Transport and Infrastructure Net Zero Consultation Roadmap

Take the survey

Department of Climate Change, Energy, Environment and Water

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Cement Industry Federation

4 Confirm that you have read and understand this declaration.
Yes

5 First name
Margie

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[redacted]

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9 Who are you answering on behalf of?

Organisation

10 Organisation name

Cement Industry Federation

11 What best describes you or your organisation?

Industry

12 What sector do you represent?

Other: "Industry Association"

13 What state or territory do you live in?

Australian Capital Territory

14 Postcode

2603

15 What area best describes where you live?

City

16 1. Do you support the proposed guiding principles?

No

17 1.1 Please add details to your response.

Not answered

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

Not answered

19 2.1 Please add details to your response.

Not answered

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

Not answered

21 3.1 Please add details to your response.

Not answered

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

Not answered

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?

Not answered

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?

Not answered

44 17.1 Please add details to your response.

Not answered

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?

Not answered

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

Not answered

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?

Not answered

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?

Not answered

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

Not answered

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

Not answered

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?

Not answered

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

Not answered

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

Not answered

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

Not answered

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

Not answered

66 Would you like to upload a document?

Yes

67 Have you removed any identifying information from your submission?

Yes

68 Upload a submission

204 Redacted CIF_Submission_Transport_and_Infrastructure_Roadmap.318d1bc6.pdf

69 Upload a submission

Not answered

70 Upload supporting file

Not answered

71 Upload supporting file

Not answered

CEMENT INDUSTRY FEDERATION

Cement Industry Federation Submission

Transport and Infrastructure Net Zero Consultation Roadmap

6 August 2024

ADBRI BORAL CEMENT AUSTRALIA

KEY POINTS

- Cement is a critical ingredient in concrete, one of the most used, safe and durable materials in the world essential for the built environment as we know it. Australian cement production is closely linked to population growth.

- Cement and concrete underpin Australia's $150 billion building and construction industry and contributes to Australia's economic and social well-being through employment, taxation and investment activities.

- Cement, lime and concrete manufacturers are highly dependent on road and rail transport to ensure they can deliver cement and concrete across the vast array of city and regional markets. Our sector constitutes once of the largest road fleets in Australia.

- Coastal shipping is required for two of our three members to move cement inputs and their final products to market within Australia.

- Cement and clinker freight costs in Australia come primarily from road transport (57%), followed by coastal shipping (22%) and rail (21%).

- Decarbonising the cement and concrete sector is possible through concerted action across the full cement and concrete value chain. This includes increased use of low carbon cement and concrete as well as access to zero emissions electricity and transport by 2050.

- The commercialisation of 'renewable gases' such as hydrogen and biomethane has the potential to deliver significant emissions reductions in our sector. This would also be assisted by incentives and policy support – including bringing renewable gases into the national gas regulatory framework.

- The CIF supports actions aimed at removing barriers and growing the market for low carbon solid and liquid fuels that can substitute for fossil fuels such as coal and gas, as well as for transport fuels.

- As new technologies and industries emerge over time, Australia's net-zero transformation will require new jobs, skills, qualifications and training pathways, both in the future energy and transports sectors, as well as in existing industries that are transitioning towards a clean industrial future.

- Carbon capture, utilisation and/or storage (CCUS) will be an important long-term mitigation measure for CO_2 emissions that cannot be addressed by conventional means such as clinker substitution or alternative fuel use.

- CCUS will require significant transport infrastructure, most likely via pipelines but also via road, rail, sea. The transport mode will be determined by a number of factors depending on the location of the CO_2 source and the relevant storage or utilisation option.

- The potential misalignment of Australian domestic policy with international policy and ambition, particularly in the Asia-Pacific region, could result in the displacement of domestic production (carbon leakage). This is a critical issue that has the potential to significantly impact the competitiveness of Australian manufacturers and therefore should be considered in any future policy development.

- It is well known that plants absorb carbon dioxide by photosynthesis and therefore forests act as a global sink for carbon dioxide. It is far less well known that cement (the key ingredient of concrete) in our built environment, in our cities and infrastructure, also absorbs carbon dioxide through a process called recarbonation. Research has been commissioned to model the uptake of carbon dioxide in cement and concrete in Australia through a project being funded by the SmartCrete CRC.

