

Transport and Infrastructure Net Zero Consultation Roadmap

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Department of Climate Change, Energy, Environment and Water

Response received at:

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- 14 Postcode
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- 15 What area best describes where you live?
Regional area
- 16 1. Do you support the proposed guiding principles?
Yes
- 17 1.1 Please add details to your response.
Overall, the CSA supports the guiding principles, especially the first principle of maximising emissions reduction. There are two recommendations we would like to make to improve these guidelines:
- Firstly, we recommend amending 'Guiding Principle 1' to become: "Maximise the rate of emissions reduction". It is insufficient to reduce emissions by the maximum quantity. To

meet emission reduction targets and control warming, large reductions need to happen in a short timeframe; hence the principle should refer to a maximum rate of emission reductions over time. We would also note that there is no 'safe' level of air pollution for human health.⁵ The dose-response relationship between PM_{2.5} exposure and mortality is steeper at lower concentrations of PM_{2.5}, which implies that any improvement or lowering of concentrations, even in an Australian setting, is likely to have a beneficial effect on health.⁶ As such, we advocate for the greatest possible reduction in emissions that is feasibly possible given the evidence that points to no threshold of effect for exposure to PM_{2.5}.

Secondly, we strongly recommend including a sixth guiding principle—'Protection of health'—to safeguard against unintended health impacts and consequences from rapid decarbonisation of the transport system and the introduction of new technologies.⁷ This guiding principle will help to ensure that appropriate health and environmental assessments are undertaken prior to adoption of new technologies, changes in fuel make-up or other transitional measures. This principle should also support the adequate assessment of the health costs and benefits of any change to fuel type or introduction of new technologies. Presently, most if not all, transport modes rely on carbon based combustible fuels, which impacts air pollution locally and regionally. For example, in 2018, the health-related costs of traffic-related air pollution were estimated to be as high as A\$910 million.⁸ Therefore, the CSA advocates that protection of health be included as a guiding principle to further deliberations on transport transitions.

Last, we recommend that health costs and co-benefits be referenced and included under Principle 2 'Value for money' to adequately reflect the value to be gained through health benefits of reducing emissions.

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 support the avoid-shift-improve framework to reduce vehicular transport need and thus reduce transport emissions. However, we make one recommendation: 'Avoid' should be defined specifically as "removing emission-intensive travel which people would prefer not to undertake". Certain modes of transport are good for health and release no emissions. As such, it would make little sense to avoid active modes of transportation such as cycling and walking. From a health perspective, active modes of transport should be encouraged⁹ even when people might choose non-active journeys for convenience or

other reasons. Active transport (such as walking and cycling) and public transport complement each other and can help increase fitness and public health.

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.

The CSA strongly agrees that a national policy framework for active and public transport will support emissions reductions and is supportive of such a framework. As the roadmap indicates, such a framework can support increased rates of active and public transport use resulting in a range of co-benefits by reducing congestion, pollution, heat, noise, and household costs. Improved health is an important co-benefit of active and public transport^{9–13} and should be a core consideration for this framework. Health researchers are exploring ways to increase public and active transport related physical activity to improve health outcomes.^{14,15} and it would be important to include some of these research groups in the development of an active and public transport strategy. As well as increased physical activity levels, public health improvements will also result from reduced air and noise pollution.^{16,17}

A holistic, intersectoral national policy framework could support emissions reductions if it brings together relevant health, environmental, transport and infrastructure sectors at all levels of government. Frequently, reduction of unhealthy or unsustainable emissions is hampered by a lack of unified, coordinated governance.¹⁸ For example, consideration of air pollution impacts tends to fall between the health and environmental portfolios. Monitoring and management interventions are often needed in the environment, planning and transport sectors where health expertise and input is limited, whereas public health impacts and responses to air pollution largely reside in the health sector. Moreover, expertise outside the health and environment sectors is needed to effectively respond to air quality challenges. A unified and coordinated approach will ensure that policies to mitigate air pollution are streamlined, consistent and easier to implement.

At an international level, target-based emission reduction frameworks appear to be effective in reducing the intensity of emissions.¹⁹ However, target setting alone is insufficient to drive reductions. Any policy framework needs to be coupled with a clear, coordinated plan for investment in reducing transport emissions, public education and communication, along with regular and transparent evaluation of progress towards meeting reduction goals.

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

To ensure that a national policy framework can drive transport-related emissions reductions it should include:

- Targets and timelines for the phase out of emission-intensive transport technologies and fuels;
- Regulatory frameworks for auditing, monitoring and enforcement of low/zero emissions transport technologies;
- Emissions reduction targets;
- Coordinated responsibility between Commonwealth, State and Local Governments to deliver on agreed targets;
- Annual reports of progress against transport emission reduction targets;
- The capture of all relevant evaluation data and transparent and timely publication of this data.

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?

Certainty regarding future regulatory settings drives investment and helps the public and business make informed decisions when planning transport solutions. The Commonwealth Government ‘as leader’ needs to establish a clear timeline for the phase out of emissions intensive transport technologies. Such signposting is necessary to reverse the trend identified in the Consultation Roadmap of Australians purchasing larger and more polluting vehicles such as SUVs. Consideration also needs to be given to auditing, enforcement and financial support packages for communities and businesses to replace polluting vehicles—such as exist in comparable jurisdictions.^{20,21} In addition to the New Vehicle Efficiency Standard,²² further actions are required to establish a timeline for the decommissioning of existing emission-intensive vehicles across the entire transport sector. To that end, we would like to note and encourage consideration of the policies and targets proposed in the 2022 report, FACTS: Framework for an Australian Clean Transport Strategy.²³

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?

