emissions reduction?

Not answered

25 6.2. How would these actions address the identified challenges and opportunities for emissions reduction in the movement of goods?

Not answered

26 7. Do you agree with the proposed net zero pathway for light road vehicles?

Not answered

- 27 7.1 Please add details to your response.
Not answered
- 28 8. The Australian Government is currently developing an Australian New Vehicle Efficiency Standard and has already begun to implement actions in the National Electric Vehicle Strategy.8.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce light vehicle emissions?
Not answered
- 29 8.2 How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?
Not answered
- 30 9. Do you agree with the proposed net zero pathway for heavy road vehicles?
Not answered
- 31 9.1 Please add details to your response
Not answered
- 32 10. The proposed pathway for heavy road vehicles relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.
Not answered
- 33 10.1 Please add details to your response. Why did you rank them in that order?
Not answered
- 34 11. What role should low carbon liquid fuels play in the heavy vehicle

decarbonisation?

Not answered

- 35 12. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce heavy vehicle emissions?

Not answered

- 36 13. Do you agree with the proposed net zero pathway for rail?

Not answered

- 37 13.1 Please add details to your response.

Not answered

- 38 14. The proposed pathway for rail relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels. Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

Not answered

- 39 14.1 Please add details to your response. Why did you rank them in that order?

Not answered

- 40 15. What role should low carbon liquid fuels play in rail decarbonisation?

Not answered

- 41 16. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce rail emissions?

Not answered

- 42 16.1 How would these actions address the identified challenges and

opportunities to reduce rail emissions?

Not answered

43 17. Do you agree with the proposed net zero pathway for maritime?

No

44 17.1 Please add details to your response.

Domestic Maritime Emissions are Important

We believe that the National Greenhouse Accounts estimate of domestic maritime fuel use

significantly underestimates actual petrol and diesel use by the domestic maritime sector⁷

. Figure

2 shows the scale of the difference.

This difference is significant because it shows that whilst international shipping's GHG emissions

of 39.4 million tons is important, so are those from domestic maritime at 7.4 million tons.

Our

submission includes a copy of our Australian Domestic Maritime Emissions Review report for

DITRDCA to refer to.

Existing Fleet Can Reduce Emissions

Based on analysis which I did for the Fisheries Research Development Corporation (FRDC) report

on Climate Resilient Wild Catch Fisheries (FRDC 2021-089) ⁸

we find that relying on newbuild

vessels and retrofits to reduce GHG emissions will only lead to some of the change needed in the

sector's emissions, and only with significant incentives and battery density improvements (see

Figure 3 for more detail). This is partly because figures from the Australian Maritime Safety

Authority (AMSA) show that only around 1% of the fleet is currently replaced each year, and many

newbuilds take multiple years to deliver, and are already in production.

We believe the proposed net zero pathway should mention incentives and support for the commercial maritime industry to take up the options for existing vessels: namely vessel efficiency

measures and drop-in low carbon liquid fuels (LCLFs). This should not take away from

retrofits and newbuilds that are decarbonised but acknowledges that they can only make up part of the existing fleet's emissions reduction.

With regards to energy optimisation measures, there are various Government measures designed to help reduce Australian businesses' inefficient use of electricity. However, there is nothing similar around energy use by commercial vessels. An easy way forward would be to extend the same sort of support and incentives around energy optimisation for commercial vessel operators.

Our estimate is that this could be taken up by approximately 24% of the existing fleet (many are already doing this very well) and it could well lead to a 10-40% reduction in GHG emissions for those vessels.

With regards to drop-in marine LCLFs, according to AMSA the domestic commercial vessel fleet

has approximately 24,000 powered vessels, and as our Australian Domestic Maritime Emissions

Review report shows, we can estimate that around 14,000 of those are probably using petrol

engines, while the rest are larger vessels most often using diesel engines. We have responded to

the Low Carbon Liquid Fuels Consultation about the needs of the maritime sector, but some of the

points bear repeating here.

There are few low carbon drop-in fuel replacements for petrol that are appropriate in a marine

environment. In land-based petrol engines there is usually a push to mix low carbon ethanol with

the petrol to provide some emissions benefits. Unfortunately, ethanol blends with petrol are not

recommended in marine environments due to the hydrophilic nature of ethanol which will tend to

7 Maritime Impulse Pty Ltd

separate from the petrol and damage the engines it is used in

. Another option, butanol, has been

tested and a 16% blend (“Bu16”) has been approved by most engine OEMs for marine use¹⁰, but there is no current supply of butanol blended petrol fuel in Australia. Small vessels have two other sustainable choices, one being to electrify their outboards, and the other being to move to more efficient diesel outboards¹¹. But given the costs involved, neither of these are equivalent to a simple drop-in fuel change.

- 45 18. The Australian Government is engaging in consultation as part of the development of the Maritime Emissions Reduction National Action Plan and those consultations will also inform the final Roadmap and Action Plan. 18.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce maritime emissions?

Green Ports for Green Shipping Corridors

With regards to international shipping, Australia does not own, operate, build, or dismantle the sorts of ships that we depend on for international trade. Therefore, we are largely limited to

influencing this area by how fast we adopt International Maritime Organisation (IMO) rules in our

local regulations, how we choose to run our ports, and what sorts of low carbon liquid fuels we

bunker/export. The Consultation Roadmap mentions green shipping corridors as a practical way

for Australia to support more sustainable international shipping, and we agree with this analysis.

An important point is to note that the slow diesel engines used by ships are able to use biodiesel

blends (B24 has become popular across Asia) that are not compatible with the medium and fast

diesel engines used by most domestic commercial vessels. In the same way, there are methanol

and ammonia ship designs that are likely to come into service well before any smaller vessel will

use those low carbon liquid fuels. So, a green shipping corridor might very well be setup

that has minimal value for decarbonising the domestic maritime sector.

Local/State Government Support for Maritime Electrification

There should be the acknowledgement that the medium to long-term future of decarbonisation efforts in domestic maritime will be focused on the electrification of maritime transport.

Figure 5

shows the complexity of the system that needs to be properly considered when electrifying maritime transport. Far beyond just the design changes to vessel propulsion, or auxiliary systems, there needs to be consideration of how to strengthen the grid near marinas, harbours, and ports, and even how to get the grid to extend beyond the current boundaries into the offshore domain.

Support offshore Charging Innovation

With regards to offshore charging infrastructure, we should learn lessons from the direction that offshore wind has taken in Europe where it is a far more mature industry than here in Australia.

We see a demand for low emissions options for offshore support vessels (OSVs) as their emissions reduce the sustainability of the power created by the offshore wind farms they service.

The noted technology limitations of battery-electric or even plug-in hybrid electric systems have

led to the development of innovations that can reduce the energy consumption of those vessels

when on station at the wind farms they are servicing.

Offshore charging solutions for wind farms have been developed by Stillstrom²⁰, MJR Power &

Automation²¹, Bluewater²², and Oasis Marine²³. This part of the market is maturing, and pilot

deployments are in the process of happening.

46 18.2 How would these actions address the identified challenges and opportunities to reduce maritime emissions?

We believe that by acknowledging the fact that Domestic Maritime Emissions are

Important we can see increased focus on reducing the emissions of some of the largest mobile sources of greenhouse gas emissions. It also justifies supporting Renewable Diesel against SAF production. Our point with Existing Fleet Can Reduce Emissions is that the Government can already take actions to reduce emissions from the current domestic maritime fleet without needing to wait for vessels to go through expensive refit or replacement lifecycles. Promoting and supporting energy optimisation measures will help the industry futureproof their existing vessels. Renewable Diesel can already make a significant difference to maritime emissions if the Government can help address the price gap by giving certainty to suppliers of those LCLFs and modestly increasing the cost of high carbon liquid fuels in a similar way to California's Low Carbon Fuel Standard. Unlike other LCLFs it has an energy density very similar to fossil Diesel and does not require significant investment in new infrastructure to deploy. By requiring Green Ports for Green Shipping Corridors, we would create more demand for decarbonised domestic commercial vessels and create opportunities for Australian marine suppliers to create local solutions and products. This would ensure that green shipping corridors help fund local infrastructure development, supply chains, and pilot projects. We believe that Local/State Government Support for Maritime Electrification is needed to see maritime electrification accelerated and not held back by a lack of focus. This will impact the smaller ports, harbours, and marinas used by most domestic commercial vessels more than bunkering facilities at large container and bulk cargo ports. Investing to Support Offshore Charging Innovation will help develop local solutions that will not only decarbonise the Australian marine tourism industry but can help address similar challenges across South-East Asia and the Pacific Islands.

- 47 19. Do you agree with the proposed net zero pathway for aviation?
Not answered
- 48 19.1 Please add details to your response.
Not answered
- 49 20. The Australian Government has already engaged in consultation on aviation decarbonisation through the development of the Aviation White Paper and those consultations will also inform final Roadmap and Action Plan.
Not answered
- 50 20.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce aviation emissions?
Not answered
- 51 21. Do you agree with the proposed net zero pathway for transport infrastructure?
Not answered
- 52 21.1 Please add details to your response.
Not answered
- 53 22. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce transport infrastructure emissions and ensure that transport infrastructure is ready for and enables low-emission transport modes?
Not answered
- 54 22.1 How would these actions address the identified challenges and opportunities to reduce transport infrastructure emissions?
Not answered

- 55 23. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the energy mix is ready to support transport emissions reduction?
Not answered
- 56 24. How should the use of low carbon liquid fuels (LCLFs) be prioritised across different transport modes over time to achieve maximum abatement?
Not answered
- 57 25. What are the best ways for the Australian Government to work collaboratively with industry, business, governments and communities to implement the proposed pathways?
Government interventions to implement these pathways will, by definition, create change in the existing landscape of the transport sector. This change will have both positive and negative aspects, and without a good feedback mechanism the Government is likely to only be aware of some of each of these.
With the maritime sector, existing industry bodies such as the Australian Commercial Marine Group (ACMG)²⁵, the Maritime Industry of Australia Ltd (MIAL)²⁶, Boating Industry Association (BIA)²⁷, and Australian Marine Park Tourism Operators (AMPTO)²⁸ can definitely help the Government understand how negative aspects can create business challenges, market imbalances, and create winners and losers.
When it comes to the positive aspects, especially the opportunities, then more specialised industry bodies should be partnered with, such as the Maritime Emissions Reduction Coalition (MERC)²⁹ and the Australian International Marine Export Group (AIMEX) as they can help the Government understand what capabilities will be needed, what opportunities exist (for both manufacturers and operators), and what level of ambition should be aimed for in terms of

a
sovereign supply chain.

58 25.1 What are good domestic or international examples of partnership and collaboration on transport and transport infrastructure emissions reduction that could inform the final Roadmap and Action Plan?

There are two excellent international examples of this sort of collaboration specific to transport emissions reduction.

Maritime CleanTech - Norway³⁰

Maritime CleanTech is a government funded innovation cluster in Norway focused on creating

energy-efficient and sustainable technologies. Like most European clusters they have a mix of

customers, manufacturers, and service providers. In their case the cluster's categories of partners includes:

- ☐ Class and regulation,
- ☐ Design and engineering,
- ☐ Energy,
- ☐ Equipment and service,
- ☐ Finance and law.
- ☐ Harbours,
- Public,
- ☐ R&D and education,
- ☐ Ship owners, and
- ☐ Yards.

Since their founding in March 2011 with nine members, Maritime CleanTech has grown to

encompass nearly 150 partner organisations in 2024. As their latest Annual Report³¹ shows (see

Figure 6) they have helped drive substantial changes in Norwegian domestic maritime emissions.

