Technical Guidance

2025

National Sustainable Procurement in Infrastructure Guideline

For use by the Australian Government, States and Territories

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About this guideline

The Australian Government has committed to achieving net zero emissions by 2050[1]. Transport is the third-largest source of greenhouse gas emissions in Australia, amounting to 21% of Australia's greenhouse gas emissions in 2023[2] As the largest proportion of these emissions come from people and goods traveling, infrastructure has an important role in enabling low carbon transport modes.

Embodied emissions from the delivery and construction of transport infrastructure are estimated to account for 3% of Australia's total greenhouse gas emissions[3]. To achieve net zero emissions by 2050, decarbonising infrastructure will be a critical policy lever for governments. Embodied emissions can be reduced by using lower-carbon materials like steel, concrete, asphalt, aluminium, the incorporation of recycled materials, or through design strategies. These strategies include circular economy principles such as avoiding new builds, improving maintenance, refurbishing existing structures, and employing more efficient planning, design, and construction techniques.

The National Sustainable Procurement in Infrastructure Guideline (Guideline) is designed to support jurisdictions to reduce embodied emissions during procurement through development and delivery of infrastructure projects. The Guideline is targeted at transport agencies, infrastructure bodies, and other public officials responsible for delivering infrastructure and contracting with industry.

The Guideline is intended as a starting point to support a nationally consistent approach to using procurement to decarbonise infrastructure, providing efficiencies for governments and industry. Together with the Summary Tool, this Guideline provides a suite of best practice procurement and contracting approaches, outlining various considerations and opportunities to maximise carbon abatement at key project stages.

Australian governments are collectively the nation's largest developers and procurers of infrastructure: In 2023-24, Australian State and Territory governments allocated $256.6 billion to public infrastructure over the forward estimates, accounting for 10-20% of each State and Territory's annual budget[4].

Governments also have significant interface and touchpoints with industry at all stages of the lifecycle: from planning and development, early design, business case advisory, construction procurement, through to contract administration, asset handover, operations, and end-of-life. These touchpoints offer opportunities for governments to influence all members of the value chain to reduce emissions and achieve broader environmental objectives.

Contracts between government and industry are a key mechanism for setting and enforcing requirements and expectations for decarbonisation on transport infrastructure projects. Effective commercial arrangements underpin successful project delivery, and offer a powerful commercial policy lever in driving sustainable practices and achieving decarbonisation goals.

[1] (Department of Climate Change, Energy, the Environment and Water)
[2] (Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA), 2024)
[3] (Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA), 2024)
[4] (Infrastructure Partnerships Australia, 2023)

Project and program-level planning, design, and delivery of transport infrastructure and services can enhance sustainability goals, opportunities, initiatives, and innovations. These efforts can increase the number of designers and contractors capable of meeting the net zero challenge. They can also drive market uptake of low carbon materials and practices, and encourage innovation to transform incoming public infrastructure into lower carbon assets. Prioritising carbon reduction in procurement can promote market expansion for lower carbon materials and practices, which is crucial for achieving decarbonisation.

While most of the implementation strategies proposed in this Guideline occur at the project level, the principles can also be applied to program-wide decarbonisation strategies. It supplements other program-wide activities that jurisdictions are undertaking to deliver emission reductions, including incorporating decarbonisation in other standards and specifications, and supporting research and industry development activities.

The Guideline recognises the need for flexibility to cater to the diverse nature, scale, and location of transport infrastructure projects. It also recognises that governments are at different starting points, and can adopt the recommended procurement or contracting approaches at their own pace. This can be done through either partial or complete adoption of the recommendations at any stage of the project lifecycle.

Commencement

The Guideline is not retrospective. However, for projects currently in delivery, agencies are encouraged to adopt guidance from the current stage of a project's lifecycle where feasible.

The Guideline is a point-in-time document that reflects current best practices, and draws on the best available data and research. In this rapidly developing area, the Guideline may be revised by Infrastructure and Transport Ministers as new information emerges and technology advances.

Scope and use of the guideline

Decarbonising transport infrastructure is a priority of the Infrastructure and Transport Ministers' Meeting (ITMM). The Guideline has been drafted as an instrument that Australian jurisdictions can use to reduce carbon emissions in project procurement, and provides actionable strategies for both industry and government. It also provides guidance on supply contracts.

While it has been developed to coordinate national approaches to land transport infrastructure projects, it may also be applied to infrastructure projects in other sectors such as energy, health, education, or telecommunications.