This chapter rightly points to a higher rates of injury and death caused by traffic accidents

involving road freight on Australia's north-south eastern seaboard corridor. In addition, the prospective health benefits of cleaner air from eliminating heavy freight diesel emissions should also be considered. Diesel exhaust has been found to include more than 40 components listed as toxic air contaminants including carcinogens such as arsenic, benzene and nickel, and it contributes disproportionately to particulate matter pollution.²⁴ The health benefits of reducing exposure to particulate matter and gas emissions from diesel exhaust should be factored into any cost-benefit analysis regarding the electrification of or moving to other forms of renewable energy for the heavy freight sector. Correspondingly, life cycle assessments (LCAs) should be conducted when considering alternative fuel sources for heavy freight.²⁵ When considering specific proposals, health impact assessments (HIA) should form part of environmental impact statements (EISs).

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

These actions will maximise the health co-benefits associated with the transition and reduce the risk of unintended health impacts.

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

Yes

27 7.1 Please add details to your response.

The CSA recommends removing passive language regarding the transition to zero emissions. Instead, we recommend focusing on actions that governments can deliver to ensure pathway targets are achieved.

The net zero pathway presents actions for Governments which are limited to incentives and the roll out of charging infrastructure and more sustainable grid capabilities. The CSA would like the roadmap to include a wider range of potential policy levers, including proposals from the FACTS23 report including:

- Setting a zero-emission light duty vehicle target;
- Introducing a zero-tailpipe emission vehicle sales mandate;
- Setting a zero-emission government vehicle use target; and
- A future scrappage scheme for accelerated vehicle retirement, as has been trialled in Victoria.²⁶

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?

The Consultation Roadmap states that “More than 50% of new vehicles sold in the country last year were SUVs, a proportion that has almost doubled over the past decade”. Clear timelines and communication regarding the transition away from emission intensive vehicles is needed to reverse this trend, including policy developments such as higher parking charges, road use charges, low emissions zones impacting emission intensive vehicles and potentially incentives to transition to more efficient vehicles that are functionally similar.

29 8.2 How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?

Such policy options need to be included in the roadmap so that consumers can make informed decisions when purchasing a vehicle. This will also support Local and State governments to introduce local emission reduction policies.

30 9. Do you agree with the proposed net zero pathway for heavy road vehicles?

Yes

31 9.1 Please add details to your response

As per our response to Question 7.1, The CSA recommends removing passive language, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the FACTS23 report:

- Set a zero-emission heavy vehicle target;
- Introduce a zero-emissions vehicle (ZEV) sales mandate;
- Introduce zero emission heavy vehicle company tax benefits;
- Introduce ZEV design rule exemptions for heavy vehicles;
- Introduce ZEV curfew exemptions for heavy vehicles;
- Increase the proportion of freight delivered by rail where feasible to reduce overall freight emissions, and decarbonise rail freight.

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.

1: Battery electric

2: Hydrogen fuel cell

3: Low carbon liquid fuels

33 10.1 Please add details to your response. Why did you rank them in that order?

Once the transition to a renewable electricity grid is realised, battery electric trucks have been identified as the best technology to reduce carbon emissions for road freight.²⁷

Health impact assessments regarding biodiesel have found that emissions contain a number of toxins and exposure increases the risk of health conditions such as lung cancer.²⁸

However, the CSA argues that further life cycle assessments also incorporating health impact assessments are required to establish the relative health impacts of each alternative. Cost-benefit analyses should be used to cost health impacts and the relative costs and co-benefits of these options.

34 11. What role should low carbon liquid fuels play in the heavy vehicle decarbonisation?

The plan indicates that as part of the Government's Future Made in Australia plan, that it will "fast track support for a LCLF industry". The document acknowledges the need of a regulatory process and lifecycle emissions measurements to ensure carbon emissions do not occur elsewhere as part of the process. However, as per our previous comments, the CSA recommends that any regulatory process, policies documents or plans, should also explicitly refer to the protection of 'health' in their charter as an overriding tenet, along with 'sustainability'. We support the need for legislation and thorough approvals processes for the adoption of any new fuels. This should include both a life cycle assessment of production and use, including toxicological analysis of each new fuel, and a health impact assessment (HIA) and cost benefit analysis of the impact of population exposure to emissions from the fuel. It is vital that any fuel replacement result in a benefit not only to the environment but also represent an improvement to public health from the status quo (demonstrated by reduced emissions of not only criteria air pollutants, but also

smaller particles such as black carbon and UFP as well as toxicological components such as volatile organic compounds (VOCs)²⁹).

The funding allocated through the Future Made in Australia Innovation Fund and other funding (p. 14 of the Roadmap) to support innovation and commercialisation and provide incentives should include funding allocated to the above activities of LCAs, HIAs and thorough toxicological testing and emissions profiling under real-world conditions. We are concerned that in the past there has been little thorough assessment of the environmental health profile of fuels under real world conditions, and that these new plans are a great opportunity to address this inadequacy.

To achieve maximum abatement of emissions, LCLFs should be prioritized based on their potential environmental and health benefits across various transport modes. Sectors where alternative technologies are less viable or more challenging, such as aviation and shipping, should be prioritised for transition to LCLFs to reduce emissions. For road transport, where electric vehicles are increasingly viable, LCLFs should be used in heavy-duty and long-haul applications where electrification is less practical.

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?

The CSA recommends removing passive language, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the FACTS23 report:

- Set a zero-emission heavy vehicle target;
- Introduce a zero-emissions vehicle (ZEV) sales mandate;
- Introduce zero emission heavy vehicle company tax benefits;
- Introduce ZEV design rule exemptions for heavy vehicles;
- Introduce ZEV curfew exemptions for heavy vehicles;

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

Yes

37 13.1 Please add details to your response.