Moananui - New Zealand³³

Moananui is a New Zealand not-for-profit Blue Economy cluster which was first conceived of in

2019 "with the ambition to be Good Ancestors and activities guided by Blue Economy Principles for

Aotearoa”³⁴. In 2023 they received “two-years government seed-funding”³⁵ and launched with “nine founding partners from diverse organisations including fisheries and aquaculture, science and research, iwi, regional development, pharmaceuticals, ports and engineering.”³⁶ Their focus has naturally formed around fisheries and fishing as many of the founding partners were in that area, they have now grown to include 34 partners who are all focused on generating economic value while still upholding environmental stewardship. Whilst it is still early days, they have already had some success bringing people and organisations together around Blue Economy collaboration in their Blue Economy Innovation Summit³⁷ and in some of the projects they have already run. They have credited Cluster Navigators³⁸ for the model they are applying, which is very similar to the European cluster model used by Maritime CleanTech

59 25.2 What opportunities can Government leverage to show leadership in Australia and internationally?

With the launch of the Maritime Emissions Reduction Coalition (MERC) in February 2024³⁹, there is now an opportunity for the government to fund the same sort of cluster-based collaboration and innovation in the maritime decarbonisation space as Maritime CleanTech and Moananui aim for. MERC already has eleven Founding Members committed to accelerating maritime decarbonisation, with a mix of vessel operators, boat builders, suppliers, manufacturers, low carbon liquid fuel suppliers, and naval architects amongst them (see Figure 7).

60 26. What measures and metrics should be used to evaluate the final Transport and Infrastructure Net Zero Roadmap and Action Plan?

We believe that the obvious primary measure should be the percentage reduction in GHG emissions versus the 2005 levels. This is what ultimately will be measured by the Paris Agreement and is the most direct measure we will have of the plan’s impact on mitigating climate

change.

As previously explained, our analysis of the current approach used by the National Greenhouse

Gas Inventory shows that it is very likely that the Scope 1 emissions for the domestic maritime

sector have been under-estimated. For that reason, we think that extra data sources should be

added. This includes self-reporting by organisations operating domestic commercial vessels of

their fuel type and annual fuel use. This would create consumption data which could be mapped

to the supplier data currently used and could provide more accurate Scope 1 data to assess

results in the domestic maritime sector.

Another issue is that there are significant GHG emissions embodied in newbuild vessels. Much of

the equipment and materials used in boat building, both locally and for imported boats, are

sourced from overseas. It is important that the Net Zero Plan does not lead to an increase in

short-term GHG emissions due to relying on foreign boat builders following carbon intensive build

processes and requiring lengthy supply chains to fulfill This applies equally across other transport sectors.

One approach to acknowledging this issue, whilst encouraging more sustainable newbuild vessels, is to ensure that the measurement of the plan's success goes beyond the Scope 1 emissions measured by the National Greenhouse Gas Inventory and includes the embodied GHG

emissions of new vessels and marine equipment. If we want to truly reduce GHG emissions, it

would be best not to allow the importation or creation of new recreational or commercial vessels

without considering their embodied GHG emissions footprint. The same should go for engine

refits, and when other types of marine equipment are added to vessels. Applying a carbon tax or

GHG emissions intensity targets to these items will encourage boat builders and manufacturers to

consider how to decarbonise their own operations whilst producing vessels that will help vessel

operators decarbonise theirs. We see leading boat designers and builders beginning to consider

this, but an industry wide approach is needed.

In all other ways we agree with the guiding principles and success measures suggested by the

Consultation Roadmap.

61 26.1 What other data and evidence could governments use and how could this offer further insights on the pace, scale and location of transport emissions reduction pathways?

There are some interesting data points that may not exist yet, but that could be very helpful.

One important enabler of the electrification of domestic maritime transport is the ability of the

grid to support significant extra utilisation of electricity at places normally regarded as the edge

of the grid, namely boat ramps, marinas, harbours, and ports. An evaluation of the confidence of

the local grid provider to service demand for charging infrastructure from operators of those

maritime facilities would help identify where there might be a mismatch between the possible

uptake of battery-electric or plug-in hybrid electric vessels and renewable electricity supply.

62 27. Do you have any feedback on the proposed review process?

We believe it is important for a review process like this to be more frequent at the beginning of the

process in order to maximise learnings and help guide the success measures towards the best

approach as quickly as possible. For this reason, we would like to see the review process include

more frequent quarterly reviews for the first three years, falling back to an annual review for the

next two years, and only then to less frequent review periods. This will require the process to be

less in-depth and comprehensive, and more nimbly focused on lessons learnt. Close relationships

with industry associations like MERC will be required to ensure that the impact of the plan on businesses is clearly understood.

63 28. Do you have any further feedback on the Consultation Roadmap and proposed pathways?

While it is necessary to have a roadmap with sectoral pathways, what we hear repeatedly from vessel operators is that without changes being either required by law/regulations, or being encouraged by taxes/subsidies, they will not prioritise making changes beyond those that provide an obvious economic benefit (e.g., adding a new, more expensive, eco tour might convince them to buy one new vessel, but not to decarbonise their existing fleet). The type of decarbonisation that is required by Australia's Paris Agreement targets will require government intervention if it is to not indiscriminately put businesses into financial straits.

64 28.1 Is there anything missing? Are the sections appropriately integrated? Is the Roadmap appropriately ambitious?

The section on maritime transport is very focused on information about international shipping, yet the pathway is very much targeting our domestic maritime emissions, which are not talked about much prior to that point. Given this is a national plan, and it admits that international shipping will require international plans, and international cooperation, we think there should be more said about the challenges that the domestic recreational and commercial maritime sector have with decarbonisation.

We also think that the pathways have too much emphasis on Green Hydrogen and Green Hydrogen derived fuels and not enough ambition with regards to electrification. These are not good fuels for commercial vessels, and very inappropriate for recreational vessels. However, we

believe that bio-methanol would be suitable due to lower production costs and green credentials.

Other types of low carbon fuels have a reliance on the creation, and transport, of Green Hydrogen,

which have both proven to be more costly and more emissions-intensive than desired.

With battery electric transport we find technological advancements following a typical technology-driven learning curve that suggests we will soon see volumetric and gravimetric

energy densities sufficient for nearly all domestic maritime use cases, along with greater safety,

and at prices which will make economic sense.

For these reasons we think the domestic maritime pathway should speak of an electrified future,

with a short-term dominated by drop-in LCLFs like Renewable Diesel, and small amounts of bio-methanol in certain use cases.

We also think that an international maritime pathway could be worth developing as it is different in

ways similar to light and heavy vehicles. That pathway could talk about shore power, decarbonisation of ports, green shipping corridors, and bunkering for international shipping

(which could include biodiesel and some amount of bio-methanol)

65 29. Is there any further information or documentation that you wish to be considered with your submission?

We will include our latest Australian Domestic Maritime Emissions Review report for DITRDCA to refer to.

66 Would you like to upload a document?

Yes

67 Have you removed any identifying information from your submission?

Yes

68 Upload a submission

Transport and Infrastructure Net Zero Consultation Roadmap response from Maritime Impulse.pdf

69 Upload a submission
MERC Australian Domestic Maritime Emissions Review - April 2024.pdf

70 Upload supporting file
Not answered

71 Upload supporting file
Not answered

26th July 2024

Department of Infrastructure, Transport,
Regional Development, Communications and the Arts (DITRDCA)
GPO Box 594
CANBERRA ACT 2601

RE: Feedback on Transport and Infrastructure Net Zero Consultation Roadmap

This document provides feedback on the *Transport and Infrastructure Net Zero Consultation Roadmap* ("Consultation Roadmap") from Maritime Impulse Pty Ltd ("Maritime Impulse", "we" or "our").

About Maritime Impulse

Maritime Impulse exists to help domestic commercial vessel (DCV) owners in Australia decarbonise their existing vessel fleets. We offer digital solutions for DCV fleet owners and services around decarbonisation and innovation.

Maritime Impulse has founded a program called [MERC \(Maritime Emissions Reduction Coalition\)](#) which is uniting leading organisations in the maritime, manufacturing, energy, finance, government, and education sectors to drive emissions reduction in the Australian maritime industry for a greener, more sustainable future. It is an innovation ecosystem that aims to bring coordination, focus, and innovation to accelerate the reduction of maritime emissions and deliver a greener, more sustainable future for our waterways and oceans.

MERC will address the reduction of maritime emissions by:

- Uniting leading organisations in the maritime, manufacturing, energy, finance, government, and education sectors,
- Advocating with governments and regulators for industry needs,
- Facilitating research into the best ways for maritime operators to decarbonise,
- Connecting innovative suppliers with early adopter customers,
- Helping manufacturers scale up and commercialise sustainable products,
- Improving Australia's sovereign capacity to deliver maritime electrification, and
- Coordinating collaborative innovation projects across the industry.

Our Feedback

We have tailored our feedback around the questions asked by the Consultation Roadmap with a view to focusing mainly on the issues we believe affect the domestic maritime sector, with our focus in that sector mainly on commercial vessels rather than recreational vessels.

1.2 The Approach

Q1. Do you agree with the proposed guiding principles?

Yes.

Q1.1 Please add details to your response.

We think that DITRDCA have selected an excellent set of guiding principles for this purpose. The only one we would query is *Maximise economic opportunity*, as we think it is important to ensure we do not ignore the potential of negative economic effects when making systemic change. We think that a small but important change would be to rephrase this as *Maximise economic optionality*. This speaks to ensuring that the roadmap does indeed maximise positive economic changes, but that it also limits the impact of negative economic changes.

Q2. Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?

Yes.

Q2.1 Please add details to your response.

We think that the avoid-shift-improve framework will be ideally suited to the sorts of changes required.

One point we do want to make is that current transport planning in Australia often sees maritime transport as a potential mode only where it has always been used. For example, ATAP has this to say in their M6 Air and Sea Transport guideline¹:

The ATAP Guidelines focus specifically on land transport, covering road, rail, public transport and active travel. The other key forms of transport are air and sea transport. The Guidelines do not provide mode-specific guidance on these modes.

We would like to emphasise that new and innovative types of maritime transport should be more often considered for cargo and passenger transport options, as they may offer less emissive solutions in some cases.

2.1 Movement of people: promoting active and public transport

Q3. Do you agree the development of a national policy framework for active and public transport will support emissions reduction?

Yes.

¹ <https://www.atap.gov.au/sites/default/files/m6-air-and-sea-transport.pdf>

Q3.1 Please add details to your response.

We think the systemic issues that limit the use of active and public transport requires a strategic response from the Australian Government. As is noted in the Consultation Roadmap, the role of state, territory and local governments requires working closely together. In that sense, the national policy framework is a supporting piece of work, it may well not be the most influential in actually delivering greater uptake of active and public transport by the public.

Q4. What should be included in a national policy framework for active and public transport and how should it be developed?

One item that might be under-appreciated is the potential for waterborne public transport to offer innovative options for helping communities divided by waterways. In many countries ferries offer a way to extend active transport routes across waterways that might otherwise require significant extra distances, across busy bridges. We see this with new electric ferry designs that make significant space for bikes and scooters. They also support densification of waterside suburbs, without putting more pressure on existing public transport routes.

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With national regulation of domestic commercial vessels there is an opportunity for the Australian Government to influence how attractive urban ferry options can become.

Q5. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the movement of people contributes to transport emissions reduction?