1. INTRODUCTION

Thank you for the opportunity to comment on the *Transport and Infrastructure Net Zero Consultation Roadmap* (May 2024).

The Cement Industry Federation (**CIF**) is the national body representing all **Australian integrated cement manufacturers**[1] – Adbri Ltd, Boral Cement Ltd and Cement Australia Pty Ltd. CIF members also produce cement at stand-alone facilities from domestic and/or imported clinker. They also manufacture lime, either col-located with clinker and cement or at stand-alone facilities.

After water, concrete (including cement as the key ingredient) is the most used material in the world and will continue to be crucial in supporting a modern world.

Australian cement, lime and concrete manufacture form part of a critical manufacturing industry of national importance, especially given the need for sovereign capability to support Australia's infrastructure (e.g., roads, bridges, water supply structures, medical facilities, defence structures, housing and commercial buildings) and as part of the overall transition to net zero.

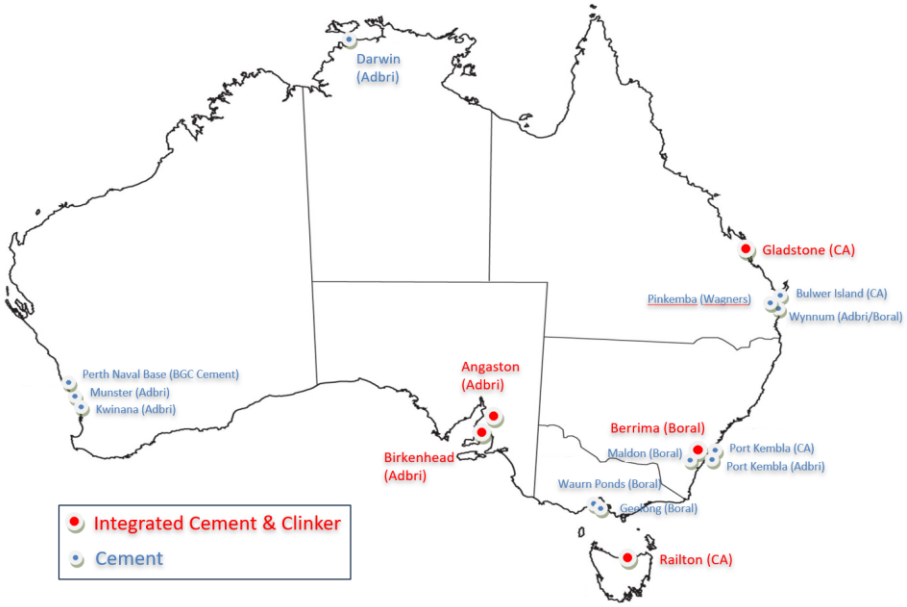
CIF members are committed to decarbonising their products by 2050 as demonstrated in the VDZ publication *Decarbonisation Pathways for the Australian Cement and Concrete Sector (2021)*.

2. CEMENT PRODUCTION

Cement is a critical ingredient in concrete, one of the most used materials in the world and essential for the built environment as we know it. Australian cement production is closely linked to population growth.

Australian integrated cement manufacturers produce clinker and cement at five facilities, located at Birkenhead (SA), Angaston (SA), Berrima (NSW), Gladstone (QLD) and Railton (TAS). Cement is also produced at twelve stand-alone cement mills – Figure 1. CIF members also produce lime, either in conjunction with their cement operations or as stand-alone facilities.

Figure 1: Location of CIF member integrated (clinker and cement) as well as stand-alone cement manufacturing facilities[2]



[1] Integrated cement manufacturing is when clinker and cement is produced as an 'integrated' process at the same facility. Whilst all cement manufacturing facilities in Australia are integrated, this is not the case in other jurisdictions such as the EU where many facilities only produce clinker.

[2] Note: BGC Cement and Wagners are not members of the CIF

Cement is manufactured in Australia from local sources of limestone, which is crushed and blended with minerals such as shale, iron ore and sand. The resultant raw mix, or 'meal', is then sent to a pre-calciner where it reaches temperatures of up to 860°C, before entering a rotating kiln where it is further heated to 1,450°C. At these temperatures the mix undergoes a sintering process as it passes through the rotating kiln, partially melting and forming nodules of clinker.

