CEMENT CONCRETE
& AGGREGATES AUSTRALIA

CCAA Submission to **the Transport and Infrastructure Net Zero Consultation Roadmap**

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CCAA Submission on the Transport and Infrastructure Net Zero Consultation Roadmap

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Introduction

In 2022, the government legislated Australia's greenhouse gas emissions reduction targets, to reach net zero by 2050 and 43% below 2005 levels by 2030.

The Australian Government's Net Zero Plan will lay out and extend Australia's action on climate change.

Six sectoral emissions reduction plans will support the Net Zero Plan. This will enable the Plan to capture the full breadth of the economy.

These six sectors forming the plans are:

- Electricity and energy
- Transport
- Industry
- Agriculture and land
- Resources
- The built environment.

Transport is currently the third largest source of greenhouse gas emissions in Australia, and without further action is projected to be Australia's highest emitting sector by 2030.

The Government is committed to developing the Transport and Infrastructure Net Zero Roadmap and Action Plan, which will explain how Australia will transition to a net zero economy, consistent with our international and domestic commitments.

Cement Concrete & Aggregates Australia

Cement Concrete & Aggregates Australia (**CCAA**) welcomes the opportunity to make a submission on the Transport and Infrastructure Net Zero Consultation Roadmap (**the Roadmap**).[1]

CCAA is the voice of the heavy construction materials industry in Australia.

Our members operate cement manufacturing and distribution facilities, concrete batching plants, hard rock quarries and sand and gravel extraction operations throughout the nation. CCAA membership produce the majority of Australia's cement, concrete & aggregates, and ranges from large global companies to SMEs and family operated businesses.

It generates approximately $15 Billion in annual revenues and employs approximately 30,000 Australians directly and a further 80,000 indirectly. The Heavy Construction Materials Industry is vital to the nation's building and construction industries and underpins the development of Australia's physical infrastructure.

Understanding each material component that makes up our industry is critical to recognising the specific challenges and actions required to decarbonise each component of our sector. For that reason, brief background information on the industry is provided below before we address the broader issues of decarbonisation, transport infrastructure and heavy vehicles.

[1] https://www.infrastructure.gov.au/have-your-say/transport-and-infrastructure-net-zero-consultation-roadmap

Summary

This submission by CCAA offers a comprehensive policy response to the Transport and Infrastructure Net Zero Consultation Roadmap. It highlights the pivotal role of the heavy construction materials industry in Australia's transition to a low-carbon future.

Representing an industry that generates $15 billion in annual revenues and contributes to the employment of approximately 110,000 Australians, CCAA underscores the critical need to decarbonise cement, concrete, and aggregate production to support sustainable infrastructure development.

CCAA's submission outlines several key recommendations aimed at facilitating this transition:

- **Whole-of-Life Carbon Approach**: Implementing a holistic approach to planning, design, and carbon estimates in government projects to accurately represent carbon footprints.
- **Revised Standards**: Encouraging federal support for redesigning standards to enable decarbonisation, such as changes to AS3972-2010 for General Purpose and blended cements.
- **Adopting Global Practices**: Fast-tracking standards and specification changes by adopting best practices from the US and Europe.
- **Material Efficiency**: Promoting designs that prioritise material efficiency, specify lower carbon concrete, and improve construction technologies.
- **Supplementary Cementitious Materials**: Moving towards performance-based specifications to increase the use of materials like Fly Ash and Blast Furnace Slag.
- **Supporting EPDs**: Accelerating the development of Environmental Product Declarations (EPDs) across the industry, through implementing funding programs similar to those available internationally.
- **Training and Information**: Providing supply chain training on using lower carbon concrete and mitigating resistance from project managers and contractors.

Additionally, CCAA emphasises the need for policies to support zero-emission vehicles (ZEVs) in the concrete supply chain, incentivise industry adoption of ZEVs, and upgrade road infrastructure to accommodate these vehicles. The submission calls for financial incentives to ensure infrastructure projects meet carbon targets and for promoting successful low-carbon projects and materials.

Through these measures, the Heavy Construction Materials Industry, represented by CCAA, aims to significantly contribute to Australia's net zero goals, addressing both the supply chain challenges and the broader policy framework required for sustainable infrastructure development.