The physical infrastructure assets which the guideline may be applied to include, but are not limited to:

- Heavy rail, including station buildings, pedestrian areas and other associated structures and facilities;
- Roads, bridges, tunnels and associated structures and infrastructure;
- Light rail infrastructure and facilities;
- Integrated precinct developments;
- Maritime infrastructure; and
- Airports.

When using this Guideline, it is important to recognise that procurement is only one part of the carbon management process. PAS 2080 Carbon Management in Buildings and Infrastructure 2023 (British Standards Institution (BSI), 2023) sets out the carbon management process, as illustrated in Figure 2 below.

Transport agencies and delivery authorities can best facilitate project success by establishing the strategic agenda and decarbonisation requirements at the beginning of the project. This early planning for carbon management will ensure it is integrated and prioritised throughout all stages of the project, optimising the range of approaches available to reduce emissions. The ability to reduce whole-life carbon in projects and programs of work is typically maximised at the earliest stages of a project lifecycle. (see **Figure 1**).

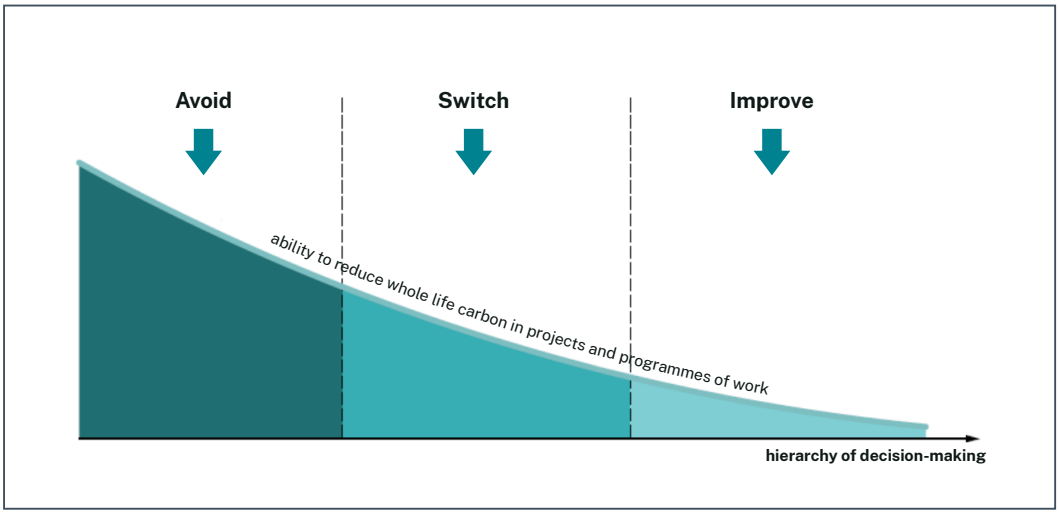


Figure 1: The PAS 2080 carbon reduction hierarchy (British Standards Institution (BSI), 2023).
This figure shows the ability to reduce whole-life carbon in projects and programs of work.

This Guideline focuses on the procurement component of the carbon management process. Procurement is one of the key contractual enablers for other carbon management components like assessment, monitoring and reporting, target setting, and baselines to achieve decarbonisation (see **Figure 2**).

It is also recommended that jurisdictions establish a process of continual improvement to uplift capability and drive innovation at each procurement lifecycle stage

The terms measurement, estimation, and quantification are used interchangeably for quantitatively assessing embodied carbon in infrastructure. Throughout this Guideline, this will be considered under one umbrella term: assessment. Assessment should follow the Embodied Carbon Measurement for Infrastructure: Technical Guidance (Infrastructure and Transport Ministers Meeting, 2024) in conjunction with a leading global standard for consistent and accurate carbon measurement in the built environment Royal Institute of Chartered Surveyors (RICS) 2nd Edition Whole-life Carbon Assessment (Royal Institute of Chartered Surveyors (RICS), 2023).

This Guideline draws on international best practice approaches to carbon management, with a focus on how to accelerate decarbonisation through procurement. It is recommended that jurisdictions start to align to the international standards outlined in this Guideline. This will drive efficiency for governments and industry partners, including reducing bid costs through standardisation of systems and processes.

The decarbonisation of infrastructure cannot be considered in isolation from other environmental sustainability areas, such as the circular economy and biodiversity. Likewise with emerging design and construction techniques, like the Modern Methods of Construction (MMC) and Nature Based Solutions (NBS). As enablers for project decarbonisation, the Guideline will incorporate these concepts as part of a holistic approach to environmental sustainability in procurement.