The clinker is then cooled and stored before being sent to the grinding mill, where it is blended with gypsum and other materials (such as unburnt limestone, fly ash and blast furnace slag) – depending on the type of cement required.

The resulting cementitious products are then distributed (via road, rail or sea) to customers around the country, with further transport requirements associated with the manufacture and distribution of concrete.

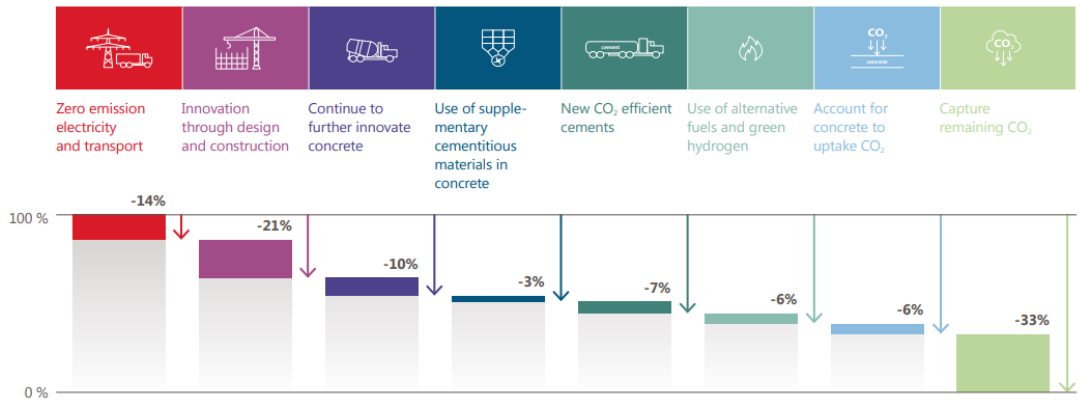
3. DECARBONISATION PATHWAYS

VDZ, a world-renowned cement and concrete research centre, was commissioned to undertake a study to better understand the technologies and practices necessary to decarbonise Australian cement and concrete.

The report identified eight decarbonisation pathways and key research requirements for the Australian cement and concrete industry to meet its declared ambition to deliver net zero carbon cement & concrete by 2050 (Figure 2), namely:

- Zero emissions electricity and transport
- Innovation through design and construction
- Innovation in concrete
- Use of SCMs in concrete
- Clinker substitution (new CO_2 efficient cements)
- Alternative fuels and green hydrogen
- Recarbonation (CO_2 uptake)
- Carbon Capture, Use and Storage

Figure 2: Identified decarbonisation pathways for cement and concrete



The VDZ report demonstrated that a decarbonised cement and concrete sector is possible through concerted action across the full cement and concrete value chain – including the design and use phase.

Access to low emissions electricity, clinker substitution and the development of new, lower carbon cements are examples of decarbonisation pathways available now, while other pathways such as zero emissions transport and CCUS will be available as technology and markets mature.

4. SUPPLY CHAIN AND TRANSPORT REQUIREMENTS

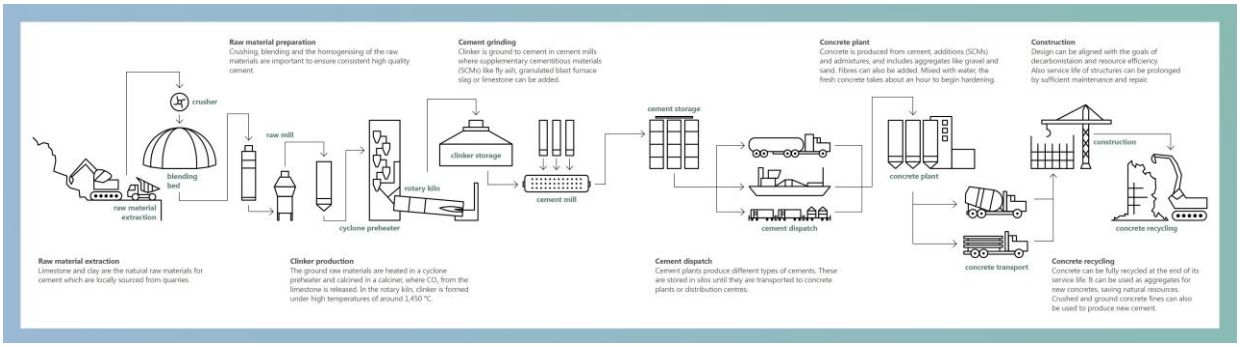
Cement manufacturers rely on road, rail and maritime transport as part of the sector's manufacturing supply chain to deliver inputs to the facilities and to deliver products to key destinations around Australia.