It is vitally important that public transport options continue to decarbonise, which in nearly all cases means electrify. This maximises the gains from shifting electricity production to more renewable sources, but also puts pressure on the grid to provide more energy. For these reasons we need to promote local production via solar panels, with local battery storage, and make it easier for the transport industry as a whole to access the energy they need.

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Unfortunately, whilst there is a standard for automotive diesel, there is no equivalent standard for marine diesel. That coupled with the fact that the marine engine emission standards only cover spark ignition (i.e., petrol) engines⁵ means that the status quo for domestic maritime transportation is hard to change.

² <https://www.mibluesperspectives.com/stories/mental-health/what-is-blue-mind-theory>

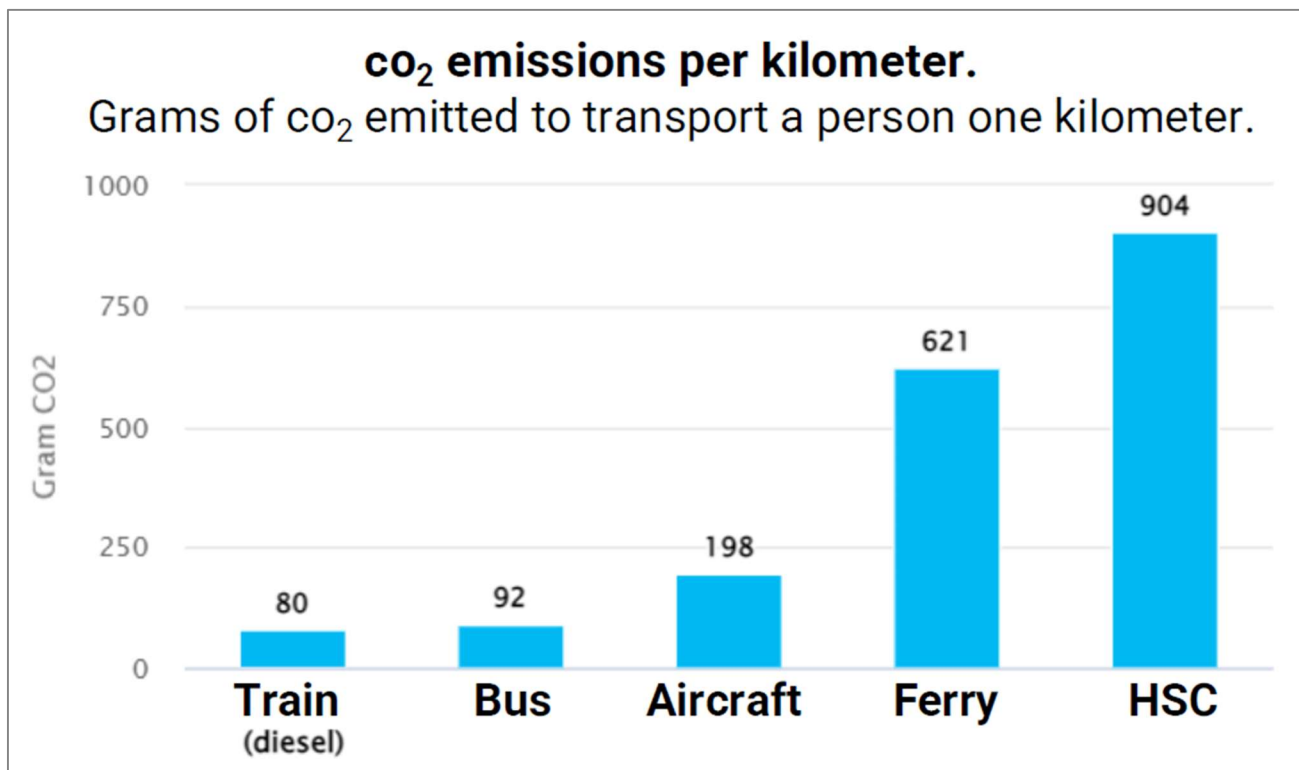
³ <https://msutoday.msu.edu/news/2016/ocean-views-linked-to-better-mental-health>

⁴ <https://www.transport.nsw.gov.au/operations/roads-and-waterways/environment-and-heritage/vessel-biofuels>

⁵ <https://www.dcceew.gov.au/environment/protection/publications/types-of-products-covered-by-new-emissions-standards>

European studies have shown that traditional and high-speed craft (HSC) ferries are far more emissions intensive than other public transportation modes⁶ (see Figure 1 below). For this reason, a highly effective decarbonisation action is to address the emissions of ferries.

Figure 1: GHG Emissions by Transport Mode. Source: Vestland County Council.



⁶ https://www.project-albatts.eu/Media/NewsEvents/25/NewsEvents_25_SLIDES_20230201_17556.pdf

3.4 Maritime

Q17. Do you agree with the proposed net zero pathway for maritime?

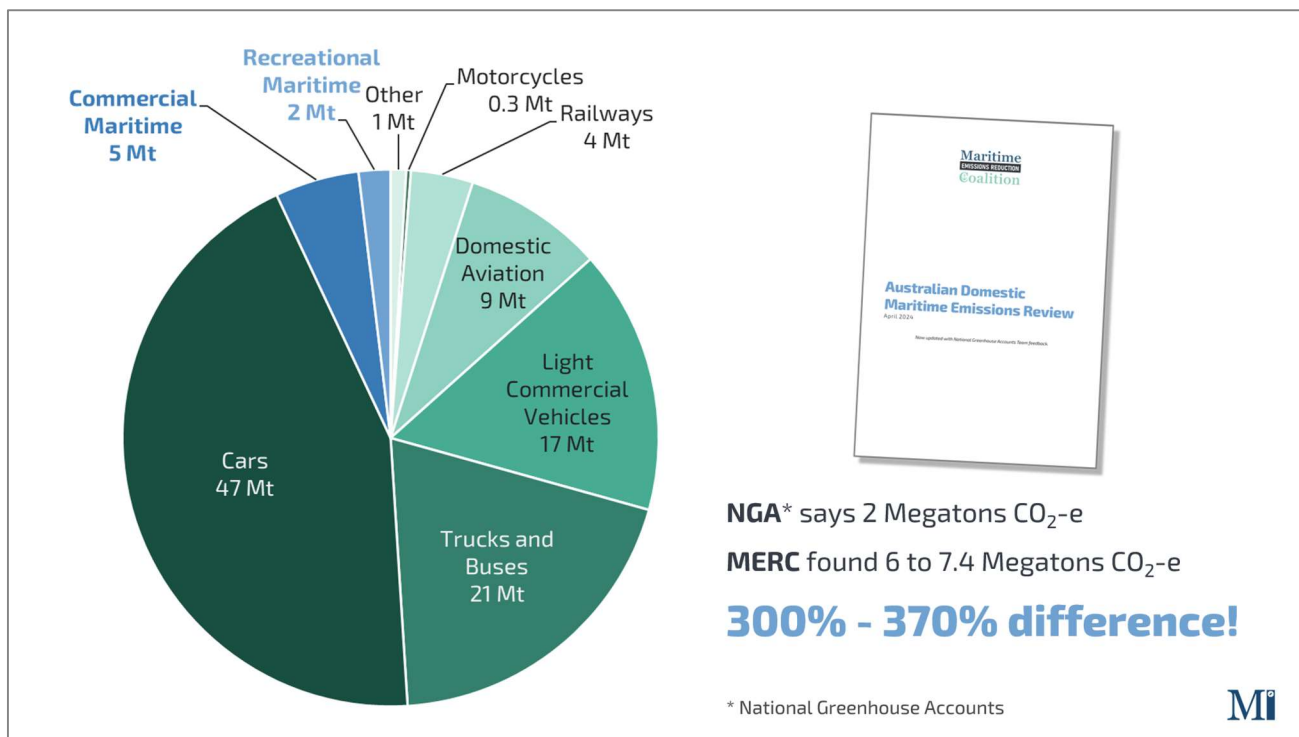
No.

Q17.1 Please add details to your response.

Domestic Maritime Emissions are Important

We believe that the National Greenhouse Accounts estimate of domestic maritime fuel use significantly underestimates actual petrol and diesel use by the domestic maritime sector⁷. Figure 2 shows the scale of the difference.

Figure 2: Australian Domestic Maritime Emissions Review



This difference is significant because it shows that whilst international shipping's GHG emissions of 39.4 million tons is important, so are those from domestic maritime at 7.4 million tons. Our submission includes a copy of our *Australian Domestic Maritime Emissions Review* report for DITRDCA to refer to.

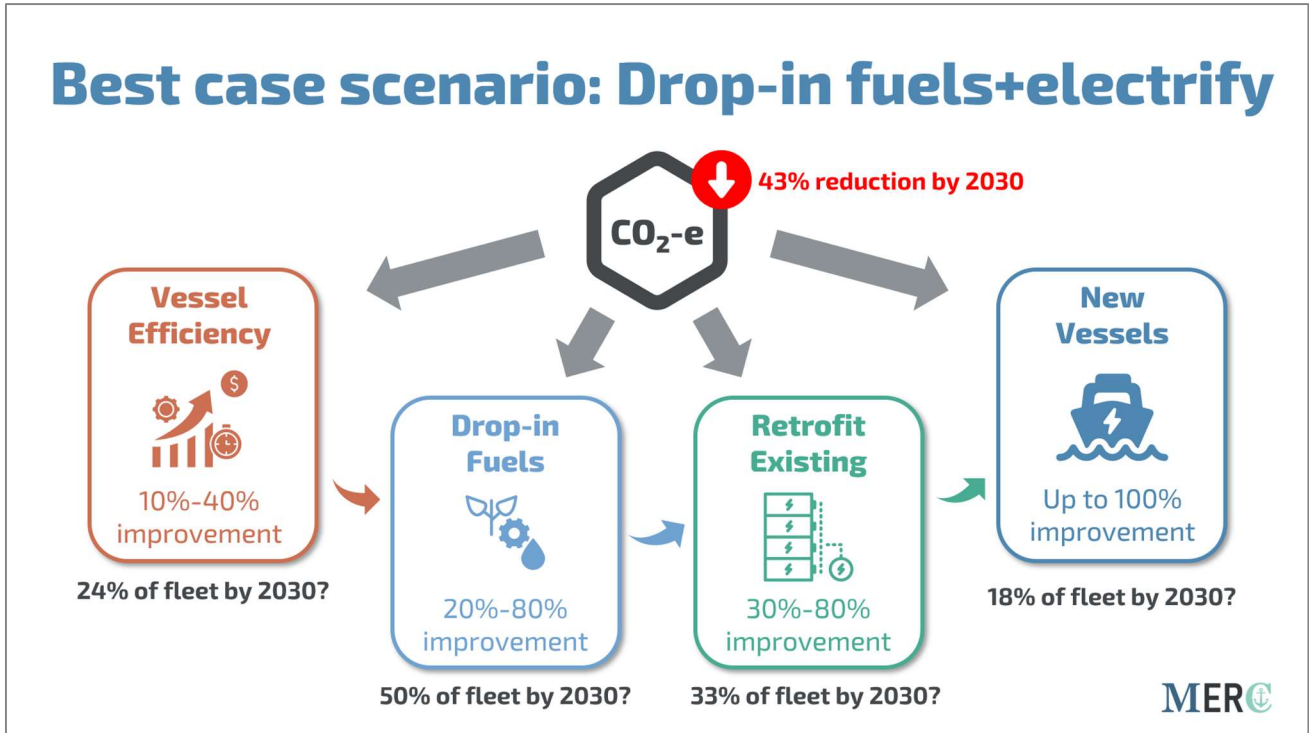
Existing Fleet Can Reduce Emissions

Based on analysis which I did for the Fisheries Research Development Corporation (FRDC) report on *Climate Resilient Wild Catch Fisheries (FRDC 2021-089)*⁸ we find that relying on newbuild vessels and retrofits to reduce GHG emissions will only lead to some of the change needed in the sector's emissions, and only with significant incentives and battery density improvements (see Figure 3 for more detail). This is partly because figures from the Australian Maritime Safety Authority (AMSA) show that only around 1% of the fleet is currently replaced each year, and many newbuilds take multiple years to deliver, and are already in production.