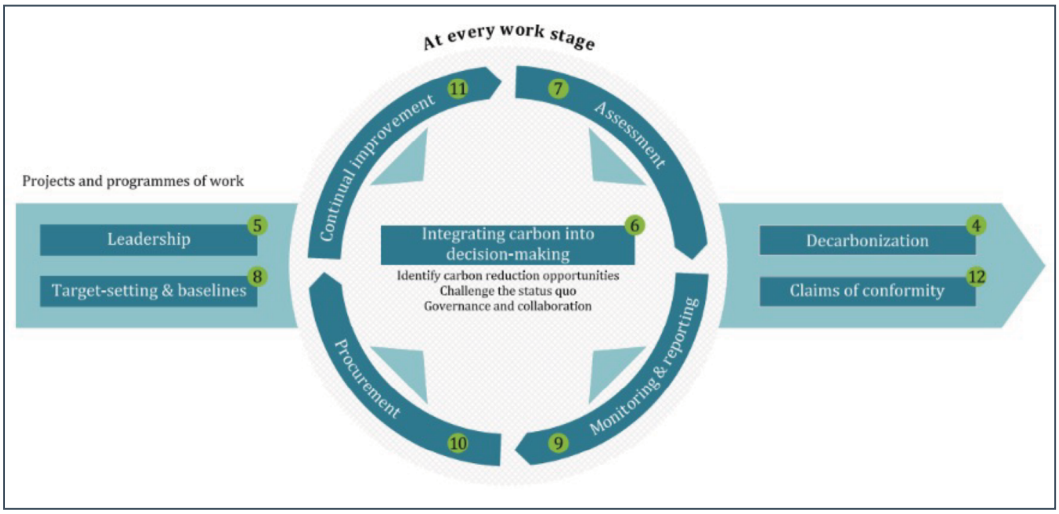


Figure 2: The PAS 2080 Carbon Management Process (British Standards Institution (BSI), 2023).
Circular workflow diagram for integrating carbon reduction into organisational decision-making.

Project lifecycle stages

Each jurisdiction has a capital project lifecycle similar to that shown in **Figure 3**. These frameworks formalise processes, decisions, and handover points, ensuring consistency in project delivery. The approach is based on a client-deliverer model, emphasising close collaboration between clients and delivery partners throughout a project's lifecycle to achieve successful outcomes.

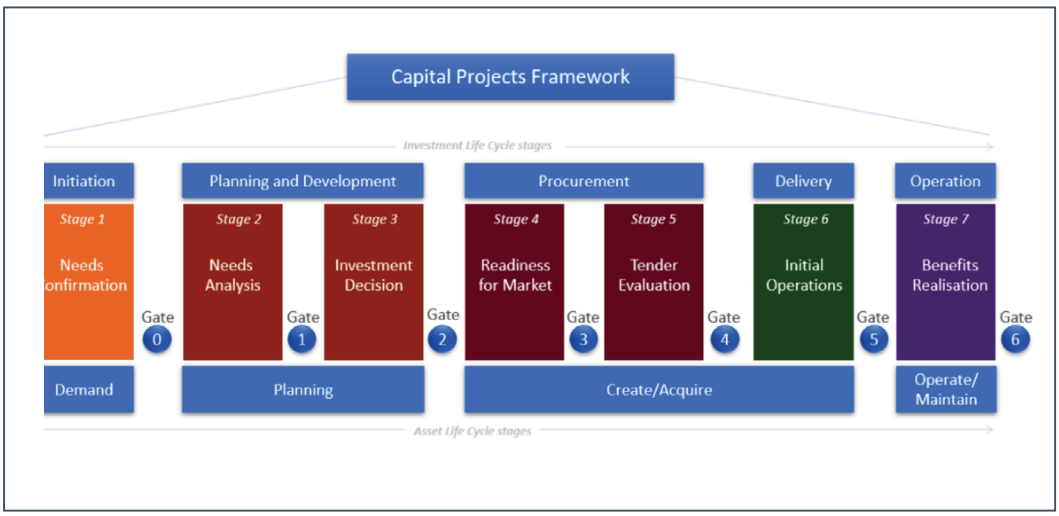


Figure 3: Example: The Transport for NSW Capital Projects Framework is aligned to key stages in the project lifecycle, and to investor assurance gates.