Freight accounts for 60 per of cement supply chain costs with road transport being the most significant cost item. This is unsurprising as cement manufacturers manage one of the largest road transport fleets in Australia.

Most cement manufacturing facilities are also reliant on coastal shipping to move key inputs and to deliver final products to market. Future shipping, port and distribution efficiencies are key to ensuring the Australian cement industry remains internationally competitive.

An overview of the cement and concrete supply chain is provided at Figure 3.

Figure 3: Overview of the cement and concrete supply chain[3]



Key areas of focus from a transport perspective for Australian cement manufacturers are:

- Raw material extraction and transport to site, as well as onsite fuel use
- The development and uptake of low carbon solid and liquid fuels that can substitute for fossil fuels such as coal and gas in the manufacturing process, as well as for transport fuels.
- General transport (clinker, cement, concrete and other inputs such as SCMs, alternative fuels, sand and aggregates)
- The increased development of low carbon cement products

Other key areas critical to the transition include:

- Imports of clinker, cement and supplementary cementitious materials (SCM)
- Transport of captured carbon dioxide for storage and/or reuse

<u>Raw material extraction and transport, as well as onsite fuel use</u>

Extracting and transporting the raw materials for clinker/cement production (primarily limestone, clay and/or shale), like most mining operations, is currently carried out using fossil fuel-based mining and haulage vehicles. In most cases transportation of the raw materials to the plant is typically over relatively short distances either by road, rail or sea.

Developments in electrification technologies across all mining and transport modes will be critical to reducing emissions from this production step. The development of affordable and readily available low carbon liquid fuels (LCLF) will also play a critical role in the transition to net zero.

[3] Decarbonisation Pathways for the Australian Cement and Concrete Sector – An Overview, VDZ 2021

CIF members are investigating opportunities to decarbonise their upstream operations. For example, Adbri has commissioned a new limestone transportation vessel (due in 2026) where electricity will replace about 25 per cent of the vessel's diesel fuel. By 2031, Adbri aims to achieve 100 per cent electric power capability.

Development of LCLFs as Alternative Fuels for Cement Manufacture as well as for Transport Fuels

The development of and access to affordable, low carbon fuels will be a key part of the transition to net-zero for the cement, lime and concrete sectors.

There is an increasing focus on utilising alternative fuels[4] to offset the current use of coal and gas that are currently used to heat cement kilns to the required 1,450 degrees Celsius.

As such, the commercialisation of 'renewable gases' such as hydrogen and biomethane has the potential to deliver significant emissions reductions in our sector. This would also be assisted by incentives and policy support – including bringing renewable gases into the national gas regulatory framework.

The CIF supports the Australian Government's involvement in assisting the development of the hydrogen industry through several initiatives, including the Hydrogen Headstart program, the Regional Hydrogen Hubs Program and the development of the Guarantee of Origin Scheme.

Low carbon liquid fuels could also potentially be used as an alternative fuel in cement kilns. They are also critical in terms of key aspects of our industry – most importantly in relation to mining (limestone for cement and lime), quarrying (aggregate for concrete) as well as transport of our inputs and final products.

The CIF welcomes the Government's commitment to supporting a low carbon liquid fuels industry in Australia on the proviso that fuel quality standards (particularly for diesel) are introduced in such a way as to minimise the disruption to industry as part of the transition to net-zero.

General Transport

While full electrification of all transport modes and infrastructure will take some time - CIF members are taking transitional steps to modernise their fleets to reduce emissions intensity through increased capacity and engine efficiencies, as well as investigating the use of hydrogen.