Recommendations

1. That all Government projects take a whole-of-life approach to planning, design and carbon estimates to ensure a more accurate representation of carbon, in the same way whole of life financial accounting is used today.
2. That the Federal Government encourage state and territory jurisdictions to support the redesign of standards that facilitate decarbonisation, such as changes to AS3972-2010 (General Purpose and blended cements). Without substantive changes to these Australian Standards and to State transport agency specifications, decarbonising of transport infrastructure will be limited more than the technology allows.
3. That the Infrastructure and Transport Ministers Meeting mandate the fast tracking of standards and specification changes by adopting standards and practices from the US and Europe.
4. That all governments promote the design of building and infrastructure that includes a clear focus on material efficiency, specifying lower carbon concrete and improved construction technologies.
5. That state/territory governments work towards performance-based specifications, away from specifying minimum amounts of Portland cement, and therefore promote the greater uptake of Supplementary Cementitious Materials (SCM) such as Fly Ash and Blast Furnace Slag.
6. That the Federal Government introduce a national grant program, similar to the USA Environmental Protection Agency Scheme[2] to support businesses that manufacture cement and concrete to develop and verify Environmental Product Declarations (EPDs).
7. That the Federal Government in conjunction with State and Territory governments provide training and information across the supply chain on how to use lower carbon concrete, as lower carbon concretes do not respond exactly the same as traditional concretes and pushback from project managers, contractors and placers are regularly resulting in higher carbon concretes being substituted over those originally specified
8. That the Federal Government financially incentivise State and Territory Governments for their “as built” infrastructure to meet their carbon targets for Federally funded infrastructure projects, to discourage alternative higher carbon concretes from being substituted by designers, project managers, contractors and sub-contractors;
9. That the Department of Infrastructure, Transport, Regional Development, Communications and the Arts in conjunction with their state counterparts promote and provide case studies for projects that have used lower carbon cements, low carbon concretes and recycled materials;
10. That the appropriate Government agencies measure more categories of construction and demolition waste to landfill and so allow for a better understanding of how much concrete is being disposed of rather than being reused or recycled.
11. That the Department of Infrastructure, Transport, Regional Development, Communications and the Arts identify the extent of road infrastructure upgrades that are required to meet the needs (particularly higher axle loadings) of different types of low and zero emission vehicles.

[2] https://www.epa.gov/greenerproducts/grant-program-reducing-embodied-greenhouse-gas-emissions-construction-materials-and

12. That Infrastructure and Transport Ministers determine policy settings for allowing heavier zero emission concrete and aggregate delivery trucks on to every residential street in Australia, to give a clear investment signal to industry as to what types of low and zero emission heavy vehicles will be viable in the medium and long term.
13. That the Federal Government set out a plan and timetable for rolling out the infrastructure that would conveniently permit the refuelling of ZEVs, irrespective of whether they are electric or FCEV (hydrogen powered) vehicles throughout the entire Australian road network.
14. That the Federal Government develop incentives for industry to take up ZEVs for use in the concrete and concrete related product supply chain.
15. That the Federal Government investigate the viability for biodiesel to be a transitional fuel to ZEV, given it is compatible with existing plant while potentially delivering a 60% reduction in CO2; and
16. That the Federal Government encourage State Governments to establish Heavy Construction Materials Supply Plans and appropriate protections to ensure aggregate and sand resources close to demand can be protected, to minimise transport distances and associated emissions.

Background

Cement Production

Cement is a critical ingredient in concrete, one of the most used materials in the world and essential for the built environment. Australian cement production is also 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). CCAA members also produce lime, either in conjunction with their cement operations or as stand-alone facilities.

Cement is manufactured in Australia from local sources of limestone using state-of-the-art pre-calciner technology.

Limestone 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^{o}C, before entering a rotating kiln where it is further heated to 1,450^{o}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 cement products are then distributed (via road, rail or sea) to customers around the country.

The chemical reaction resulting from the calcination of limestone to produce clinker, the main ingredient in Portland Cement, is unavoidable. The carbon dioxide released as a result are referred to as process emissions and are independent of the type of fuel (coal, gas, alternative fuels) used to heat the kiln.

Aggregates

Another key ingredient in concrete is aggregate. Both coarse aggregates (stone fractions) and fine aggregates (sand fractions) are quarried and/or dredged for use in concrete. This use makes up only a small portion of the total extractive industry output, most of which is used in asphalt, road base, civil works and site works.

It is estimated that there are approximately 2,200 active quarries supplying Australia's extractive industry, of which around 30 per cent is used in the manufacture of concrete.

Aggregates are usually transported long distances of up to 3 hours' drive time and are delivered directly to the customer or to concrete batching plants.

Quarries are being forced further and further away from high population centres where the aggregates are most needed. This, in turn, increases the transport related carbon emissions in supplying these materials.