- **Initiation:**
  The Needs Confirmation stage involves verifying that an intervention is necessary to address an identified need, and provides a well-founded rationale for investing in a project.

- **Planning and development:**
  In the Needs Analysis stage, various investment options are evaluated to address the confirmed need. Key outputs include an Options Report assessing benefits and costs, an initial Project Management Plan (PMP), a preliminary investment case, and governance documentation for project progression.

- **Planning and development:**
  During the Investment Decision stage, the preferred option is selected and further developed to create a comprehensive investment case. Key outputs include a Preferred Option Report, concept design, Final Business Case, Benefits Realisation Management Plan, and a final governance plan for project progression.

- **Procurement:**
  In the Readiness for Market stage, the project requirements are established. Key outputs include the establishment of a procurement process, including tender documentation, assessment teams, and evaluation criteria.

- **Procurement:**
  The Tender Evaluation stage involves issuing the tender to the market and evaluating responses to select a preferred contractor. The key output typically includes a Tender Evaluation Report and recommendation.

- **Delivery:**
  During the Delivery & Initial Operations stage, the project is constructed, and assessments are made for handing over the new asset to the asset owners. Key outputs include awarding the contract to the contractor identified in the Tender Evaluation stage, constructing the asset according to approved project parameters, testing and assurance reports, benefits realisation, and final asset handover.

- **Operation:**
  In the Benefits Realisation stage, the newly created asset, which has been handed over to the asset owner and has completed its commissioning, begins delivering benefits. Key outputs include a clear understanding of lessons learned from project delivery (through a post-completion review) and measuring performance and benefits achieved to date. This stage also involves tracking longer-term benefits at the project and program levels.

- **End of Life:**
  When infrastructure reaches the end of its useful life, activities such as deconstruction, waste processing, and disposal take place. This phase also involves assessing the potential for reusing, recycling, and recovering energy from materials. Planning for the end-of-life phase should be incorporated in planning and development, and also any asset renewal activities. Key considerations include reusing materials in a new asset, , realising benefits from designing for disassembly, and incorporating circular economy principles to maximise resource efficiency.

Suggested requirements

Suggested requirements have been included in this Guideline to assist jurisdictions to include carbon management into their procurement processes and contracts. The suggested requirements are Transport for NSW contract clause templates that can be adapted by jurisdictions.

While this Guideline is focused on decarbonisation, the Transport for NSW contract clause templates also outline requirements for broader sustainability areas, including: Climate Resilience, Energy and Carbon, Biodiversity, Pollution Control, Water Cycle Management, Circular Economy, Sustainable Procurement, Liveable Places, Community Benefits, and Sustainable Leadership & Governance.

As Australia does not have a nationally standardised system of tender documents and contract sets[5], the suggested requirements do not specify where to include them in legal documents or exhibits. Consequently, these requirements don't prescribe a specific location within documents like the Scope of Works and Technical Criteria (SWTC) or similar documents with incentive schedules that could be part of standard contract forms.

Each jurisdiction mandates specific procurement policies and procedures to ensure that procurement activities are conducted ethically, legally, and transparently. These regulations are designed to uphold integrity, promote fair competition, and ensure that all procurement processes can withstand scrutiny. By adhering to these standards, jurisdictions aim to foster trust, prevent corruption, and achieve value for money in public spending. Jurisdictions should seek independent, commercial, procurement, and legal advice prior to using the suggested requirements and schedules to ensure they are appropriate.

Throughout this Guideline, suggested requirements are shown in blue boxes at the relevant stage of the procurement lifecycle, with hyperlinks through to relevant Appendices with requirements.

[5]This is unlike some other international jurisdictions, such as the United Kingdom, where the New Engineering Contract (NEC) sets out a consistent approach to the tender process, contract award and contract administration.

Carbon management readiness and capability

Jurisdictions have different levels of resources, capacity, and experience in carbon management and procurement, which is referred to as maturity in the PAS 2080 guidance document (Institution of Civil Engineers, 2023).

Note: Carbon management maturity in this Guidance and Summary Tool should be read alongside Figure 4.

PAS 2080 Carbon management maturity terminology:	Equivalent National Sustainable Procurement in Infrastructure Guideline terminology:
Foundation	Foundational
Embed and practise	Maturing
Lead	Established

When considering the guidance and suggested requirements in this Guideline, jurisdictions' level of maturity will influence which carbon management actions are most appropriate (**Figure 4**).