⁷ <https://www.merc.blue/resources>

⁸ <https://www.frdc.com.au/project/2021-089>

Figure 3: Best case scenario for decarbonising DCVs by 2030



We believe the proposed net zero pathway should mention incentives and support for the commercial maritime industry to take up the options for existing vessels: namely vessel efficiency measures and drop-in low carbon liquid fuels (LCLFs). This should not take away from retrofits and newbuilds that are decarbonised but acknowledges that they can only make up part of the existing fleet's emissions reduction.

With regards to energy optimisation measures, there are various Government measures designed to help reduce Australian businesses' inefficient use of electricity. However, there is nothing similar around energy use by commercial vessels. An easy way forward would be to extend the same sort of support and incentives around energy optimisation for commercial vessel operators. Our estimate is that this could be taken up by approximately 24% of the existing fleet (many are already doing this very well) and it could well lead to a 10-40% reduction in GHG emissions for those vessels.

With regards to drop-in marine LCLFs, according to AMSA the domestic commercial vessel fleet has approximately 24,000 powered vessels, and as our *Australian Domestic Maritime Emissions Review* report shows, we can estimate that around 14,000 of those are probably using petrol engines, while the rest are larger vessels most often using diesel engines. We have responded to the *Low Carbon Liquid Fuels Consultation* about the needs of the maritime sector, but some of the points bear repeating here.

There are few low carbon drop-in fuel replacements for petrol that are appropriate in a marine environment. In land-based petrol engines there is usually a push to mix low carbon ethanol with the petrol to provide some emissions benefits. Unfortunately, ethanol blends with petrol are not recommended in marine environments due to the hydrophilic nature of ethanol which will tend to

separate from the petrol and damage the engines it is used in⁹. Another option, butanol, has been tested and a 16% blend ("Bu16") has been approved by most engine OEMs for marine use¹⁰, but there is no current supply of butanol blended petrol fuel in Australia. Small vessels have two other sustainable choices, one being to electrify their outboards, and the other being to move to more efficient diesel outboards¹¹. But given the costs involved, neither of these are equivalent to a simple drop-in fuel change.

Fortunately, the bulk of the emissions from domestic commercial vessels is from the larger vessels which consume diesel. Renewable Diesel is a low carbon drop-in fuel that has been extensively used by maritime vessels in Europe and California and is supported by most marine diesel engine OEMs¹². Given the chemical similarity with regular diesel there are few regulatory or safety requirements that need changing. Renewable Diesel is currently available with around 80-90% reductions in Scope 1 GHG emissions than regular automotive diesel. The Department of Climate Change, Energy, the Environment and Water (DCCEEW) has run a consultation on *Enabling Supply of Renewable Diesel in Australia* which focused on whether a new standard was needed for Paraffinic Diesel (a chemical description of Renewable Diesel) and which we have also responded to.

Given the seriousness with which Australia is attempting to ensure a domestic supply of Renewable Diesel it seems obvious that it should be identified as a priority short-term solution in the Transport and Infrastructure Net Zero Plan beyond saying that "LCLFs are used in some small vessels". Even a modest blend of 50% Renewable Diesel and 50% automotive diesel would help make a significant impact on emissions if used by the majority of diesel consuming vessels in the existing fleet. Whilst this would increase costs, we think the example of California is worth noting.

In California, because of the *Low Carbon Fuel Standard*, the cost of Renewable Diesel is now on par with fossil Diesel (see Figure 4)¹³. These prices are higher than the costs for either in other states, but well below the 200%-400% premium we currently see with Renewable Diesel in Australia. As a result, the California Air Resources Board (CARB) has been able to require 99%+ Renewable Diesel use in all commercial harbor craft since January 2023, and has required all commercial operators report on their fuel use to CARB¹⁴.

⁹ <https://www.nsw.gov.au/driving-boating-and-transport/e10-fuel/e10-facts>

¹⁰

<https://www.nmma.org/assets/cabinets/Cabinet515/Marine%20Biobutanol%20Research%20Book%20SFS2.compressed.pdf>

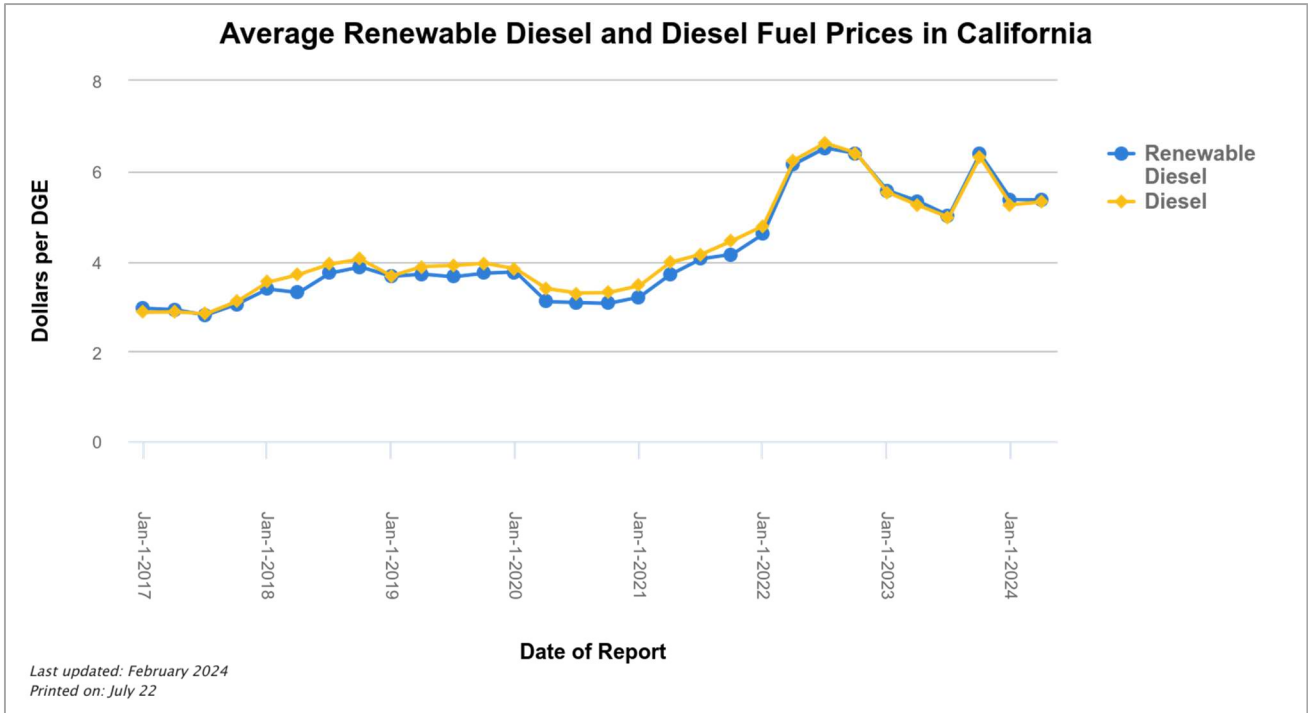
¹¹ <https://www.boatsales.com.au/editorial/details/diesel-outboard-engine-buyers-guide-143170/>

¹² <https://www.neste.be/en/renewable-diesel-hvo/product-information/product-information/oem-approvals>

¹³ <https://afdc.energy.gov/fuels/prices.html>

¹⁴ <https://ww2.arb.ca.gov/resources/fact-sheets/chc-factsheet-renewable-diesel-r100-or-r99>

Figure 4: Renewable Diesel vs Diesel Prices in California. Source: US DoE



With regards to recreational vessel owners, we think the amount of GHG emissions per vessel (2 million tons of GHG emissions annually, split across approximately 900,000 boats and 100,000 personal watercraft) makes the existing fleet not worth addressing beyond mandating the use of marine appropriate drop-in fuels. However, the Government should bring in strict emissions standards for new marine engines and promote the purchase of new recreational vessels that are designed to be battery electric or plug-in hybrid electric.

Q18. The Australian Government is engaging in consultation as part of the development of the Maritime Emissions Reduction National Action Plan and those consultations will also inform the final Roadmap and Action Plan.

Q18.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce maritime emissions?

Green Ports for Green Shipping Corridors

With regards to international shipping, Australia does not own, operate, build, or dismantle the sorts of ships that we depend on for international trade. Therefore, we are largely limited to influencing this area by how fast we adopt International Maritime Organisation (IMO) rules in our local regulations, how we choose to run our ports, and what sorts of low carbon liquid fuels we bunker/export. The Consultation Roadmap mentions green shipping corridors as a practical way for Australia to support more sustainable international shipping, and we agree with this analysis.

An important point is to note that the slow diesel engines used by ships are able to use biodiesel blends (B24 has become popular across Asia) that are not compatible with the medium and fast diesel engines used by most domestic commercial vessels. In the same way, there are methanol and ammonia ship designs that are likely to come into service well before any smaller vessel will use those low carbon liquid fuels. So, a green shipping corridor might very well be setup that has minimal value for decarbonising the domestic maritime sector.

We propose that where green shipping corridors are announced, the local ports involved in those, be required to commit to decarbonising the harbour vessels that work in and around the port. This should include the tugs, pilot boats, workboats, and barges, as well as the auxiliary engines used on those vessels around the port.

We see this happening with ports like Singapore. The Singapore Green Plan 2030 states that their target by 2030 is for “All new harbour craft operating in our port waters to be fully electric, be capable of using B100 biofuels, or be compatible with net zero fuels from 2030”¹⁵.

This commitment brings decarbonisation benefits to their domestic commercial vessels and marine supplier businesses, and also causes there to be a natural aligning of interests with the IMO’s GHG strategy. Singapore has followed that up with their Maritime Cluster Fund, Energy Efficiency Grant, and Enterprise Financing Scheme which all offer maritime businesses, either free or cheap, funds to decarbonise their operations¹⁶. The Singapore Maritime and Port Authority has also stepped forward as a patron of electric solutions by piloting charging solutions for electric vessels¹⁷ and sponsoring the development of electric harbour craft designs¹⁸. Finally, they have helped create the Global Centre for Maritime Decarbonisation (GCMD) in 2021 which has led the way in advancing projects to develop thinking ahead of the IMO’s GHG strategy.

Whilst no Australian port has the global reach and impact that Singapore has, we should note that Australia does have a sizable marine industry that according to industry research, employs over 25,000 people, has a turnover of \$9.64 billion and experienced local boat and ship builders that supply local and export markets¹⁹. Any green shipping corridor proposal should consider how to ensure the transformative effects of decarbonisation can positively impact local businesses, beyond helping multinational companies source their green fuels from Australia’s resources.