Adbri has also entered into a partnership with Janus Electric to develop battery-electric retrofit options for prime movers, with the first of Adbri's existing prime movers having been converted into an electric vehicle in 2023.

In 2023 Cement Australia was awarded grant funding to lease battery sets and convert six diesel prime movers in its Melbourne fleet to an electric drivetrain, which are currently undergoing a 12-month trial/demonstration stage to evaluate the performance, maintenance and repair requirements, training of personnel and reliability of charging infrastructure. This is in addition to a 70-tonne electric heavy-duty truck (Janus JE410 fully manufactured in Australia) that delivered its first load in NSW in December 2022.

Boral is taking steps to optimise its supply chain logistics and routes and has committed to exploring and implementing alternative fuels for Boral and contractor fleets, including electrification, biofuels and hydrogen.

Low Carbon Cement Products

The increased use of supplementary cementitious materials (SCMs) to replace clinker in cement and concrete is a key decarbonisation pathway available now.

Clinker, when ground with 4 to 5 per cent gypsum, develops the useful cementitious quality of reacting and hardening when mixed with water. There are other mineral compounds that also have these hydraulic

[4] Alternative fuels currently in use include demolition wood waste, refuse derived fuels, used oil and solvents, carbon powders and spent cell liners (from aluminium production).

properties when mixed and ground with clinker and gypsum. These mineral compounds can be used as clinker substitutes known as SCMs.

Due to the fact these compounds are pre-calcined (heated) by other industrial processes, the avoided emissions (process and combustion emissions) make SCMs one of the most attractive greenhouse gas reduction options for the cement and concrete sector.

Materials that can replace clinker in cement and concrete can be naturally occurring (unburnt limestone) or manufactured – for example, as a by-product of other industries (fly ash, ground granulated blast furnace slag) that would otherwise be sent to landfill or stockpiled.

SCMs have been used in cement and concrete manufacture for many years. They contribute to performance with the added benefit of offsetting emissions associated with clinker.

However, several factors can limit the use of SCMs in cement production, including:

- Availability of SCMs
- National standards and building codes and
- Market acceptance

While cement standards and specifications can be a barrier to uptake, market acceptance can also be a limiting factor in the use of SCMs. Government agencies, responsible for large infrastructure projects, often require design specifications which hinder the optimal use of SCMs to produce lower carbon cements.

Standards, Codes and Specifications for cement, SCMs and concrete need to be reviewed and updated where necessary to fully realise the emissions reduction potential of clinker substitution.

This will require the modification of existing cement types (i.e., Type GP, Type GB and Type GL) as well as the introduction of new, low carbon cement types (i.e., to allow for new SCMS such as calcined clay, as well as higher limestone cements).

For example, a reduction in clinker content to produce a lower carbon Type GP cement can be obtained by increasing the maximum mineral addition (limestone content) from 7.5 per cent to 10 per cent. This is currently being considered as part of a review of the Australian cement standard - AS 3972 – and will require the support of all stakeholders.

In general, a move away from prescription-based standards towards more performance-based standards would allow cement manufacturers more flexibility in adopting more innovative and lower carbon cement products.

Other Codes and Specifications, such as those used by infrastructure authorities as well as state and local governments, should also be reviewed and updated along the same lines.

However, simply producing clinker-efficient cement and concretes will not solve the problem if there is little demand for the products. There will need to be a transition from product push to market pull, which will require close cooperation and ongoing exchange of knowledge along the entire cement and concrete value chain.

Public procurement can play a key leadership role here given public investment provides a major part of infrastructure spending, and since state regulator´s standards will continue to determine how the majority of cement and concrete is specified.

There are already examples of strong action in this area, including Infrastructure Australia guidance as well as the Office of Projects Victoria Sustainable investment Guidelines, which provide guidance on how to embed sustainability into infrastructure projects across all stages of the investment lifecycle.

In general, stakeholders will be looking to governments and regulators taking leadership in procurement processes with a strong focus on embodied carbon and the production and supply of lower carbon cement and concrete.

Imports

Whilst retaining a significant local manufacturing footprint, Australian manufacturers also import clinker and increasingly SCMs depending on market conditions.