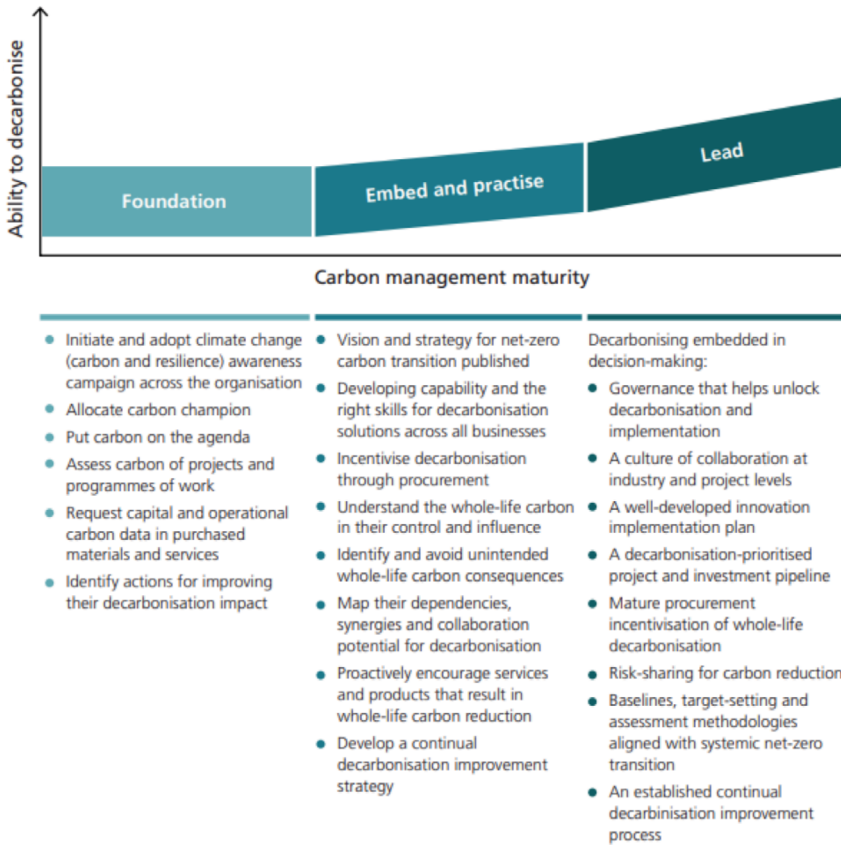


Figure 4: Carbon maturity progression and the ability to decarbonise (Institution of Civil Engineers, 2023)

Needs confirmation: transport agencies and delivery authorities

Australian transport agencies have different structures and processes for delivering transport infrastructure. In some jurisdictions, the Department of Transport operates alongside a separate delivery authority that has the primary objective of delivering specific capital pipelines. Others operate under one agency and have an internal Client Deliverer model.

Typically, the transport agency will start to develop and direct a series of high level requirements at the Needs Confirmation stage, often captured in a client requirements document or equivalent. These requirements are often developed in partnership with the delivery authority, and could remain fluid until the end of Needs Analysis stage.

Delivery authorities should gain an early understanding of client requirements for decarbonisation, which should:

- Reference all legislated, policy and specified carbon reduction mandates and targets that apply to the project; and
- reference this Guideline and other relevant national and jurisdiction-specific requirements for carbon reduction in procurement.
- reference to the ITMM Measurement Guidelines when estimating carbon and setting baselines and target.

Requirements 1:
Suggested requirements between a Transport Agency and Delivery Authority are in Appendix 1.I Market Interaction Process (Sustainability Questions)

Guidance for Implementation

1. Recommended guidance to support implementing **Requirements 1**

Guidance

Clause 6 Integrating carbon management into decision-making of PAS 2080 outlines implementation principles for asset owners:

a) Requirements for All Work Stages

Section 6.2.1 outlines that asset owners/managers must develop a carbon management process, assign clear responsibilities, prioritise decarbonisation, align with broader goals, set governance structures, communicate assessment requirements, establish GHG assessment objectives, implement low-carbon procurement, and foster collaboration.

b) Requirements for the Need and Optioneering Stages

Section 6.2.2 requires asset owners/managers to assess projects for net zero carbon support, identify and strategise net zero projects, evaluate carbon impacts, explore land use changes, define study boundaries, assess and compare carbon impacts, set baselines and targets, consider low-carbon alternatives, and maximise existing asset use.