Local/State Government Support for Maritime Electrification

There should be the acknowledgement that the medium to long-term future of decarbonisation efforts in domestic maritime will be focused on the electrification of maritime transport. Figure 5 shows the complexity of the system that needs to be properly considered when electrifying maritime transport. Far beyond just the design changes to vessel propulsion, or auxiliary systems, there needs to be consideration of how to strengthen the grid near marinas, harbours, and ports, and even how to get the grid to extend beyond the current boundaries into the offshore domain.

¹⁵ <https://www.greenplan.gov.sg/targets/>

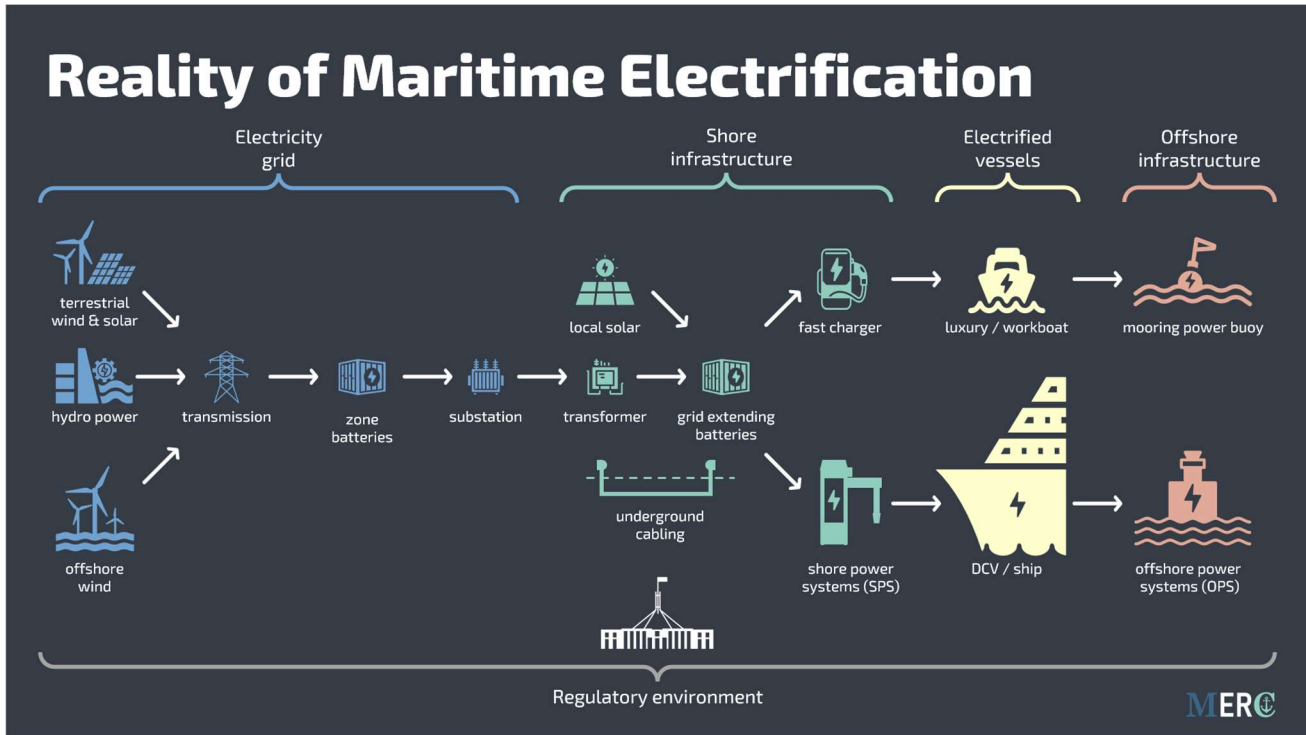
¹⁶ <https://www.mpa.gov.sg/media-centre/details/media-factsheet-charting-singapore-forward-as-a-hub-port-and-international-maritime-centre>

¹⁷ <https://www.mpa.gov.sg/media-centre/details/vessel-charging-concepts-for-electric-harbour-craft-selected-for-trials>

¹⁸ <https://www.mpa.gov.sg/media-centre/details/11-proposals-selected-to-advance-electric-harbour-craft-designs-in-singapore>

¹⁹ <https://bia.org.au/library/industry-data/>

Figure 5: Reality of Maritime Electrification



The land-based changes required to support maritime electrification need to be raised with communities that will be affected, and the many stakeholders and rights holders in the coastal zones need to be consulted about what sort of outcomes should be aimed for. Unfortunately, the geographical and oceanographical limitations of marinas, harbours, and ports mean that there are few options to create new ones and good reasons for why the existing ones should remain. This will mean that local and state governments that control these assets will need to consider how to re-purpose existing land to support electrification, when to start preparing for this to happen, and how to support development applications for these purposes.

Support Offshore Charging Innovation

With regards to offshore charging infrastructure, we should learn lessons from the direction that offshore wind has taken in Europe where it is a far more mature industry than here in Australia. We see a demand for low emissions options for offshore support vessels (OSVs) as their emissions reduce the sustainability of the power created by the offshore wind farms they service. The noted technology limitations of battery-electric or even plug-in hybrid electric systems have led to the development of innovations that can reduce the energy consumption of those vessels when on station at the wind farms they are servicing.

Offshore charging solutions for wind farms have been developed by Stillstrom²⁰, MJR Power & Automation²¹, Bluewater²², and Oasis Marine²³. This part of the market is maturing, and pilot deployments are in the process of happening.

²⁰ <https://stillstrom.com/offshore-wind>

²¹ <https://www.mjrpowers.com/products/offshore-power-charging>

²² <https://www.bluewater.com/media-contacts/downloads/e-buoy-brochure/>

²³ <https://oasismarine.co.uk/>

Offshore charging is still seeing innovators explore other use cases, such as Stillstrom's Green Anchorage Zones idea²⁴, the Magonis MAGBuoy for trickle charging small electric boats, and OPT's PB3 PowerBuoy® which offers charging for their WAM-V® autonomous surface vessels (ASVs).

Obviously, Australia's offshore wind farm developers will be able to simply purchase the offshore charging infrastructure needed when they start commissioning the wind turbines. However, our point is that the early focus on offshore wind farms in Europe has been harnessed to help them develop unique solutions for decarbonising the maritime sector. Australia has unique problems in managing our vast maritime domain, but we also make incredible use of it with marine tourism. Currently there are operational reasons why electrification might be hard for this industry, but a focus on promoting innovative decarbonisation solutions could lead to Australia developing our own solutions to global problems like offshore charging in protected and remote areas. Solutions that could offer a way of electrifying even difficult use cases like all day marine excursions to the Great Barrier Reef.

Q18.2 How would these actions address the identified challenges and opportunities to reduce maritime emissions?

We believe that by acknowledging the fact that *Domestic Maritime Emissions are Important* we can see increased focus on reducing the emissions of some of the largest mobile sources of greenhouse gas emissions. It also justifies supporting Renewable Diesel against SAF production.

Our point with *Existing Fleet Can Reduce Emissions* is that the Government can already take actions to reduce emissions from the current domestic maritime fleet without needing to wait for vessels to go through expensive refit or replacement lifecycles.

Promoting and supporting energy optimisation measures will help the industry futureproof their existing vessels. Renewable Diesel can already make a significant difference to maritime emissions if the Government can help address the price gap by giving certainty to suppliers of those LCLFs and modestly increasing the cost of high carbon liquid fuels in a similar way to California's *Low Carbon Fuel Standard*. Unlike other LCLFs it has an energy density very similar to fossil Diesel and does not require significant investment in new infrastructure to deploy.

By requiring *Green Ports for Green Shipping Corridors*, we would create more demand for decarbonised domestic commercial vessels and create opportunities for Australian marine suppliers to create local solutions and products. This would ensure that green shipping corridors help fund local infrastructure development, supply chains, and pilot projects.

We believe that *Local/State Government Support for Maritime Electrification* is needed to see maritime electrification accelerated and not held back by a lack of focus. This will impact the smaller ports, harbours, and marinas used by most domestic commercial vessels more than bunkering facilities at large container and bulk cargo ports.

Investing to *Support Offshore Charging Innovation* will help develop local solutions that will not only decarbonise the Australian marine tourism industry but can help address similar challenges across South-East Asia and the Pacific Islands.

²⁴ <https://stillstrom.com/green-anchorage-zones>

5.1 Travelling in partnership

Q25. What are the best ways for the Australian Government to work collaboratively with industry, business, governments and communities to implement the proposed pathways?

Government interventions to implement these pathways will, by definition, create change in the existing landscape of the transport sector. This change will have both positive and negative aspects, and without a good feedback mechanism the Government is likely to only be aware of some of each of these.

With the maritime sector, existing industry bodies such as the Australian Commercial Marine Group (ACMG)²⁵, the Maritime Industry of Australia Ltd (MIAL)²⁶, Boating Industry Association (BIA)²⁷, and Australian Marine Park Tourism Operators (AMPTO)²⁸ can definitely help the Government understand how negative aspects can create business challenges, market imbalances, and create winners and losers.

When it comes to the positive aspects, especially the opportunities, then more specialised industry bodies should be partnered with, such as the Maritime Emissions Reduction Coalition (MERC)²⁹ and the Australian International Marine Export Group (AIMEX) as they can help the Government understand what capabilities will be needed, what opportunities exist (for both manufacturers and operators), and what level of ambition should be aimed for in terms of a sovereign supply chain.

Q25.1. What are good domestic or international examples of partnership and collaboration on transport and transport infrastructure emissions reduction that could inform the final Roadmap and Action Plan?

There are two excellent international examples of this sort of collaboration specific to transport emissions reduction.

Maritime CleanTech - Norway³⁰

Maritime CleanTech is a government funded innovation cluster in Norway focused on creating energy-efficient and sustainable technologies. Like most European clusters they have a mix of customers, manufacturers, and service providers. In their case the cluster's categories of partners includes:

- Class and regulation,
- Design and engineering,
- Energy,
- Equipment and service,
- Finance and law.
- Harbours,