Yes but, as per our response to Question 7.1, The CSA also recommends using stronger language to articulate targets, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the FACTS23 report e.g.:

- A net zero rail fleet target by 2045;

- Invest in high-speed rail to replace aviation.

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.

1: Battery electric

2: Hydrogen fuel cell

3: Low carbon liquid fuels

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

Once the transition to a renewable electricity grid is realised, battery electric trucks have been identified as the best technology to reduce carbon emissions for road freight.²⁷

Health impact assessments regarding biodiesel have found that emissions contain a number of toxins and exposure increases the risk of health conditions such as lung cancer.²⁸

However, the CSA argues that further life cycle assessments also incorporating health impact assessments are required to establish the relative health impacts of each alternative. Cost-benefit analyses should be used to cost health impacts and the relative costs and co-benefits of these options.

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

The CSA recommends that any regulatory process, policies documents or plans, should also explicitly refer to the protection of 'health' in their charter as an overriding tenet, along with 'sustainability'. We support the need for legislation and thorough approvals processes for the adoption of any new fuels. This should include both a life cycle assessment of production and use, including toxicological analysis of each new fuel, and a health impact assessment (HIA) and cost benefit analysis of the impact of population exposure to emissions from the fuel. It is vital that any fuel replacement result in a benefit not only to the environment but also represent an improvement to public health from the status quo (demonstrated by reduced emissions of not only criteria air pollutants, but also smaller particles such as black carbon and UFP as well as toxicological components such as volatile organic compounds (VOCs)²⁹).

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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?

The CSA also recommends using stronger language to articulate targets, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the FACTS23 report e.g.:

- A net zero rail fleet target by 2045;
- Invest in high-speed rail to replace aviation.

42 16.1 How would these actions address the identified challenges and opportunities to reduce rail emissions?

A net zero target for rail would create clear expectations and drive investment and development of zero emissions technologies. High speed rail would reduce emissions by displacing trips currently taken by cars, trucks and aircraft.

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

44 17.1 Please add details to your response.

Yes, the CSA agrees with the proposed net zero pathway for maritime alongside the development of a Maritime Emissions Reduction National Action Plan (MERNAP).

Previous research by CSA researchers reported that particulate matter air pollution from

shipping fuel emissions in greater metropolitan Sydney was associated with an estimated 220 years of life lost in 2010-11.³⁰ As such, The CSA applauds any move to adopt 'cleaner' fuels for shipping and aviation fuels, however, recommends that a life cycle assessment including toxicological profiles be conducted on any fuel before its widespread introduction, to ensure that there are not unintended health consequences associated with any switch in fuel.

- 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?

In addition to MERNAP, the Australian Government should advocate for freight emission standards to be included in international trade agreements and collaborate with regional partners to share technological advances and improve emissions reductions across borders.

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

The International Maritime Organisation's decision to cut sulphur content in maritime fuels demonstrates that international cooperation to reduce maritime emissions is possible and can even be achieved rapidly. Australia being a proactive advocate for reduced maritime emissions internationally has great potential for driving agreements that reduce emissions.

- 47 19. Do you agree with the proposed net zero pathway for aviation?

Yes

- 48 19.1 Please add details to your response.

As with maritime fuels, the CSA applauds any move to adopt 'cleaner' fuels for aviation. However, we recommend that a LCA, including toxicological profiles, be conducted on any fuel before its widespread introduction, to ensure that there are not unintended health consequences for the switch in fuel. There have been few studies conducted locally in Australia on the health impact of aviation emissions, however, international studies have demonstrated that there are higher black carbon and ultrafine particle (UFP)

concentrations around airports due to aviation fuel emissions³ and at least one study has reported short term health impacts from airport related UFP exposure.³²

As per our response in Question 7.1, The CSA recommends using stronger language, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the FACTS²³ report, e.g.:

- Setting a decarbonisation and fuel target for shipping;
- Developing net zero plans for shipping;
- Introducing a low-carbon ports initiative; and
- Supporting international transport research and development (R&D).

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.

NA

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?

As a hard-to-electrify sector, initiatives that help Australians shift from air travel and freight are especially useful. Investment in high-speed rail, for instance, has great potential to reduce domestic aviation between Australian cities and regional areas. Given the existence of high speed rail in Europe, some countries are considering banning flights between cities connected by high speed rail that are commutable in less than two hours.²³ Australia could consider similar action although commutable times would need to be greater given the longer distances between Australian cities and regional centres.

Similarly, targets and rules can be introduced to shift air freight to shipping. For example, rules could be introduced that require justification for air freight such as critical delivery times or the need to transport perishable goods.²³

51 21. Do you agree with the proposed net zero pathway for transport infrastructure?

Yes

52 21.1 Please add details to your response.

Yes. We recommend using active language that makes clear who is responsible for what action. This roadmap should include clear targets and focus on setting a timeline for deliverable Government actions.

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?

To maximise the health co-benefits associated with decarbonisation of transport infrastructure, we recommend consideration of:

- The location of transport infrastructure relative to populations at greater risk of health impacts of air pollution such as schools, aged care facilities, health facilities and residential areas. These land uses cater for populations which are potentially more susceptible to the effects of air pollution and should therefore be placed away from areas of high air pollution exposures (e.g. main roads, ports, airports). A recent study by CSA researchers found that air pollution at these land use sites in Sydney was higher than at other locations within the surrounding local areas, despite the feasibility of alternative lower exposed locations.³³ This demonstrates the importance of carefully choosing the locations of sites for land uses that may have higher air pollution emissions.
- Set a target for greater investment in active transport as a share of transport infrastructure funding to maximise the health benefits of greater physical activity.
- Invest in green spaces to reduce heat island effect, reduce ground-level ozone, make active transport corridors more attractive, and improve mental health.³⁴

54 22.1 How would these actions address the identified challenges and opportunities to reduce transport infrastructure emissions?