Needs analysis and strategic business case

In the Needs Analysis stage, a range of high-level investment options and expected outcomes are considered. This stage typically produces the following key outputs:

- An assessment of the benefits and costs of a range of different investment options, presented in an Options Report;
- An initial plan for the project including direction, scope, and indicative schedule and cost information – this is outlined in a Project Management Plan (PMP) which is updated with greater detail in each subsequent stage;
- A preliminary investment case that details the reason for the project, a range of alternative service delivery options, and a project governance plan. This is articulated in a Strategic Business Case; and
- A governance plan and an assurance report, prior to seeking divisional endorsement to progress to the next stage in the lifecycle.

During this phase, infrastructure agencies procure for a wide range of services. These services include advisory, design, cost estimation, and strategic business case development. Generally, these services are procured under a contract for professional services, which is managed and executed by a Professional Services Contractor (PSC).

Jurisdictions can potentially undertake a large volume of simultaneous projects at any given time, and include a range of priority requirements in the project scope. Consistency in procurement requirements will aid consistent delivery across these projects by PSCs, addressing components identified in **Figure 2.** Options for achieving consistency in procurement requirements are illustrated in **GUIDANCE FOR IMPLEMENTATION** 2 below.

Figure 5 below demonstrates all value chain members' ability to accelerate decarbonisation throughout the delivery process. As indicated in **Figure 5,** governments or asset owners/ managers have the highest ability to influence whole-life carbon during the needs analysis and strategic stage, in collaboration with PSCs.

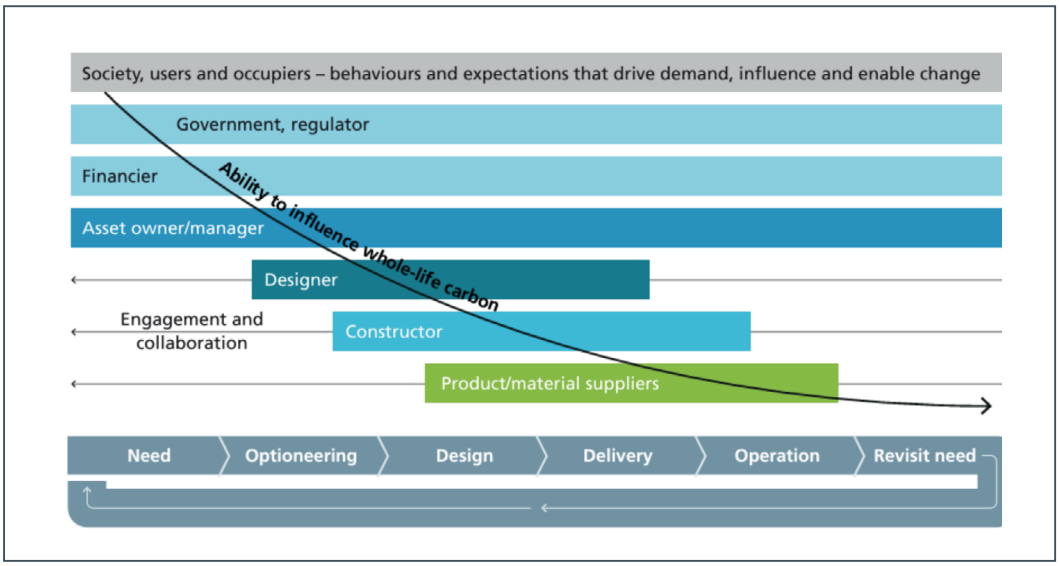


Figure 5: Value-chain members' ability to accelerate decarbonisation throughout the delivery process (Institution of Civil Engineers, 2023)

Requirements 2
Suggested procurement requirements:

1. **Appendix 1**
   Sustainability Procurement Templates (Overview): Provides an overview of the template documents and how they are to be used.

2. **Appendix 1.A**
   Sustainability Requirements (Design): Defines minimum sustainability requirements for the strategic, concept and detailed design, including consideration of options' carbon impact and alignment with net zero in options assessment, and sets out the designer's obligations to ensure alignment to PAS2080:2023.

3. **Appendix 1.B**
   Sustainability Reporting & Assurance Requirements (Design Phase): Sets out the designer's/contractor's sustainability reporting and assurance obligations for the Design Phase.

4. **Appendix 1.C**
   Sustainability Management Plan Requirements (Design Phase): Sets out the requirements for the Sustainability Management Plan and Carbon Management Plan (a sub-plan of the Sustainability Management Plan), both of which must be developed and implemented by the designer and contractor (if applicable).