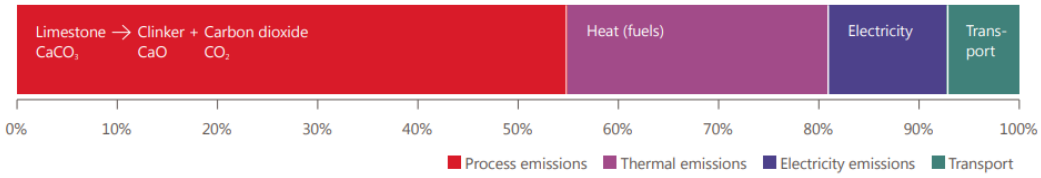
As noted in the discussion paper, Australia's reliance on international vessels for coastal shipping services means international decisions will have great influence on decarbonising maritime transport. Australia will need to accommodate multiple energy sources and technologies, especially for international bunkering.

Transport of Captured Carbon Dioxide for Storage and/or Reuse

Carbon dioxide emissions from the high temperature calcination of limestone to produce clinker, the main ingredient in Portland Cement, is unavoidable. While every effort is being made to reduce emissions across the sector, process emissions cannot be avoided with the currently available pathways and will have to be stored and/or utilised.

There are three main sources of carbon-dioxide emissions from the traditional cement manufacturing process - process emissions, direct thermal (energy) emissions and indirect (electricity) emissions (Figure 4).

Figure 4: Typical emissions profile of Australian cement and concrete production

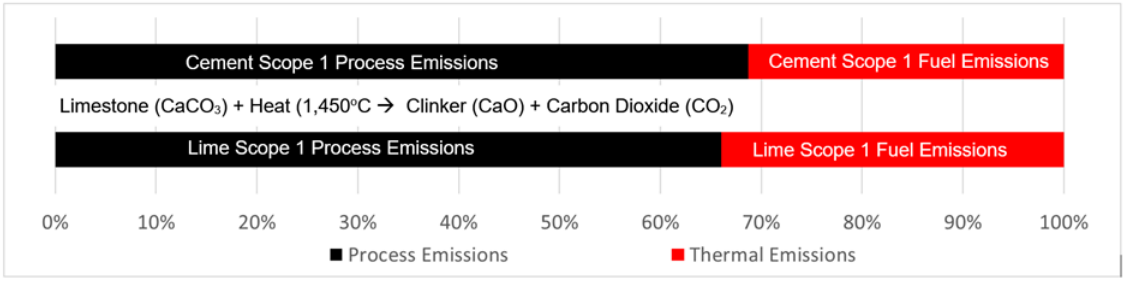


Approximately 55 per cent of per cent of total carbon dioxide emissions occur as unavoidable process emissions which result from the necessary conversion of calcium carbonate to calcium oxide. Calcium carbonate is present in the principal raw material used in cement manufacture, limestone.

When only direct (scope 1) emissions are considered, process emissions account for around 70 per cent (Figure 5).

Unavoidable process emissions are the primary reason why cement and lime manufacturing are considered hard-to-abate sectors.

Figure 5: Typical direct (scope 1) emissions profile for cement and lime



As such, carbon capture, utilisation and/or storage (CCUS) will be an important mitigation measure for CO_2 emissions that cannot be addressed by conventional means. However, successful adoption of CCUS will require a clear focus on legislative and regulatory frameworks across all levels of government.

CCUS will also require significant transport infrastructure, most likely via pipelines but also via road, rail, sea. The transport mode will be determined by a number of factors depending on the location of the CO_2 source and the relevant storage or utilisation option.

There is a clear role for governments to not only put in place the legislative and regulatory framework, but also to support research aimed at investigating and demonstrating CCUS at an industrial scale and

adapted to the specificities of the Australian cement industry, as well as pre-feasibility studies into CO_2 compression and transport options relative to the location of Australian cement manufacturing facilities and potential storage locations.

Internationally, there is an increasing focus on CCUS, both from a regulatory as well as technical standpoint. As capture technology and storage locations/use options mature, the focus must then shift to CO_2 transport. For example, a recently released report by world-renowned German research centre, VDZ, looks at the future CO2 infrastructure requirements for Germany[5].