²⁵ <https://www.commercialmarine.com.au/>

²⁶ <https://mial.org.au/>

²⁷ <https://bia.org.au/>

²⁸ <http://www.ampto.org/>

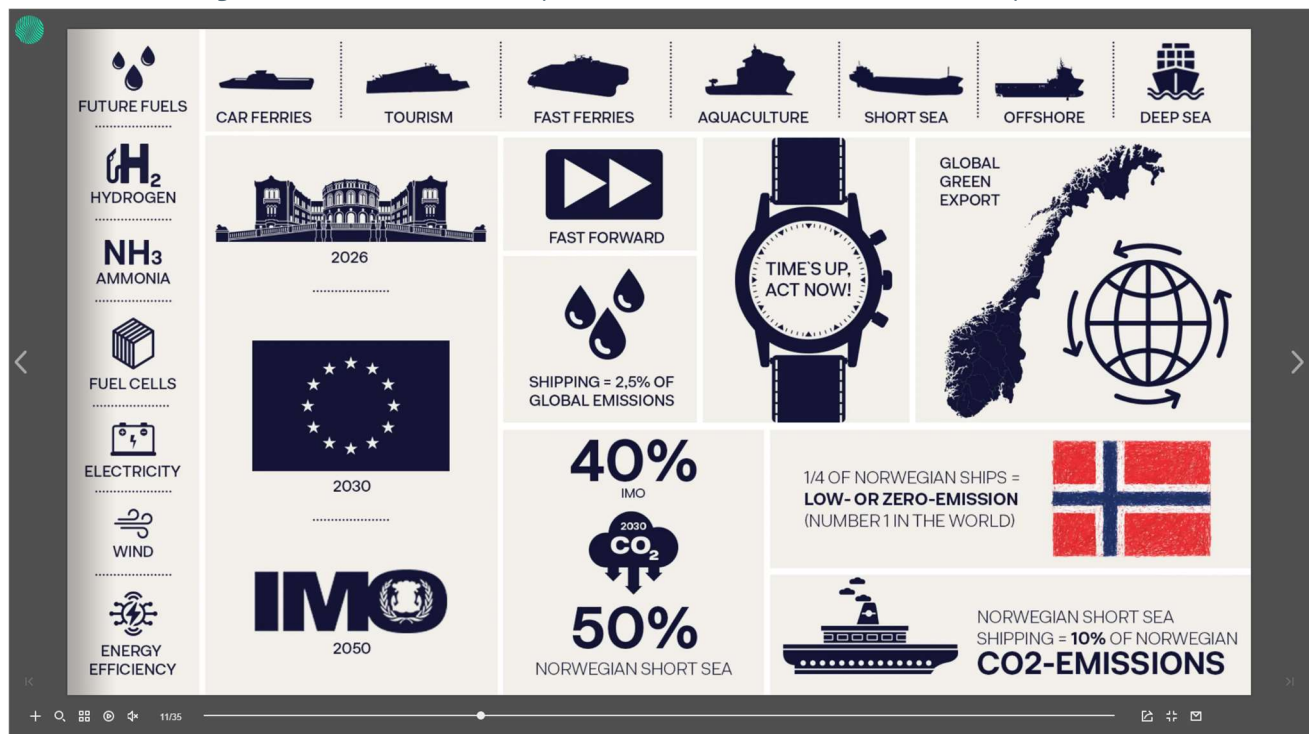
²⁹ <https://www.merc.blue/>

³⁰ <https://maritimecleantech.no/>

- Public,
- R&D and education,
- Ship owners, and
- Yards.

Since their founding in March 2011 with nine members, Maritime CleanTech has grown to encompass nearly 150 partner organisations in 2024. As their latest Annual Report³¹ shows (see Figure 6) they have helped drive substantial changes in Norwegian domestic maritime emissions.

Figure 6: Maritime CleanTech Impact. Source: Maritime Cleantech Annual Report 2023



Maritime CleanTech benefited from the Norwegian Innovation Clusters' (NIC) focus on creating Government funded innovation clusters "to strengthen the ability for collaboration and innovation among Norwegian companies, so that they can solve challenges and create competitive advantages together"³². NIC funding is split between coverage of operating expenses and innovation support.

Moananui - New Zealand³³

Moananui is a New Zealand not-for-profit Blue Economy cluster which was first conceived of in 2019 "with the ambition to be Good Ancestors and activities guided by Blue Economy Principles for Aotearoa"³⁴. In 2023 they received "two-years government seed-funding"³⁵ and launched with

³¹ <https://online.fliphtml5.com/nibuz/wpqw/>

³² <https://nic.innovasjon norge.no/>

³³ <https://www.moananui.org.nz/>

³⁴ <https://moananui.webflow.io/post/moananui-our-story>

³⁵ Ibid.

“nine founding partners from diverse organisations including fisheries and aquaculture, science and research, iwi, regional development, pharmaceuticals, ports and engineering.”³⁶

Their focus has naturally formed around fisheries and fishing as many of the founding partners were in that area, they have now grown to include 34 partners who are all focused on generating economic value while still upholding environmental stewardship. Whilst it is still early days, they have already had some success bringing people and organisations together around Blue Economy collaboration in their Blue Economy Innovation Summit³⁷ and in some of the projects they have already run.

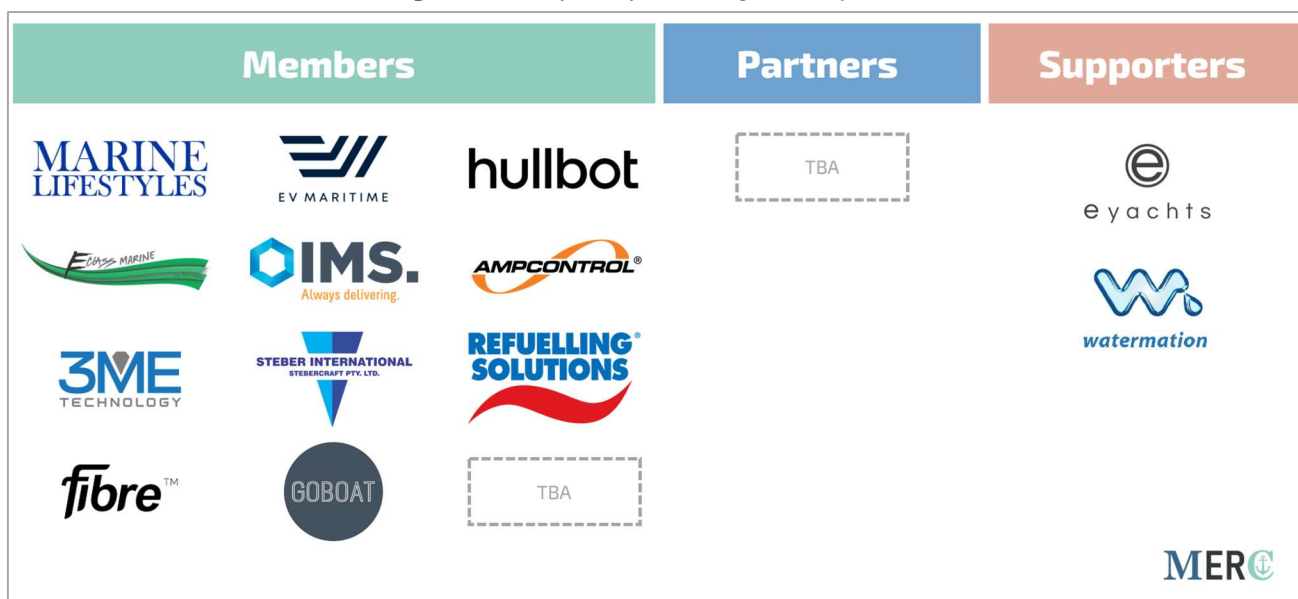
They have credited Cluster Navigators³⁸ for the model they are applying, which is very similar to the European cluster model used by Maritime CleanTech.

Q25.2 What opportunities can the government leverage to show leadership in Australia and internationally?

With the launch of the Maritime Emissions Reduction Coalition (MERC) in February 2024³⁹, there is now an opportunity for the government to fund the same sort of cluster-based collaboration and innovation in the maritime decarbonisation space as Maritime CleanTech and Moananui aim for.

MERC already has eleven Founding Members committed to accelerating maritime decarbonisation, with a mix of vessel operators, boat builders, suppliers, manufacturers, low carbon liquid fuel suppliers, and naval architects amongst them (see Figure 7).

Figure 7: MERC participants as of 26th July 2024



An important point that is sometimes missed by people not familiar with the maritime sector is that different countries and regions have different specialties. For example, Korea, Japan, and

³⁶ Ibid.

³⁷ <https://moananui.webflow.io/summit>

³⁸ <https://www.clusternavigators.com/>

³⁹ https://www.linkedin.com/posts/maritime-impulse_mernap-maritimeindustry-energytransition-activity-7162663972469428224-lzN4

China build most of the world's large ships. Norway has a formidable reputation for passenger ferries which Maritime CleanTech is helping channel into export growth⁴⁰:

Maritime CleanTech and partners are involved in several export-oriented programs. Low and zero-emission solutions and corresponding infrastructure for passenger vessels are proven and mature technology in the Norwegian market and ready for export.

On behalf of Innovation Norway, Maritime CleanTech is leading the export initiative to position Norwegian shipyards, equipment manufacturers, and service providers in the green maritime passenger transport markets in Southern Europe, starting in France before continuing to Spain and Italy. In addition, there is strong collaboration with Team Norway and several actions taken related to the markets in Asia and North America, e.g, towards Singapore and Pacific Northwest of USA.

Whilst Australia does not produce bulk carriers, container vessels, or oil tankers, we do have a deserved reputation for large high-speed ferries, thanks to Incat Tasmania and Austal Ltd⁴¹. We also have significant local capacity to create many smaller commercial craft and there is an opportunity for Australia to show leadership in parts of the maritime sector that are particularly important to Australia.

For example, the marine tourism industry, which is a key drawcard for Australian tourism, and a vital part of our economy, was valued at \$19.9 billion in 2020-21 and directly employs 138,703 people (despite COVID-19 affecting international tourism numbers)⁴². In our Pacific Islands neighbours, there is also a reliance by most states on marine tourism. There are significant barriers to decarbonising marine tourism in that region, not the least of which is the difficulty of accessing renewable electricity generation in pristine remote locations. Addressing this sort of problem can create a significant competitive advantage for Australia and create a significant export market for Australian-designed and made, low emissions vessels and marine equipment.

The Maritime Emissions Reduction Coalition (MERC) measures our success in a number of ways;

1. By tracking the Scope 1, 2 and 3 greenhouse gas (GHG) emission reductions of our members that operate vessels and maritime facilities (marinas, harbours, ports, etc.),
2. By the number and significance of lessons learned with specific technologies or emissions reduction strategies,
3. By the number, size, and importance of the cross-industry collaborative projects our members engage in, and
4. By the number and size of export opportunities we facilitate for member organisations.

⁴⁰ <https://online.fliphtml5.com/nibuz/wpqw/>

⁴¹ https://en.wikipedia.org/wiki/High-speed_craft

⁴² AIMS Index of Marine Industry 2023, Australian Institute of Marine Science

By funding MERC, the government will:

- Strengthen collaboration and innovation around decarbonising the Australian domestic maritime sector,
- Promote maritime decarbonisation, without picking a particular winning technology, product, or company, and
- Help create a new export market for Australian marine equipment businesses.

5.2 Measuring success

Q26. What measures and metrics should be used to evaluate the final Transport and Infrastructure Net Zero Roadmap and Action Plan?

We believe that the obvious primary measure should be the percentage reduction in GHG emissions versus the 2005 levels. This is what ultimately will be measured by the Paris Agreement and is the most direct measure we will have of the plan's impact on mitigating climate change.

As previously explained, our analysis of the current approach used by the National Greenhouse Gas Inventory shows that it is very likely that the Scope 1 emissions for the domestic maritime sector have been under-estimated. For that reason, we think that extra data sources should be added. This includes self-reporting by organisations operating domestic commercial vessels of their fuel type and annual fuel use. This would create consumption data which could be mapped to the supplier data currently used and could provide more accurate Scope 1 data to assess results in the domestic maritime sector.

Another issue is that there are significant GHG emissions embodied in newbuild vessels. Much of the equipment and materials used in boat building, both locally and for imported boats, are sourced from overseas. It is important that the Net Zero Plan does not lead to an increase in short-term GHG emissions due to relying on foreign boat builders following carbon intensive build processes and requiring lengthy supply chains to fulfill. This applies equally across other transport sectors.

One approach to acknowledging this issue, whilst encouraging more sustainable newbuild vessels, is to ensure that the measurement of the plan's success goes beyond the Scope 1 emissions measured by the National Greenhouse Gas Inventory and includes the embodied GHG emissions of new vessels and marine equipment. If we want to truly reduce GHG emissions, it would be best not to allow the importation or creation of new recreational or commercial vessels without considering their embodied GHG emissions footprint. The same should go for engine refits, and when other types of marine equipment are added to vessels. Applying a carbon tax or GHG emissions intensity targets to these items will encourage boat builders and manufacturers to consider how to decarbonise their own operations whilst producing vessels that will help vessel operators decarbonise theirs. We see leading boat designers and builders beginning to consider this, but an industry wide approach is needed.