These actions would increase health co-benefits of decarbonising transport infrastructure and, therefore, increase the return on investment in low-emissions infrastructure.

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?

Further HIAs and LCAs are required to ensure that increased uptake of LCLFs do not have

unintended health impacts on humans or the environment. Existing reviews of biodiesel exhaust emissions indicate the presence of harmful particulates, gases and toxins.²⁸ Further research and development of this industry needs to focus on minimizing harmful emissions and collecting adequate data through real world testing conditions to demonstrate that biofuel emissions will not be harmful to health.

56 24. How should the use of low carbon liquid fuels (LCLFs) be prioritised across different transport modes over time to achieve maximum abatement?

To achieve maximum abatement of emissions, LCLFs should be prioritized based on their potential environmental and health benefits across various transport modes. Sectors where alternative technologies are less viable or more challenging, such as aviation and shipping, should be prioritised for transition to LCLFs to reduce emissions. For road transport, where electric vehicles are increasingly viable, LCLFs should be used in heavy-duty and long-haul applications where electrification is less practical.

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?

We note on p. 12 of the Roadmap that the Commonwealth Department of Health & Aged Care was not part of the Interdepartmental Committee established by the Commonwealth Government. The CSA argues that Health and Environmental Health agencies should be included on this committee to support the core focus on active and public transport and emissions reductions. In addition to the fora listed in this chapter, we recommend clear targets and a timetable for the transition of transport sectors to zero emissions technologies.

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?

International Maritime Organisation's Low Sulphur Fuel Standards.

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

The health co-benefits and co-costs of transport decarbonisation need to be included as relevant metrics. Air pollution emissions, exposure and health impacts are important to

consider including:

- The number of premature deaths avoided;
- Associated savings from avoided deaths; and
- Multi-pollutant measurements and modelling techniques.

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

The CSA manages The Clean Air and health Research Data and Analysis Technology (CARDAT) platform; a collection of IT infrastructure that enables easy data sharing and reuse, and reproducible data analysis. It is an online research platform that collates a wide array of population, health and environmental datasets with a collection of analysis tools and methodology resources. The data in CARDAT includes air pollution, weather and built environment data in Australia and internationally. This platform enables collaboration between researchers and policy makers. CARDAT's mission is to provide data, methods and tools to support CAR to inform policy through research and analysis of air pollution, energy and health.

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?

NA

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

NA

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

NA

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

We recommend including a section dealing specifically with the health impacts of decarbonising the transport sector.

65 29. Is there any further information or documentation that you wish to

be considered with your submission?

NA

66 Would you like to upload a document?

Yes

67 Have you removed any identifying information from your submission?

Yes

68 Upload a submission

CSA Submission - Transport Net Zero Roadmap.pdf

69 Upload a submission

Not answered

70 Upload supporting file

Not answered

71 Upload supporting file

Not answered

Submission: Transport and Infrastructure Net Zero Consultation Roadmap

Department of Climate Change, Energy, the Environment and Water

Submission from the [Centre for Safe Air](#) (NHMRC CRE) and supported by the [Centre for Research Excellence in Pulmonary Fibrosis](#) (NHMRC CRE)

Authored by: Dr **Bill Dodd** (Centre for Safe Air, Menzies Institute for Medical Research), Dr **Gongbo Chen** (Centre for Safe Air post-doctoral research fellow, Monash University), Dr **Nicolas Borchers Arriagada** (Centre for Safe Air post-doctoral research fellow, Menzies Institute for Medical Research), Dr **Christine Cowie** (University of New South Wales, Centre for Safe Air Affiliate), Dr **Nigel Goodman** (University of Canberra, Centre for Safe Air Affiliate), Professor **Tamara Corte** (University of Sydney, Director of the Centre for Research Excellence in Pulmonary Fibrosis), Professor **Yuming Guo** (Monash University, Chief Investigator of the Centre for Safe Air)

Date: 6 August 2024

About the Centre for Safe Air

The [Centre for Safe Air \(CSA\)](#) is a Centre of Research Excellence funded by the National Health and Medical Research Council. The CSA brings together more than 20 researchers at the forefront of their fields, based in 13 of Australia's leading research institutions. The CSA supports multidisciplinary research across epidemiology, exposure assessment, toxicology, climate and air science, biostatistics, respiratory medicine and health economics to pursue collaborative projects and to develop capacity.

The vision of the CSA is *"to achieve substantial improvements in population health, safety, and resilience in the face of existing, emerging, and escalating airborne hazards through evidence-based policy and practice interventions"*. The CSA is focused on three areas of activity: **Sources**: determining how to measure, track, predict and manage outdoor air hazards at national and regional scales, **Settings**: considering the options for homes, schools or workplaces to mitigate the health burden from outdoor air hazards, and **Individuals**: considering people in the most vulnerable population groups and how we can best protect them.