The Infrastructure Australia Market Capacity Report 2023 elaborated on this point:

Acute quarry shortages loom in a few hotspots across the country. Shortages in local quarry supply threatens the deliverability of major public infrastructure works, increases project costs and schedule delays, and contributes greater emissions by bringing heavy materials to site from further afield via truck or train. Data availability of raw quarry products varies by state and territory, while long quarry approval times (5—10 years) impede efforts to plan supply for demand. While quarries are monitored and managed by state and territory governments predominantly, national regulation and policies across biodiversity and environment, cultural heritage, and net zero requirements, may also contribute to delays in quarry approvals.[3]

State Governments should be encouraged to establish Heavy Construction Materials Supply Plans and appropriate protections to ensure aggregate and sand resources close to demand can be protected, to minimise transport distances and associated emissions.

[3] https://www.infrastructureaustralia.gov.au/sites/default/files/2023-12/IA23_Market%20Capacity%20Report.pdf

Concrete

Cement and aggregates are key ingredients in concrete – the most commonly used construction material in the world today. Concrete underpins Australia's $150 billion building and construction industry and contributes to Australia's economic and social well-being through employment, taxation and investment activities.

It is estimated that around 30 million cubic meters of concrete is produced in Australia per annum supplied by around 1,300 concrete batching plants. A cubic meter of concrete contains approximately 250kg of cement/cementitious material, 700kg of sand, 1,200kg of aggregates.

In Australia, a large proportion of concrete is produced in premixed concrete batching plants and delivered in a plastic state to construction sites. A 'just-in time' product, premixed concrete is mixed and delivered locally to order, using locally sourced materials, labour and other resources. The resulting social and economic impacts are felt in large cities and industrial hubs, as well as in small rural communities.

Concrete can be moulded into any shape and, due to its strength and durability, will continue to be the base for housing and infrastructure and subsequently for economic growth, societal wellbeing and prosperity. It will also be the foundation of future low carbon infrastructure.

Premixed concrete is manufactured at batching plants that are typically located strategically within a radius of 45-minute travelling time from major development areas.

Decarbonisation Pathways

In 2021, the Cement and Concrete industry declared its ambition to deliver net zero carbon cement and concrete to Australian society by 2050.

Our industry has recognised the challenges of climate change and in the Ambition Statement outlined a commitment to work collaboratively with stakeholders across the value chain towards decarbonisation of the built environment. Achievement of this collective goal will require technological, regulatory, structural, and behavioural change.

To better understand the opportunities available to decarbonise, CCAA, in partnership with the Cement Industry Federation (CIF) commissioned VDZ, a global engineering house with concrete expertise to report on the pathways for the Australian cement and concrete sector to decarbonise.

This resulted in the publication of a report, Decarbonisation Pathways for the Australian Cement and Concrete Sector (2021) (The Report) that has enabled a better understanding of the technologies and practices necessary to decarbonise Australian cement and concrete. From the report, eight decarbonisation pathways have been identified, (See figure 1 below) and key future research requirements (see Appendix 1 for more details)

The Report and the subsequent Industry Decarbonisation Facilitation Plan[4] developed by CCAA & CIF shows the percentage contribution by pathway to total decarbonisation objective from 2020-2050 (2050 being at Net Zero). The pathways most relevant to the Transport & Transport Infrastructure Roadmap are:

1. **Zero Emission Transport** (and mobile plants) - 7% [with Zero Emission electricity in plants account for the balance of the total 14% calculated for the pathway]
2. **Innovation through decarbonising Design & Construction** - 21%
3. **Continue to further innovate concrete** - 10% [involving working with value chain stakeholders to change Standards & Specifications to support increased flexibility in binder content and composition and reducing concrete waste]
4. **Use of supplementary cementitious materials (SCMs) in concrete** – 3% [increasing the ability for the industry and customers to use traditional materials such as Slag & Fly Ash and new emerging materials.
5. **New CO2 efficient cements** – 7% [requiring increased ability to innovate with alternatives to Portland Cement]
6. **Account for Concrete to uptake CO2** – 6% [emission savings calculations taking into account the naturally occurring Recarbonation into Carbon calculations and construction processes]