In all other ways we agree with the guiding principles and success measures suggested by the Consultation Roadmap.

Q26.1 What other data and evidence could governments use and how could this offer further insights on the pace, scale and location of transport emissions reduction pathways?

There are some interesting data points that may not exist yet, but that could be very helpful.

One important enabler of the electrification of domestic maritime transport is the ability of the grid to support significant extra utilisation of electricity at places normally regarded as the edge of the grid, namely boat ramps, marinas, harbours, and ports. An evaluation of the confidence of the local grid provider to service demand for charging infrastructure from operators of those maritime facilities would help identify where there might be a mismatch between the possible uptake of battery-electric or plug-in hybrid electric vessels and renewable electricity supply.

Q27. Do you have any feedback on the proposed review process?

We believe it is important for a review process like this to be more frequent at the beginning of the process in order to maximise learnings and help guide the success measures towards the best approach as quickly as possible. For this reason, we would like to see the review process include more frequent quarterly reviews for the first three years, falling back to an annual review for the next two years, and only then to less frequent review periods. This will require the process to be less in-depth and comprehensive, and more nimbly focused on lessons learnt. Close relationships with industry associations like MERC will be required to ensure that the impact of the plan on businesses is clearly understood.

Q28. Do you have any further feedback on the Consultation Roadmap and proposed pathways?

While it is necessary to have a roadmap with sectoral pathways, what we hear repeatedly from vessel operators is that without changes being either required by law/regulations, or being encouraged by taxes/subsidies, they will not prioritise making changes beyond those that provide an obvious economic benefit (e.g., adding a new, more expensive, eco tour might convince them to buy one new vessel, but not to decarbonise their existing fleet). The type of decarbonisation that is required by Australia's Paris Agreement targets will require government intervention if it is to not indiscriminately put businesses into financial straits.

Q28.1. Is there anything missing? Are the sections appropriately integrated? Is the Roadmap appropriately ambitious?

The section on maritime transport is very focused on information about international shipping, yet the pathway is very much targeting our domestic maritime emissions, which are not talked about much prior to that point. Given this is a national plan, and it admits that international shipping will require international plans, and international cooperation, we think there should be more said about the challenges that the domestic recreational and commercial maritime sector have with decarbonisation.

We also think that the pathways have too much emphasis on Green Hydrogen and Green Hydrogen derived fuels and not enough ambition with regards to electrification. These are not good fuels for commercial vessels, and very inappropriate for recreational vessels. However, we believe that bio-methanol would be suitable due to lower production costs and green credentials. Other types of low carbon fuels have a reliance on the creation, and transport, of Green Hydrogen, which have both proven to be more costly and more emissions-intensive than desired.

With battery electric transport we find technological advancements following a typical technology-driven learning curve that suggests we will soon see volumetric and gravimetric energy densities sufficient for nearly all domestic maritime use cases, along with greater safety, and at prices which will make economic sense.

For these reasons we think the domestic maritime pathway should speak of an electrified future, with a short-term dominated by drop-in LCLFs like Renewable Diesel, and small amounts of bio-methanol in certain use cases.

We also think that an international maritime pathway could worth developing as it is different in ways similar to light and heavy vehicles. That pathway could talk about shore power, decarbonisation of ports, green shipping corridors, and bunkering for international shipping (which could include biodiesel and some amount of bio-methanol).

Q29. Is there any further information or documentation that you wish to be considered with your submission?

We will include our latest *Australian Domestic Maritime Emissions Review* report for DITRDCA to refer to.

In Conclusion

Maritime Impulse wishes to thank DITRDCA for the opportunity to comment on the *Transport and Infrastructure Net Zero Consultation Roadmap*.

We believe this is an excellent and well-researched roadmap, that has been prepared with the aim of seeking pragmatic solutions, and balancing a wide range of concerns, primarily environmental, but also ones related to fairness, equity, and accessibility.

We hope our input is valuable in helping make this roadmap, and the maritime pathway, more effective for the domestic maritime sector. We have presented the Maritime Emissions Reduction Coalition (MERC) as a potential partner for the government to work with in accelerating the decarbonisation of the maritime sector, and we hope this invitation to work together is taken up.

Yours faithfully,


Angus McDonald
CEO & Co-founder
Chair of the MERC Steering Committee

Maritime Impulse Pty Ltd
ABN 72 666 351 471

Maritime
EMISSIONS REDUCTION
Coalition



Australian Domestic Maritime Emissions Review

April 2024

Now updated with National Greenhouse Accounts Team feedback.

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Contributors

Australian Maritime Safety Authority, Boating Industry Australia, National Greenhouse Accounts Team



Executive Summary

Australia has committed to reducing our greenhouse gas (GHG) emissions by 43% by 2030 as an interim point on our progress towards net zero emissions by 2050. The energy transition needed to deliver on these targets is considerable and focus must be made where it is most important – whilst not neglecting the impact on any part of the economy.

Since those targets were announced, Australia's Paris Agreement inventory emissions from fuel use in domestic maritime has remained recorded as around **2 Megatons** of CO₂-equivalent gaseous emissions¹.

Unfortunately, this grossly underestimates the GHG emissions from the maritime sector, both because it ignores Scope 2 and Scope 3 emissions (such as fuel transport, refrigerant leakage, shoreside electricity use, etc.) and because it does not actually match the likely emissions when derived through bottom-up calculations using published industry numbers.

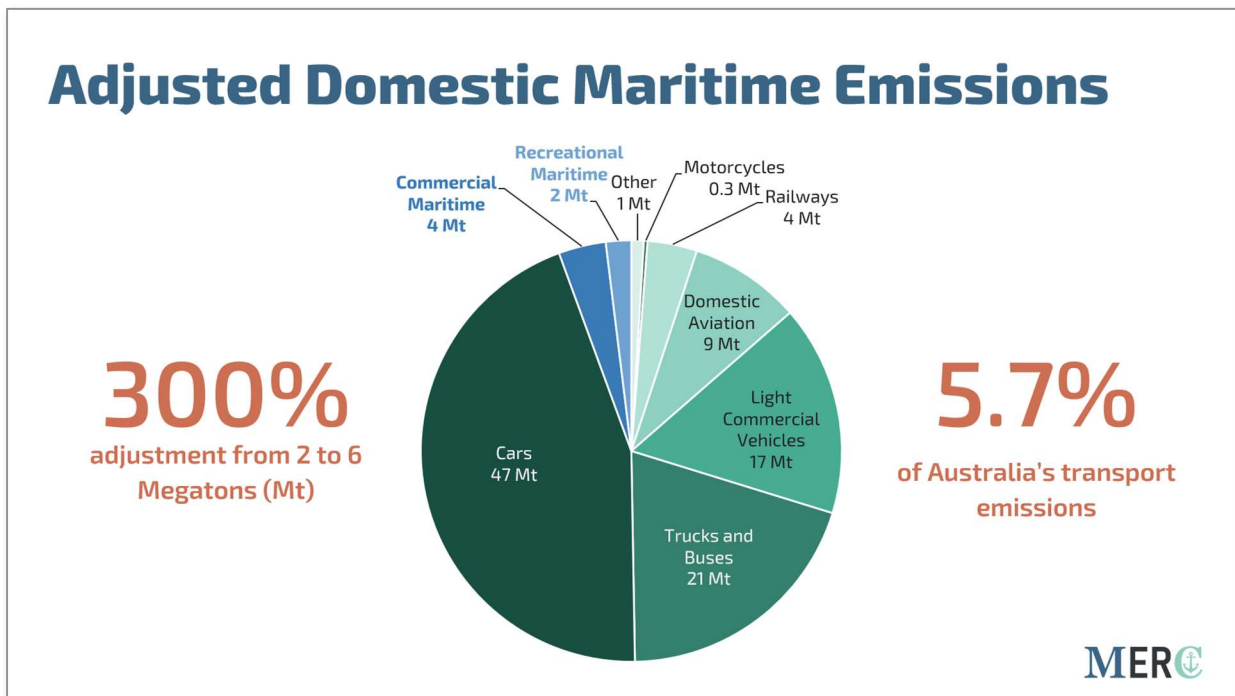


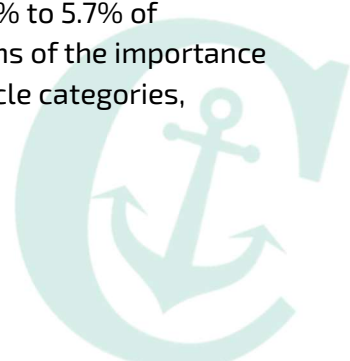
Figure 1: Adjusted Domestic Maritime Emissions

Our analysis shows that Australian domestic maritime GHG emissions from fuel use alone should actually be over **6 Megatons** of CO₂-equivalent gases annually. An adjustment of 300% to the original number! It could even be higher, up to **7.4 Megatons** of CO₂-equivalent gases annually.

This document details how we performed that analysis, in order to derive these numbers. We are making these public so that others can confirm our calculations and, if necessary, correct or further improve upon them.

The result of adjusting these numbers is that domestic maritime leaps from 2% to 5.7% of Australia's transport emissions, putting it just below domestic aviation in terms of the importance to address. It is also likely that the fuel is already counted in various road vehicle categories,

¹ <https://greenhouseaccounts.climatechange.gov.au/>



which if true might reduce the contribution of trucks, buses and cars, but in any case, the analysis shows it should be much higher than the current inventory reports say it is.

Method

When looking at Australian's domestic maritime activity there are two main divisions. On the one hand, there are commercial vessels, smaller in number, but generally larger in size and usage; and on the other, there are recreational vessels, large in number, but generally smaller in size and only occasionally used.

The **Australian Maritime Safety Authority (AMSA)** is responsible for registering and managing the regulation of domestic commercial vessels (DCVs). Their *Domestic Commercial Vessels Fleet Profile*² identifies that there are 31,000 DCVs active, of which 7,000 are human powered and sail vessels (e.g. hired rowboats). That leaves us with 24,000 DCVs that are powered craft.

The **Boating Industry Association (BIA)** is the premier industry group for domestic recreational vessels. Their *2023 Boating Data Report Card*³ identifies that there are 905,000 registered boats (i.e. with an engine) and another 95,000+ registered personal watercraft (again, with engines).

There is no mandatory registration information for either commercial or recreational vessels about their engine size.

For commercial vessels, AMSA still does have a lot of information about engine sizes – although it may be more common in larger vessel registrations. To cater for potential bias upwards, this data was used in two forms. For each set of vessels grouped by length, the median was used to give engine sizes that were more commonly recorded, while the average was used to give what should be the average engine size. This is reported as a range in engine size and derived values.

For recreational vessels the length of vessels is recorded, and this was used as a proxy for determining engine size. An estimate for potential average engine sizes was made for each set of vessels grouped by length, and the numbers were sense-checked with the BIA.

Most domestic vessels use either petrol or diesel engines. Petrol outboards are mostly used in smaller vessels, and diesel inboards in larger vessels (diesel is also used in larger vessels for generators). We applied this as an assumption across the vessel sizes provided by AMSA and BIA.