Introduction

Air pollution is the single greatest environmental threat to human health and wellbeing.¹ Globally, long-term exposure to air pollution is responsible for approximately 7 million premature deaths each year,² while short-term exposure to daily PM_{2.5} is related to more

than 1 million deaths.¹ In Australia, annual mortality is conservatively estimated to be more than 3,200³ with an average annual cost of more than AUD\$6.2 billion from years of life lost.⁴ Air pollution ranks alongside unhealthy diet, inadequate physical activity and smoking/vaping, as a major global risk factor for mortality.⁵

There is now well-established evidence of the harm of transport emissions on health. The combustion of fuels for transportation releases a range of harmful gases, particulates and toxins including nitrogen oxides (NO_x), elemental carbon (EC), particulate matter $\leq 2.5 \mu\text{m}$ in aerodynamic diameter (PM_{2.5}), ultrafine particles (UFPs), heavy metals, polycyclic aromatic hydrocarbons, and volatile organic compounds (VOCs).

One of the most thorough reviews on the health impacts of air pollution is the 2022 US Health Effects Institute (HEI) report.² This comprehensive meta-analysis found strong evidence of associations between long term exposure to traffic related air pollution and adverse health outcomes including birth outcomes, cardiometabolic outcomes, mortality, and respiratory outcomes (**Figure 1**).

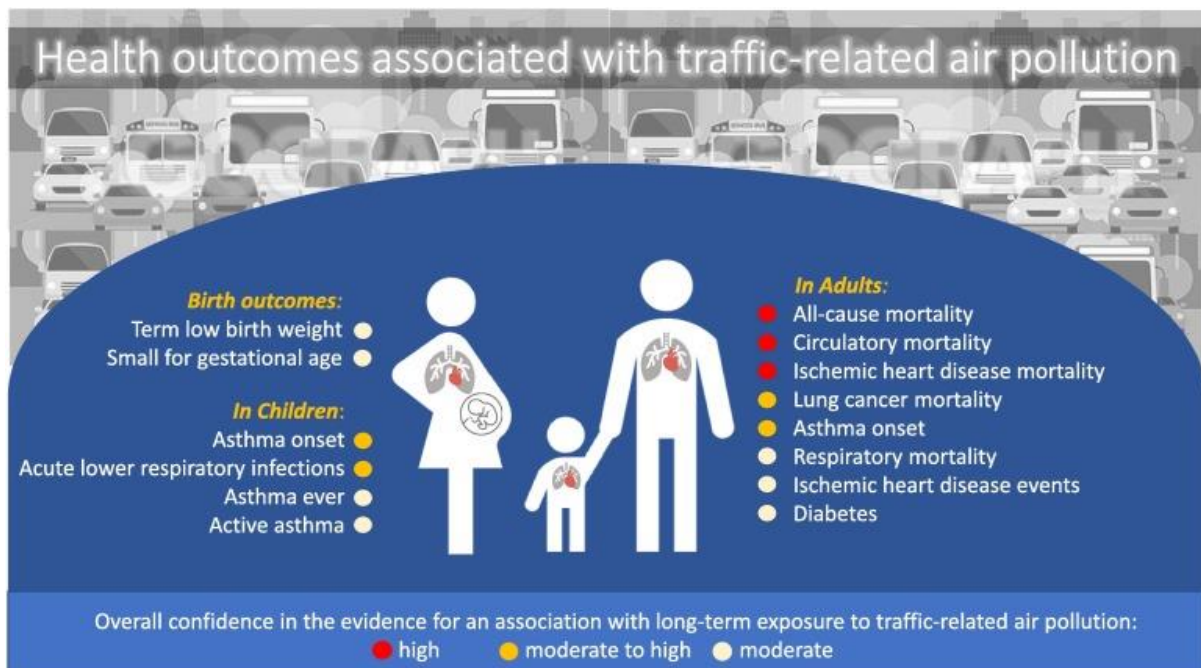


Figure 1: Long-term exposure to traffic-related air pollution and selected health outcomes: A systematic review and meta-analysis²

A case in point is that of pulmonary fibrosis; a devastating, chronic lung condition with very poor survival rates of 2–5 years on average. The prevalence of pulmonary fibrosis is increasing 5% every year due to worsening air quality and the aging population. Recent Australian data has shown that people living near major roads in Australia had faster progression of their disease.³ We now know there is an association between worse air quality (higher PM_{2.5} levels) and exacerbations of pulmonary fibrosis and progression of disease.⁴

In our response to the questions posed in the Roadmap, we outline the benefits and importance of including health co-costs and co-benefits in the transition to zero carbon.

Response to questions posed in the Roadmap

1. Do you agree with the proposed guiding principles?

1.1. Please add details to your response.

Overall, the CSA supports the guiding principles, especially the first principle of maximising emissions reduction. There are two recommendations we would like to make to improve these guidelines:

Firstly, we recommend amending 'Guiding Principle 1' to become: "Maximise *the rate of emissions reduction*". It is insufficient to reduce emissions by the maximum quantity. To meet emission reduction targets and control warming, large reductions need to happen in a short timeframe; hence the principle should refer to a maximum rate of emission reductions over time. We would also note that there is no 'safe' level of air pollution for human health.⁵ The dose-response relationship between PM_{2.5} exposure and mortality is steeper at lower concentrations of PM_{2.5}, which implies that any improvement or lowering of concentrations, even in an Australian setting, is likely to have a beneficial effect on health.⁶ As such, we advocate for the greatest possible reduction in emissions that is feasibly possible given the evidence that points to no threshold of effect for exposure to PM_{2.5}.

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Last, we recommend that health costs and co-benefits be referenced and included under Principle 2 'Value for money' to adequately reflect the value to be gained through health benefits of reducing emissions.