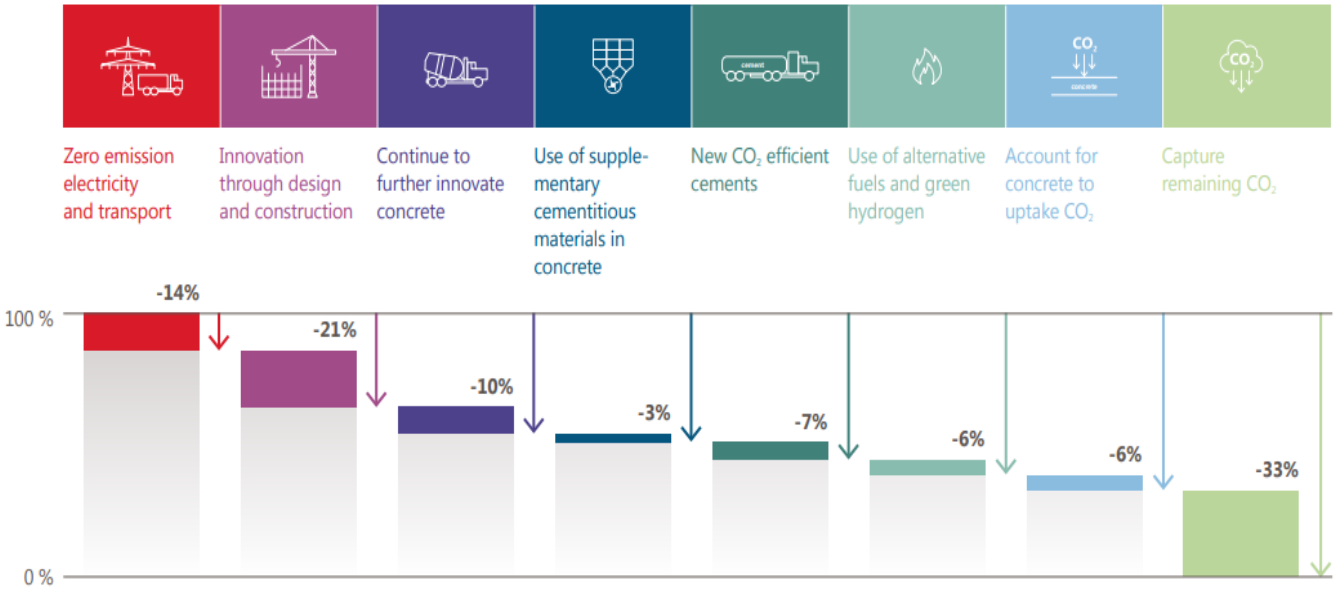

Figure 1: Identified decarbonisation pathways for cement and concrete

[4] Further details on the Industry Decarbonisation Facilitation Plan can be provided in follow up meetings.

As can be seen in the Industry Decarbonisation Pathways report, there are substantial steps being taken to decarbonise cement, concrete and aggregate supply, however Governments at both State and Federal level as the lead policy makers, procurers of infrastructure and influencers, have the largest influence in the decarbonisation of transport infrastructure.

The recommendations below highlight a number of ways in which Government can influence the decarbonisation of transport infrastructure.

Recommendations

1. That all Government projects take a whole-of-life approach to planning, design and carbon estimates to ensure a more accurate representation of carbon, in the same way whole of life financial accounting is used today.
2. That the Federal Government encourage state and territory jurisdictions to support the redesign of standards that facilitate decarbonisation, such as changes to AS3972-2010 (General Purpose and blended cements). Without substantive changes to these Australian Standards and to State transport agency specifications, decarbonising of transport infrastructure will be limited more than the technology allows.
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6. That the Federal Government introduce a national grant program, similar to the USA Environmental Protection Agency (EPA) scheme, to support businesses that manufacture cement and concrete to develop and verify Environmental Product Declarations (EPDs).[5]
7. That the Federal Government in conjunction with State and Territory governments provide training and information across the supply chain on how to use lower carbon concrete, as lower carbon concretes do not respond exactly the same as traditional concretes and pushback from project managers, contractors and placers are regularly resulting in higher carbon concretes being substituted over those originally specified

CCAA also notes the recent publication of Infrastructure Australia's Embodied Carbon Projections for Australian Infrastructure and Buildings report[6], that Infrastructure Australia states "forms part of our broader advice to support the Australian Government's decarbonisation priorities and objectives."

In this report, Infrastructure Australia puts forward 6 recommendations to the Australian Government to consider in its work towards the reduction of embodied carbon from infrastructure and buildings. In reviewing these recommendations, CCAA recognises and is encouraged by consistency with the recommendations made in this submission.