In this study VDZ looks at a number of scenarios that include multimodal CO_2 transport by pipeline, rail or ship – as well as intermediate storage options at the point of origin and at the transfer points. VDZ found that around 4,800 km of long-distance pipelines (~EUR 14 billion) and 3,000 annual trips by 20 block trains with tank wagons are required to transport the CO_2, with estimates of around 500Mt removed through CCUS over 20 years.

Importantly, a key finding of the study is that key infrastructure needs to be **in place by 2035** to achieve an ambitious goal of climate-neutral production by 2040.

CCUS in Australia is not as advanced as in other jurisdictions. Additionally, transport distances are likely to much longer in Australia when compared with Germany, which highlights the importance of an immediate focus in Australia on developing and implementing legislative and regulatory frameworks to support the rapid development of capture and storage options, as well as the significant transport infrastructure that will be required.

Pre-requisites and fields of action identified by VDZ that could be used as a guide for Australian governments are summarised below:

- Support and safeguards / Infrastructure investments
- Legal framework for CCUS in 2024 / Carbon Management Strategy
- Technical regulations / International cooperation
- Construction of CO_2 pipeline network 2028 until 2035 / Co-operation of network operators
- Parallel development of CO_2 and H2 infrastructure / Train and ship transport
- CO_2 free energy / Site connection / Acceptance
- Access to CO_2 storage off- and on-shore / Integration of CCU
- Extraordinary acceleration of planning and permitting / Skilled workforce

5. CARBON LEAKAGE

The potential misalignment of Australian domestic policy with international policy and ambition, particularly in the Asia-Pacific region, could result in the displacement of domestic production (carbon leakage). This is a critical issue that has the potential to significantly impact the competitiveness of Australian manufacturers and therefore should be considered in any future policy development.

Key points from the CIF's December 2023 submission to the Carbon Leakage Review include:

- Leakage risks are significant for lime, clinker and cement: Carbon leakage, arising from differences in climate ambition between countries, could undermine valuable efforts to address climate change and negatively affect domestic manufacturing facilities, their communities and supply chains.

- Early implementation should be a priority for simply transformed goods such as lime, clinker and cement: Early implementation of a Carbon Border Adjustment Mechanism (CBAM) will be critical to mitigate imminent production leakage risks and enable the industry to invest with confidence in decarbonisation technologies across the production process.

[5] Requirements for a CO_2 infrastructure in Germany: VDZ, June 2024 (https://www.vdz-online.de/fileadmin/wissensportal/publikationen/zementindustrie/Executive_Summary_VDZ_Study_CO2-Infrastructure.pdf)

- A multi-pronged policy approach is needed, including a Carbon Border Adjustment Mechanism (CBAM): A CBAM will need to be complemented by other policies to address leakage due to the likely initial focussed coverage, and the need to carefully manage transitional arrangements.

- Complementary measures will be needed to address domestic leakage and distortion within sectors: Policies to address international carbon leakage should be matched by complementary measures to address the risk of domestic leakage.

- The Australian cement and lime industry will work with authorities and other stakeholders to achieve positive outcomes: CIF members will continue to work with their supply chains to assist in increasing capability to measure embodied carbon and record these at the border.

6. RECARBONATION

Another important decarbonisation pathway identified by VDZ, and currently the focus of international research and action, is recarbonation.

It is well known that plants absorb carbon dioxide by photosynthesis and therefore forests act as a global sink for carbon dioxide. It is far less well known that cement (the key ingredient of concrete) in our built environment, in our cities and infrastructure, also absorbs carbon dioxide.

The International Panel on Climate Change's (IPCC) Sixth Assessment Report (2021) noted carbonation as a sink associated with cement and concrete production. The IPCC report also noted that the uptake of CO_2 in cement and concrete infrastructure (carbonation) offsets between 20-43 per cent of the carbonate emissions from current cement production (process emissions).

Further research has been commissioned to model the uptake of carbon dioxide in cement and concrete in Australia through a project being funded by the SmartCrete CRC. The project, along with similar research projects from a number of other countries, will feed into the IPCC method development process, as well as national carbon accounting frameworks, through the relevant national and global associations.

Further comments

Thank you for the opportunity to provide the above comments. For further information relating to this submission please contact [redacted]

[redacted]