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

2.1. Please add details to your response.

We support the avoid-shift-improve framework to reduce vehicular transport need and thus reduce transport emissions. However, we make one recommendation: 'Avoid' should be defined specifically as "removing *emission-intensive* travel which people would prefer not to undertake". Certain modes of transport are good for health and release no emissions. As such, it would make little sense to avoid active modes of transportation such as cycling and walking. From a health perspective, active modes of transport should

be encouraged⁹ even when people might choose non-active journeys for convenience or other reasons. Active transport (such as walking and cycling) and public transport complement each other and can help increase fitness and public health.

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

The CSA strongly agrees that a national policy framework for active and public transport will support emissions reductions and is supportive of such a framework. As the roadmap indicates, such a framework can support increased rates of active and public transport use resulting in a range of co-benefits by reducing congestion, pollution, heat, noise, and household costs. Improved health is an important co-benefit of active and public transport⁹⁻¹³ and should be a core consideration for this framework. Health researchers are exploring ways to increase public and active transport related physical activity to improve health outcomes.^{14,15} and it would be important to include some of these research groups in the development of an active and public transport strategy. As well as increased physical activity levels, public health improvements will also result from reduced air and noise pollution.^{16,17}

3.1. Please add details to your response.

A holistic, intersectoral national policy framework could support emissions reductions if it brings together relevant health, environmental, transport and infrastructure sectors at all levels of government. Frequently, reduction of unhealthy or unsustainable emissions is hampered by a lack of unified, coordinated governance.¹⁸ For example, consideration of air pollution impacts tends to fall between the health and environmental portfolios. Monitoring and management interventions are often needed in the environment, planning and transport sectors where health expertise and input is limited, whereas public health impacts and responses to air pollution largely reside in the health sector. Moreover, expertise outside the health and environment sectors is needed to effectively respond to air quality challenges. A unified and coordinated approach will ensure that policies to mitigate air pollution are streamlined, consistent and easier to implement.

At an international level, target-based emission reduction frameworks appear to be effective in reducing the intensity of emissions.¹⁹ However, target setting alone is insufficient to drive reductions. Any policy framework needs to be coupled with a clear, coordinated plan for investment in reducing transport emissions, public education and communication, along with regular and transparent evaluation of progress towards meeting reduction goals.

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

To ensure that a national policy framework can drive transport-related emissions reductions it should include:

- Targets and timelines for the phase out of emission-intensive transport technologies and fuels;
- Regulatory frameworks for auditing, monitoring and enforcement of low/zero emissions transport technologies;
- Emissions reduction targets;

- Coordinated responsibility between Commonwealth, State and Local Governments to deliver on agreed targets;
- Annual reports of progress against transport emission reduction targets;
- The capture of all relevant evaluation data and transparent and timely publication of this data.

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?

Certainty regarding future regulatory settings drives investment and helps the public and business make informed decisions when planning transport solutions. The Commonwealth Government ‘as leader’ needs to establish a clear timeline for the phase out of emissions intensive transport technologies. Such signposting is necessary to reverse the trend identified in the Consultation Roadmap of Australians purchasing larger and more polluting vehicles such as SUVs. Consideration also needs to be given to auditing, enforcement and financial support packages for communities and businesses to replace polluting vehicles—such as exist in comparable jurisdictions.^{20,21} In addition to the New Vehicle Efficiency Standard,²² further actions are required to establish a timeline for the decommissioning of existing emission-intensive vehicles across the entire transport sector. To that end, we would like to note and encourage consideration of the policies and targets proposed in the 2022 report, *FACTS: Framework for an Australian Clean Transport Strategy*.²³

6. The Australian Government has already engaged in consultation on the 2023 review of the National Freight and Supply Chain Strategy and those consultations will also inform the final Roadmap and Action Plan.

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?

This chapter rightly points to a higher rates of injury and death caused by traffic accidents involving road freight on Australia’s north–south eastern seaboard corridor. In addition, the prospective health benefits of cleaner air from eliminating heavy freight diesel emissions should also be considered. Diesel exhaust has been found to include more than 40 components listed as toxic air contaminants including carcinogens such as arsenic, benzene and nickel, and it contributes disproportionately to particulate matter pollution.²⁴ The health benefits of reducing exposure to particulate matter and gas emissions from diesel exhaust should be factored into any cost–benefit analysis regarding the electrification of or moving to other forms of renewable energy for the heavy freight sector. Correspondingly, life cycle assessments (LCAs) should be conducted when considering alternative fuel sources for heavy freight.²⁵ When considering specific proposals, health impact assessments (HIA) should form part of environmental impact statements (EISs).

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

These actions will maximise the health co–benefits associated with the transition and reduce the risk of unintended health impacts.

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

7.1. Please add details to your response.

The CSA recommends removing passive language regarding the transition to zero emissions. Instead, we recommend focusing on actions that governments can deliver to ensure pathway targets are achieved.

The net zero pathway presents actions for Governments which are limited to incentives and the roll out of charging infrastructure and more sustainable grid capabilities. The CSA would like the roadmap to include a wider range of potential policy levers, including proposals from the *FACTS*²³ report including:

- Setting a zero-emission light duty vehicle target;
- Introducing a zero-tailpipe emission vehicle sales mandate;
- Setting a zero-emission government vehicle use target; and
- A future scrappage scheme for accelerated vehicle retirement, as has been trialled in Victoria.²⁶

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?

The Consultation Roadmap states that *"More than 50% of new vehicles sold in the country last year were SUVs, a proportion that has almost doubled over the past decade"*. Clear timelines and communication regarding the transition away from emission intensive vehicles is needed to reverse this trend, including policy developments such as higher parking charges, road use charges, low emissions zones impacting emission intensive vehicles and potentially incentives to transition to more efficient vehicles that are functionally similar.