[5] https://www.epa.gov/greenerproducts/grant-program-reducing-embodied-greenhouse-gas-emissions-construction-materials-and

[6] Further details on the Industry Decarbonisation Facilitation Plan can be provided in follow up meetings.

Transport Infrastructure

In regards to transport and infrastructure policy, as was stated on page 73 of the Roadmap.

State, territory and local governments are primarily responsible for transport infrastructure through their ownership, operation and maintenance of assets, and as co-investors, driving the planning, identification and delivery of infrastructure projects. Although the Australian Government relies on state procurement decisions, it does have some influence over transport infrastructure emissions through decision-making during all stages of the project lifecycle.

And:

To contribute to a net zero pathway in the short-term, reducing embodied emissions in infrastructure will be a key priority. This approach will require establishing markets, building governance architecture, prioritising low or zero emissions procurement, and working to fill the knowledge and skills gap. National standards on data collection, measurement and reporting of embodied emissions will be required in order to enable a fair comparison and assessment of emissions from transport infrastructure. This will require national leadership and coordination. There will also need to be increased investment in low and zero carbon materials (steel, cement and aluminium).

The Roadmap thus identifies many of the steps that need to be taken to assist in the decarbonisation of the Australian economy.

Some initiatives have already been developed.

For instance, at its meeting held on 7 June 2024 the Infrastructure and Transport Ministers' Meeting (ITMM), Ministers provided in-principle support for the use of a nationally consistent set of carbon values in the assessment of business cases for transport infrastructure projects over $100 million as well as approving the *Embodied Carbon Measurement for Infrastructure: Technical Guidance*, providing a nationally consistent approach to measuring embodied emissions in infrastructure projects.[7]

These are positive steps for which ITMM should be commended.

This standard could for instance be amended by permitting an increase in the percentage of limestone mineral addition in cement (in place of clinker), which has a material impact on the level of embodied carbon (and thus the level of emissions produced) when manufacturing cement with similar qualities to products produced under the current standard.[8]

The Infrastructure and Transport Ministers' Meeting has established an Infrastructure Decarbonisation Working Group.

That Working Group could be tasked to develop model procurement guidelines designed to encourage the use of lower carbon concrete in infrastructure as the supply of such concrete becomes available as a 2024-2030 decarbonisation target.

Procurement guidelines must recognise the lifecycle carbon impact of a project rather than just the upfront embedded carbon. Projects built from concrete, including roads, bridges and structures typically require less maintenance and last longer.

Such procurement guidelines should also recognise the challenges of sticking to the initially specified lower carbon concretes. The use of lower carbon concretes can lead to higher construction costs and may impact curing times or the time taken to reach required performance, such as strength, resulting in project delays. These factors often lead to project manager and others seeking concessions to the use of higher carbon concretes.The Federal Government can incentivise state governments to stick to their original plans by tying funding to achieving the stated carbon objectives of the infrastructure project.

[7] Further details on the Industry Decarbonisation Facilitation Plan can be provided in follow up meetings.

[8] Further details on the Industry Decarbonisation Facilitation Plan can be provided in follow up meetings.

Recommendations

8. That the Federal Government financially incentivise State and Territory Governments for their “as built” infrastructure to meet their carbon targets for Federally funded infrastructure projects, to discourage alternative higher carbon concretes from being substituted by designers, project managers, contractors and sub-contractors;
9. That the Department of Infrastructure, Transport, Regional Development, Communications and the Arts in conjunction with their state counterparts promote and provide case studies for projects that have used lower carbon cements, low carbon concretes and recycled materials;
10. That the appropriate Government agencies measure more categories of construction and demolition waste to landfill and so allow for a better understanding of how much concrete is being disposed of rather than being reused or recycled.

Heavy Vehicles

In the delivery of our Industry's vital materials to their delivery and customer destination, there are approximately 100,000 average heavy vehicle movements in Australia per day (usually during daylight hours) related to our industry.

Delivering these materials using Zero Emission heavy vehicles would make a strong contribution towards net zero, and specifically to the 7% reduction Pathway opportunity described above.

It is well known however that it is difficult to abate the level of emissions from heavy vehicles. [9] and [10] In no small part this is due to the challenges involved in sourcing and purchasing zero emission heavy vehicles (ZEVs) which can be legally used on Australian Roads and can be refuelled efficiently.

Perhaps an even greater challenge is that our industry needs to access every single local government-maintained street in Australia, at any given point in time, to provide the concrete and aggregates for the infrastructure itself, combined with the housing and commercial developments that are developed along the road network.