The number of vessels, their fuel type, and their engine size is only part of the equation needed to derive the annual GHG emissions for the domestic maritime industry. A simple version of the equation for a single vessel is:

$$\begin{aligned}
 & \text{Annual GHG Emissions (Mt CO}_2\text{-e)} \\
 & = \\
 & \text{Engine Size (kW)} \\
 & \times \text{Duration (h)} \\
 & \times \text{Average Power Used (\%)} \\
 & \div \text{Thermal Efficiency (\%)} \\
 & \times \text{GHG Emissions Per kWh (CO}_2\text{-e g/kWh)}
 \end{aligned}$$

² <https://www.amsa.gov.au/domestic-commercial-vessels-fleet-profile>

³ <https://bia.org.au/news/2023-boating-data-report-card-released/>



Duration is the number of hours that engine is run per year. For commercial vessels, there are wide ranging differences here, some are used every day of the year, for a whole working day, whilst others might run for 24 hours non-stop for weeks on end, but then sit unused for months at a time. We assumed that the average is 8 hours a day, 5 days a week, 48 weeks of the year. That allows for vessels that are not used every day, and some downtime for repairs or maintenance.

For recreational vessels, we used numbers from the *Pathways to Propulsion Decarbonisation for the Recreational Marine Industry - Synopsis Report*⁴ from the **International Council of Marine Industry Associations (ICOMIA)**. They used data from engine manufacturers that stated recreational vessels used their engines on average 35 to 48 hours per year. This extraordinarily low number is explained by the large number of vessels that sit unused for weeks at a time, only to be driven for an hour to a bay, sit unused at anchor, then drive back an hour to their berth. We have heard some criticism of relying on manufacturers' information, and so for the sake of this report we have assumed an annual duration of use of 52 hours for each vessel (basically 1 hour per week).

Average Power Used represents what portion of the engine's theoretical capacity is actually used on average. Diesel engines generally have an ideal operating range around 85% of capacity, and petrol engines are more flexible, but we assumed 70% of capacity was used on average. This impacts their fuel consumption and assuming less than 100% reduces the emissions generated.

Thermal Efficiency describes how much *exergy* is provided by the engine based on the available *energy* in the consumed fuel. **Figure 2** shows how the energy potential of the diesel fuel is wasted by a diesel generator on the way to creating work done. Kilowatt ratings for engines are output based, meaning the power generated on the crankshaft, not the energy in the fuel they consume. Thermal Efficiency ranges are well known for petrol and diesel engines, and we have assumed 40% thermal efficiency for diesel engines and 30% thermal efficiency for petrol engines.

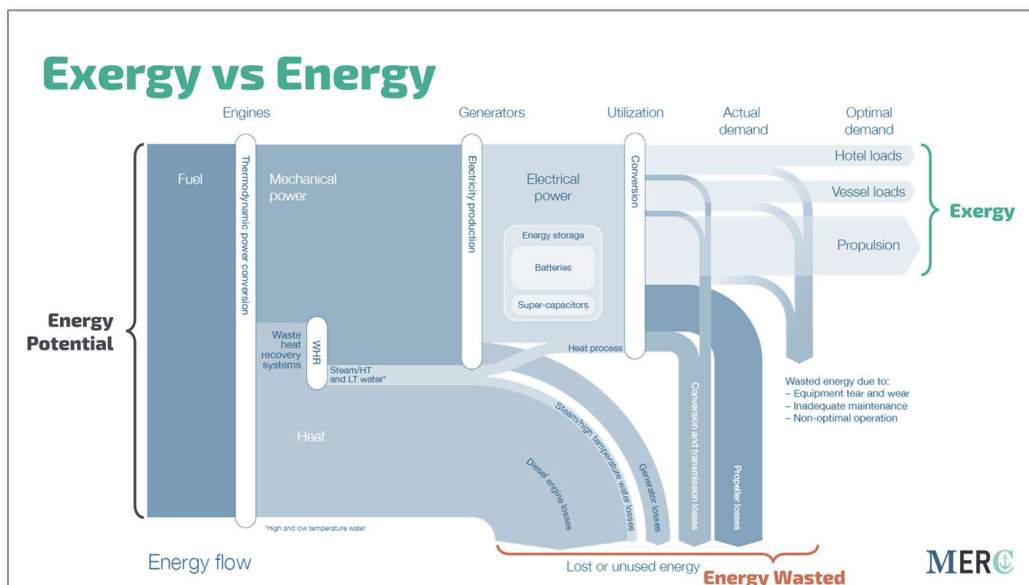


Figure 2: SANKEY Diagram of energy use by a diesel generator (Source: ABB)

⁴ <https://www.icomia.org/content/pathways-propulsion-decarbonisation-recreational-marine-industry-synopsis>



Greenhouse Gas (GHG) Emissions Per Kilowatt Hour is the well-to-wake GHG emissions for each kilowatt hour of potential energy in the fuel consumed. GHG emissions are usually expressed per litre of fuel, so we need to convert those numbers to per kilowatt hour. For diesel we have used the approximation of 10.7 kilowatt hours per litre of fuel, which gives 253 CO₂-equivalent grams/kilowatt hour. For petrol we have used the approximation of 9.5 kilowatt hours per litre of fuel, which gives 243 CO₂-equivalent grams/kilowatt hour. In comparison to the previous version of this report, we no longer are using well-to-wake emissions, but the same Scope 1 emissions numbers used by the National Greenhouse Accounts team.

Having researched our vessel information and made assumptions about fuel used and engine sizes, we then applied the equation across the data set.

Results

Commercial Vessels

The duration of use for commercial vessels is assumed to be 8 hours x 5 days x 48 weeks = 1,920 hours/year. Note that All Engines is listed as there are often multiple engines or generators on board each vessel.

Table 1: Commercial Vessel Fleet Numbers

By Size	% of Fleet	# of Vessels	All Engines (Median)	All Engines (Avg)	Annual Hours	Annual GWh (Median)	Annual GWh (Avg)
0-7.5 m	58.8%	14,112	45 kW	69.5 kW	27,095,040 h	1,219 GWh	1,883 GWh
7.5-12 m	18.3%	4,392	186 kW	216.4 kW	8,432,640 h	1,568 GWh	1,825 GWh
12-24 m	19.1%	4,584	330 kW	445.1 kW	8,801,280 h	2,904 GWh	3,917 GWh
24-35 m	3.0%	720	736 kW	1,351.1 kW	1,382,400 h	1,017 GWh	1,868 GWh
35-45 m	0.5%	120	596 kW	1,016.9 kW	230,400 h	137 GWh	234 GWh
45+ m	0.3%	72	1345 kW	1,630.9 kW	138,240 h	186 GWh	225 GWh
Totals:					46,080,000 h	7,031 GWh	9,952 GWh

Commercial vessels from 0-7.5 m are assumed to be using petrol engines, and the others are all assumed to be diesel engines. We can calculate the emissions using the *median* engine sizes.

Table 2: Commercial GHG Emissions (Mt CO₂-e) Using Median Engines Sizes

Petrol Engines	Diesel Engines
1,219,000,000 kWh	(7,031,000,000 kWh – 1,219,000,000 kWh)
x 70%	x 85%
÷ 30%	÷ 40%
x 243 CO ₂ -e g/kWh	x 253 CO ₂ -e g/kWh
691,173 tons of CO₂-e	3,124,677 tons of CO₂-e
or 0.7 Mt of CO ₂ -e	or 3.1 Mt of CO ₂ -e
Commercial GHG Emissions Annual Total:	3.8 Mt of CO₂-e

The same calculation can be done using the *average* engine sizes from AMSA's data.

Table 3: Commercial GHG Emissions (Mt CO₂-e) Using Average Engine Sizes

Petrol Engines	Diesel Engines
1,883,000,000 kWh	(9,952,000,000 kWh – 1,883,000,000 kWh)
x 70%	x 85%
÷ 30%	÷ 40%
x 243 CO ₂ -e g/kWh	x 253 CO ₂ -e g/kWh
1,067,661 tons of CO₂-e	4,338,096 tons of CO₂-e
or 1.1 Mt of CO ₂ -e	or 4.3 Mt of CO ₂ -e
Commercial GHG Emissions Annual Total:	5.4 Mt of CO₂-e

Recreational Vessels

With recreational vessels the duration is assumed to be 1 hour x 52 weeks = 52 hours/year.

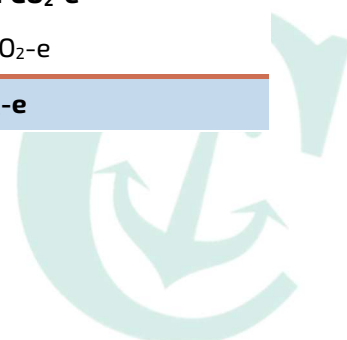
Table 4: Recreational Vessel Fleet Numbers

By Size	% of Fleet	# of Vessels	All Engines	Annual Hours	Annual GWh
PWC		95,000	119 kW	4,940,000 h	588 GWh
0-4 m	39.8%	360,190	19 kW	18,729,880 h	356 GWh
4-5 m	32.8%	296,840	45 kW	15,435,680 h	695 GWh
5-6 m	14.4%	130,320	75 kW	6,776,640 h	508 GWh
6-8 m	8.2%	74,210	149 kW	3,858,920 h	575 GWh
8-10 m	1.7%	15,385	224 kW	800,020 h	179 GWh
10+ m	3.1%	28,055	522 kW	1,458,860 h	762 GWh
Totals:				52,000,000 h	3,663 GWh

Recreational vessels from 0-8 m and personal watercraft (PWC) are assumed to be using petrol engines, and the others are all assumed to be diesel engines.

Table 5: Recreational GHG Emissions (Mt CO₂-e) Using Average Engine Sizes

Petrol Engines	Diesel Engines
2,722,000,000 kWh	(3,663,000,000 kWh – 2,722,000,000 kWh)
x 70%	x 85%
÷ 30%	÷ 40%
x 243 CO ₂ -e g/kWh	x 253 CO ₂ -e g/kWh
1,543,374 tons of CO₂-e	505,905 tons of CO₂-e
or 1.5 Mt of CO ₂ -e	or 0.5 Mt of CO ₂ -e
Recreational GHG Emissions Annual Total:	2 Mt of CO₂-e



Conclusion

Australia's Paris Agreement inventory emissions from fuel use in domestic maritime is currently recorded as around **2 Megatons** of CO₂-equivalent gaseous emissions⁵.

Using bottom-up analysis from industry bodies like the Australian Maritime Safety Authority (AMSA), the Boating Industry Association (BIA), and the International Council of Marine Industry Associations (ICOMIA) we have shown how the greenhouse gas emissions can be assessed for both domestic commercial and recreational vessels.

Table 6: Summary of Results

Declared	Likely	Possible
1 Mt from Commercial	3.8 Mt from Commercial	5.4 Mt from Commercial
1 Mt from Recreational	2 Mt from Recreational	2 Mt from Recreational
2 Mt Total	5.8 Mt Total	7.4 Mt Total

The analysis we have performed in this document shows that in fact Australia's Paris Agreement inventory emissions from fuel use in domestic maritime is likely to be much higher. It is likely to be at least **6 Megatons** of CO₂-equivalent gaseous emissions but could be as high as **7.4 Megatons** of CO₂-equivalent gaseous emissions.

⁵ <https://greenhouseaccounts.climatechange.gov.au/>



About the Maritime Emissions Reduction Coalition

The Maritime Emissions Reduction Coalition (MERC) is a program initiated by Maritime Impulse Pty Ltd, a firm dedicated to advancing maritime sustainability. MERC exists to accelerate the reduction of Australia's maritime greenhouse gas (GHG) emissions.

We are uniting leading organisations in the maritime, manufacturing, government, and education sectors to drive emissions reduction in the Australian maritime industry for a greener, more sustainable future.

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