8.2. How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?

Such policy options need to be included in the roadmap so that consumers can make informed decisions when purchasing a vehicle. This will also support Local and State governments to introduce local emission reduction policies.

9. Do you agree with the proposed net zero pathway for heavy road vehicles?

9.1. Please add details to your response.

As per our response to Question 7.1, The CSA recommends removing passive language, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the *FACTS*²³ report:

- Set a zero-emission heavy vehicle target;
- Introduce a zero-emissions vehicle (ZEV) sales mandate;
- Introduce zero emission heavy vehicle company tax benefits;
- Introduce ZEV design rule exemptions for heavy vehicles;
- Introduce ZEV curfew exemptions for heavy vehicles;

- Increase the proportion of freight delivered by rail where feasible to reduce overall freight emissions, and decarbonise rail freight.

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.

1, 2, 3

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

Once the transition to a renewable electricity grid is realised, battery electric trucks have been identified as the best technology to reduce carbon emissions for road freight.²⁷

Health impact assessments regarding biodiesel have found that emissions contain a number of toxins and exposure increases the risk of health conditions such as lung cancer.²⁸

However, the CSA argues that further life cycle assessments also incorporating health impact assessments are required to establish the relative health impacts of each alternative. Cost-benefit analyses should be used to cost health impacts and the relative costs and co-benefits of these options.

11. What role should low carbon liquid fuels play in heavy vehicle decarbonisation?

The plan indicates that as part of the Government's Future Made in Australia plan, that it will "fast track support for a LCLF industry". The document acknowledges the need of a regulatory process and lifecycle emissions measurements to ensure carbon emissions do not occur elsewhere as part of the process. However, as per our previous comments, the CSA recommends that any regulatory process, policies documents or plans, should also explicitly refer to the protection of 'health' in their charter as an overriding tenet, along with 'sustainability'. We support the need for legislation and thorough approvals processes for the adoption of any new fuels. This should include both a life cycle assessment of production and use, including toxicological analysis of each new fuel, and a health impact assessment (HIA) and cost benefit analysis of the impact of population exposure to emissions from the fuel. It is vital that any fuel replacement result in a benefit not only to the environment but also represent an improvement to public health from the status quo (demonstrated by reduced emissions of not only criteria air pollutants, but also smaller particles such as black carbon and UFP as well as toxicological components such as volatile organic compounds (VOCs)²⁹).

The funding allocated through the Future Made in Australia Innovation Fund and other funding (p. 14 of the Roadmap) to support innovation and commercialisation and provide incentives should include funding allocated to the above activities of LCAs, HIAs and thorough toxicological testing and emissions profiling under real-world conditions. We are concerned that in the past there has been little thorough assessment of the environmental health profile of fuels under real world conditions, and that these new plans are a great opportunity to address this inadequacy.

To achieve maximum abatement of emissions, LCLFs should be prioritized based on their potential environmental and health benefits across various transport modes. Sectors where alternative technologies are less viable or more challenging, such as aviation and shipping, should be prioritised for transition to LCLFs to reduce emissions. For road transport, where electric vehicles are increasingly viable, LCLFs should be used in heavy-duty and long-haul applications where electrification is less practical.

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?

The CSA recommends removing passive language, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the *FACTS*²³ report:

- Set a zero-emission heavy vehicle target;
- Introduce a zero-emissions vehicle (ZEV) sales mandate;
- Introduce zero emission heavy vehicle company tax benefits;
- Introduce ZEV design rule exemptions for heavy vehicles;
- Introduce ZEV curfew exemptions for heavy vehicles;

12.1. How would these actions address the identified challenges and opportunities to reduce heavy vehicle emissions?

See response to Question 9.

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

13.1. Please add details to your response.

Yes but, as per our response to Question 7.1, The CSA also recommends using stronger language to articulate targets, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the *FACTS*²³ report e.g.:

- A net zero rail fleet target by 2045;
- Invest in high-speed rail to replace aviation.

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.

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

1, 2, 3

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

See response to Question 11.

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

See response to 13.1

16.1. How would these actions address the identified challenges and opportunities to reduce rail emissions?

A net zero target for rail would create clear expectations and drive investment and development of zero emissions technologies. High speed rail would reduce emissions by displacing trips currently taken by cars, trucks and aircraft.

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

17.1. Please add details to your response.

Yes, the CSA agrees with the proposed net zero pathway for maritime alongside the development of a Maritime Emissions Reduction National Action Plan (MERNAP). Previous research by CSA researchers reported that particulate matter air pollution from shipping fuel emissions in greater metropolitan Sydney was associated with an estimated 220 years of life lost in 2010–11.³⁰ As such, The CSA applauds any move to adopt ‘cleaner’ fuels for shipping and aviation fuels, however, recommends that a life cycle assessment including toxicological profiles be conducted on any fuel before it’s widespread introduction, to ensure that there are not unintended health consequences associated with any switch in fuel.

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?

In addition to MERNAP, the Australian Government should advocate for freight emission standards to be included in international trade agreements and collaborate with regional partners to share technological advances and improve emissions reductions across borders.

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

The International Maritime Organisation’s decision to cut sulphur content in maritime fuels demonstrates that international cooperation to reduce maritime emissions is possible and can even be achieved rapidly. Australia being a proactive advocate for reduced maritime emissions internationally has great potential for driving agreements that reduce emissions.