5. **Appendix 1.D**
   PSC Returnable Schedule (Sustainability): Sets out the tender response requirements with respect to sustainability for the procurement of a design PSC.

Guidance for Implementation 2.
Main outputs and guidance to support suggested requirements for procuring PSCs shown in **Requirements 2**

PAS 2080 is crucial for guiding decarbonisation in infrastructure procurement across the project lifecycle. It provides a comprehensive framework for managing whole-life carbon emissions, emphasising early collaboration, defining roles and responsibilities, and integrating decision-making processes across the entire lifecycle of projects.

Options Report and Strategic Design: PAS 2080 Section 6.2.2 requires assessing projects' ability to enable and support the net zero carbon transition, evaluating carbon impacts, and considering low-carbon alternatives. Refer to the following documents when undertaking an assessment of the benefits and costs of a range of different investment options.

Guidance

a) National Embodied Carbon Measurement Guidance provides guidance on the measurement of carbon emissions in infrastructure projects.

b) Royal Institute of Chartered Surveyors (RICS) Whole-life Carbon Assessment 2nd Edition provides a framework for evaluating and reducing carbon emissions throughout a project's lifecycle.

c) Modern Methods of Construction UK Guidance Note refers to a variety of innovative construction techniques and processes that aim to improve efficiency, quality, and sustainability in both building and infrastructure projects. These methods often involve off-site construction, the use of advanced materials, and digital design and manufacturing technologies.

d) The NSW Government Decarbonising Infrastructure Delivery Policy provides guidance to delivery agencies on managing upfront carbon in public infrastructure projects. It also provides a list of actions to consider for optioneering in business cases.

e) The Netherlands Platform CB23 provides guidelines for circular construction, aiding sustainable design and procurement. English language resources are available: Measuring circularity in the construction sector, Passports for the construction sector, Future re-use, Circular design, and Circular tendering.

f) The Land Transport Sector Eligibility Criteria of the Climate Bonds Standard & Certification Scheme provides guidance on measuring and reducing carbon emissions, evaluating whole-life carbon, and exploring innovative construction techniques (Climate Bonds Initiative, 2023).

g) Waka Kotahi has developed the Climate Assessment of Transport Investment (CATI) model to assess the potential impact of land transport investment programmes on carbon emissions, providing a qualitative rating of activities to guide decision-making (Waka Kotahi, 2023).

Project Management Plan & Project Funding Strategy: an initial plan for the project including direction, scope, and indicative schedule and cost information.

Guidance

a) International Cost Management Standard 3 (ICMS3) provides a high-level structure and format for classifying, defining, measuring, recording, analysing and presenting life cycle costs and carbon emissions associated with construction projects and constructed assets.

Strategic Business Case and Cost Benefit Analysis a preliminary investment case that details the reason for the project, and a range of alternative service delivery options.

Guidance

a) Infrastructure Australia Guidance Note on Valuing emissions for economic analysis provides emissions values for economic analysis in infrastructure proposals.

b) Infrastructure Australia Guide to assessing greenhouse gas emissions outlines requirements for measuring and valuing GHG emissions in infrastructure proposals.

c) TPG23-08 NSW Guide to Cost Benefit Analysis (CBA) Section A3.4 Carbon Emissions and associated Technical Note provides methods for valuing carbon emissions in cost-benefit analysis in the NSW context.

d) UK Green Book Annexure 9. A1. Non-market Valuation and Unmonetisable Values for Natural Capital, and Enabling a Natural Capital Approach Supplementary Guidance provides methods for valuing non-market and unmonetisable natural capital, particularly in place-based applications.

e) ATAP Cost Benefit Analysis provides a framework for evaluating the economic efficiency of transport projects.

f) ATAP PV5 Environmental Parameter Values provides environmental unit costs for assessing transport policies and initiatives.

Governance Plan and Assurance Report
A governance plan and an assurance report prior to seeking divisional endorsement to progress to the next stage in the lifecycle.

a) PAS 2080 Section 12 'Claims of Conformity' outlines the requirements for demonstrating compliance with the standard. It specifies three types of conformity: independent third-party certification, other-party validation, and self-validation.

Project Example: Western Sydney International Airport Precinct Roads Network, NSW

Transport for NSW (TfNSW) is helping to create one of Australia's largest infrastructure and city shaping programs, the 11,200ha Western Sydney International Airport Precinct.