The Roadmap should consider opportunities to work with Industry to address these significant challenges.

Particular to the concrete industry is that battery electric heavy vehicle concrete agitators, required to deliver concrete have higher steer axle loads than other industries using heavy vehicles, exacerbating the problem of access to roads generally the domain of lighter vehicles. This combined with the unique requirement to access every residential street and every country road to deliver concrete, would place a significant infrastructure demand to ultimately upgrade every state and local Government owned road in Australia.

These challenges highlight the need for interim solutions, of which biodiesel may be one.

Recommendations

11. That the Department of Infrastructure, Transport, Regional Development, Communications and the Arts identify the extent of road infrastructure upgrades that are required to meet the needs (particularly higher axle loadings) of different types of low and zero emission vehicles.
12. That Infrastructure and Transport Ministers determine policy settings for allowing heavier zero emission concrete and aggregate delivery trucks on to every residential street in Australia, to give a clear investment signal to industry as to what types of low and zero emission heavy vehicles will be viable in the medium and long term.
13. That the Federal Government set out a plan and timetable for rolling out the infrastructure that would conveniently permit the refuelling of ZEVs, irrespective of whether they are electric or FCEV (hydrogen powered) vehicles throughout the entire Australian road network.
14. That the Federal Government develop incentives for industry to take up ZEVs for use in the concrete and concrete related product supply chain.
15. That the Federal Government investigate the viability for biodiesel to be a transitional fuel to ZEV, given it is compatible with existing plant while potentially delivering a 60% reduction in CO2; and
16. That the Federal Government encourage State Governments to establish Heavy Construction Materials Supply Plans and appropriate protections to ensure aggregate and sand resources close to demand can be protected, to minimise transport distances and associated emissions.

[9] Further details on the Industry Decarbonisation Facilitation Plan can be provided in follow up meetings.

[10] Further details on the Industry Decarbonisation Facilitation Plan can be provided in follow up meetings.

Appendix 1

From VDZ (2021) Decarbonised Pathways for the Australian Cement and Concrete Sector

Cement and Concrete Decarbonisation Pathways

Zero emission electricity and transport

- Promoting methods to decarbonise Australia's electricity network, whilst ensuring it remains reliable and affordable.
- Sourcing price competitive renewable purchase agreements.
- Adopting energy efficiency measures – including artificial intelligence and sensors.
- Supporting and adopting competitive technologies and energy sources to decarbonise the transport sector.

Innovation through design and construction

- Promoting design of building and infrastructure that includes a clear focus on material efficiency, specifying lower carbon concrete and improved construction technologies.
- Ensuring structural optimisation that allows for lifetime extension, repair and reuse.

Continue to further innovate concrete

- Improving the mix design and mixing technology for concrete, e.g. packing density optimisation, optimised use of admixtures.
- Developing an appropriate balance between performance and prescriptive approach in standards and building codes to lower clinker content in concrete.
- Reducing volumes of fresh concrete waste.

Use of supplementary cementitious materials in concrete

- Ensuring the benefits of using SCMs in cement and concrete are understood and reflected in procurement strategies.
- Focussing strongly on embodied carbon in concrete construction to create a market pull for low CO_2 concretes.
- Changing standards and building codes to reflect the benefits of increased SCMs.

New CO_2 efficient cements

- Producing cements with higher content of SCMs like fly ash, GGBFS, calcined clay and unburned limestone.
- Further lowering the clinker factor in cement.
- Creating and obtaining acceptance of new innovative cements.
- Developing standards and application rules which will be required to reflect the benefits of CO_2 efficient cements and enable their use in concrete.

Use alternative fuels and green hydrogen

- Increasing the use of alternative fuels to replace coal and gas to heat the cement kiln.
- Using alternative fuels in cement kilns will also be beneficial for lowering the emissions from landfills, although transport costs can prevent the uptake of alternative fuels.
- Applying the required pre-processing technologies.
- Utilising green hydrogen as fuel to lower the amount of fossil fuels in clinker production – substitution rates greater than 10% will require further research.

Account for concrete to uptake CO_2

- The International Panel on Climate Change (IPCC) Draft Report (2021) notes concrete absorbs CO_2 emissions from the production of cement and concrete.
- Recarbonation occurs during the lifetime of the concrete structure and after the end of its life.

Capturing remaining CO_2

- Proposed mitigation measure for CO_2 emissions that cannot be mitigated by conventional means.
- Several technologies are currently in pilot and demonstration phase.
- Australia provides good conditions for CCS and CCUS.