19. Do you agree with the proposed net zero pathway for aviation?

19.1. Please add details to your response.

As with maritime fuels, the CSA applauds any move to adopt ‘cleaner’ fuels for aviation. However, we recommend that a LCA, including toxicological profiles, be conducted on any fuel before its widespread introduction, to ensure that there are not unintended health consequences for the switch in fuel. There have been few studies conducted locally in Australia on the health impact of aviation emissions, however, international studies have demonstrated that there are higher black carbon and ultrafine particle (UFP) concentrations around airports due to aviation fuel emissions³ and at least one study has reported short term health impacts from airport related UFP exposure.³²

As per our response in Question 7.1, The CSA recommends using stronger language, focusing on deliverable actions, and including a wider range of potential policy levers including proposals from the *FACTS*²³ report, e.g.:

- Setting a decarbonisation and fuel target for shipping;
- Developing net zero plans for shipping;
- Introducing a low-carbon ports initiative; and
- Supporting international transport research and development (R&D).

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.

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?

As a hard-to-electrify sector, initiatives that help Australians shift from air travel and freight are especially useful. Investment in high-speed rail, for instance, has great potential to reduce domestic aviation between Australian cities and regional areas. Given the existence of high speed rail in Europe, some countries are considering banning flights between cities connected by high speed rail that are commutable in less than two hours.²³ Australia could consider similar action although commutable times would need to be greater given the longer distances between Australian cities and regional centres.

Similarly, targets and rules can be introduced to shift air freight to shipping. For example, rules could be introduced that require justification for air freight such as critical delivery times or the need to transport perishable goods.²³

20.2. How would these actions address the identified challenges and opportunities to reduce aviation emissions?

These actions will reduce demand for air freight by shifting the mode of transport to less emission-intensive sectors.

21. Do you agree with the proposed net zero pathway for transport infrastructure?

21.1. Please add details to your response.

Yes. We recommend using active language that makes clear who is responsible for what action. This roadmap should include clear targets and focus on setting a timeline for deliverable Government actions.

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?

To maximise the health co-benefits associated with decarbonisation of transport infrastructure, we recommend consideration of:

- The location of transport infrastructure relative to populations at greater risk of health impacts of air pollution such as schools, aged care facilities, health facilities and residential areas. These land uses cater for populations which are potentially more susceptible to the effects of air pollution and should therefore be placed away from areas of high air pollution exposures (e.g. main roads, ports, airports). A recent study by CSA researchers found that air pollution at these land

use sites in Sydney was higher than at other locations within the surrounding local areas, despite the feasibility of alternative lower exposed locations.³³ This demonstrates the importance of carefully choosing the locations of sites for land uses that may have higher air pollution emissions.

- Set a target for greater investment in active transport as a share of transport infrastructure funding to maximise the health benefits of greater physical activity.
- Invest in green spaces to reduce heat island effect, reduce ground-level ozone, make active transport corridors more attractive, and improve mental health.³⁴

22.1. How would these actions address the identified challenges and opportunities to reduce transport infrastructure emissions?

These actions would increase health co-benefits of decarbonising transport infrastructure and, therefore, increase the return on investment in low-emissions infrastructure.

23. The Australian Government invited views on aspects of the energy transformation that represent the most material challenges and opportunities for the electricity and energy sector. Submissions closed on Friday 12 April 2024 (AEDT). This feedback will be used to inform the development of the Electricity and Energy Sector Plan and Net Zero Plan.

The Australian Government will be undertaking targeted consultation to identify options for production incentives to support the establishment of a made in Australia low carbon liquid fuel industry, including through the release of a low carbon liquid fuels consultation paper.

Feedback heard through this process will also inform development of the final Transport and Infrastructure Net Zero Roadmap and Action Plan.

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?

Further HIAs and LCAs are required to ensure that increased uptake of LCLFs do not have unintended health impacts on humans or the environment. Existing reviews of biodiesel exhaust emissions indicate the presence of harmful particulates, gases and toxins.²⁸

Further research and development of this industry needs to focus on minimizing harmful emissions and collecting adequate data through real world testing conditions to demonstrate that biofuel emissions will not be harmful to health.

24. How should the use of low carbon liquid fuels be prioritised across different transport modes over time to achieve maximum abatement?

See response to Question 11.

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

We note on p. 12 of the Roadmap that the Commonwealth Department of Health & Aged Care was not part of the Interdepartmental Committee established by the Commonwealth Government. The CSA argues that Health and Environmental Health agencies should be included on this committee to support the core focus on active and

public transport and emissions reductions. In addition to the fora listed in this chapter, we recommend clear targets and a timetable for the transition of transport sectors to zero emissions technologies.

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?

International Maritime Organisation's Low Sulphur Fuel Standards.

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

International trade agreements and regional partnerships such as the Asia Pacific Forum and ASEAN–Australia Summits, and potentially the G7 (if expanded to include Australia).

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

The health co-benefits and co-costs of transport decarbonisation need to be included as relevant metrics. Air pollution emissions, exposure and health impacts are important to consider including:

- The number of premature deaths avoided;
- Associated savings from avoided deaths; and
- Multi-pollutant measurements and modelling techniques.

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?

The CSA manages [The Clean Air and health Research Data and Analysis Technology \(CARDAT\)](#) platform; a collection of IT infrastructure that enables easy data sharing and reuse, and reproducible data analysis. It is an online research platform that collates a wide array of population, health and environmental datasets with a collection of analysis tools and methodology resources. The data in CARDAT includes air pollution, weather and built environment data in Australia and internationally. This platform enables collaboration between researchers and policy makers. CARDAT's mission is to provide data, methods and tools to support CAR to inform policy through research and analysis of air pollution, energy and health.

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

NA

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

NA

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

We recommend including a section dealing specifically with the health impacts of decarbonising the transport sector.

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

NA

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