TfNSW has identified 7 road corridors that could constitute the Western Sydney International Airport Precinct Road Network. The development of these corridors aims to ensure future transport connectivity, enabling people to travel safely and easily throughout the new precinct. The network will also support the efficient movement of freight to and from the new business areas. There is a proposed multibillion-dollar program of works currently at the Strategic Business Case stage, with delivery dates proposed for 2030/2040.

Integrated carbon & cost management was executed on the project at strategic stage. Cost was 'mirrored' by baseline carbon by applying the TfNSW Engineering Cost & Carbon Library (Library), which enables automation of baseline carbon estimates as part of the existing cost estimation process. The Library is configured to the Royal Institute of Chartered Surveyors (RICS) Whole Life Carbon Assessment (WLCA) 2nd Edition and the National Embodied Carbon Measurement Guidance.

Several decarbonised options were derived from key carbon hotspots across roads and bridges, with the marginal cost of abatement established. The 7 corridors were analysed and compared for cost and carbon using the International Cost Management Standard 3 (ICMS3) and benchmarks TfNSW has developed as part of the 'Global Estimating' approach. The project has helped to inform the development of TfNSW Carbon & Cost Management Technical Guidance.

A back analysis of the Cost Benefit Analysis (CBA) was completed to account for embodied emissions. Including embodied emissions and marginal abatement costs did not materially affect the CBA results. Embodied emissions accounted for less than 1% of total benefits (in absolute value terms) while marginal costs represent less than 1% of total costs.

Project Example: Program-wide emissions reduction through NACOE and TMR-AfPA Strategic Alliance, QLD

The Queensland Department of Transport and Main Roads (TMR) – Australian Flexible Pavements Association (AfPA) Strategic Alliance project has involved forming a working group consisting of subject matter experts from TMR and AfPA to evaluate the technical and production readiness of the asphalt industry in Queensland to reduce asphalt production temperatures statewide. The project draws on previous industry experience as well as research outcomes from the National Asset Centre of Excellence (NACOE) that improve the accuracy and repeatability of test methods used in laboratory testing for TMR registration of asphalt mixes – which needed revision for the lower temperatures. As an interim step, the working group agreed to update TMR standard specifications for asphalt in March 2024 to:

- Mandate the inclusion of warm mix asphalt additive in all asphalt mixes; and
- Reduce the maximum production temperatures for asphalt mixes by 20°C.

The 20oC reduction in asphalt production temperature is expected to lead to an 8% reduction in energy usage emissions statewide for TMR asphalt production and for local authorities that utilise TMR specifications. The long term (5-year) goal is to adopt warm mix asphalt on all TMR projects. Further temperature reductions are anticipated to achieve this goal.[6]

[6] Information on the Project Example (QLD program-wide emissions reduction through NACOE and TMR-AfPA Strategic Alliance) provided by Queensland Department of Transport and Main Roads.

Investment decision and final business case

During the Investment Decision and Final Business Case phase, the preferred option is selected and further developed with the level of detail required to present a comprehensive investment case for government consideration. While there may be some variance between jurisdictions, typical outputs at this stage are listed below. Each of these outputs could be procured and completed by multiple PSCs under differing contracts and packages:

This stage produces the following key outputs:

- A preferred option, based on a comparative assessment of costs, benefits and outcomes, as well as technical, environmental and risk considerations – this is articulated in a Preferred Option Report;
- A concept design of the preferred option, which could include preliminary road and drainage design and vertical and horizontal alignments;
- A Final Business Case with a clear demonstration of the preferred option's value for money, a final Project Management Plan (PMP) and a proposed procurement strategy;
- A Benefits Realisation Management Plan including a Benefits register; and
- A final governance plan for the project and an investment assurance report prior to seeking divisional endorsement to progress to the next stage.

Options report and concept design

While some jurisdictions may handle this stage differently, project teams typically prepare a report at this point in the process. This report outlines various options, including value engineering and whole-of-life-cost considerations. This report captures the social, economic and environmental costs and benefits of a project in assessment of its viability.

A preferred option is selected based on a comparative assessment of costs, benefits and outcomes, as well as technical, environmental and risk considerations. This is further developed with the level of detail required to present a comprehensive investment case.

As multiple design options are developed in early concept design, there is a key opportunity to embed decarbonisation in decision making. This can be achieved by including decarbonisation in value management exercises and Multi Criteria Analysis (MCA) when narrowing down to a preferred option.

Guidance for Implementation 3:
For this stage, use the same implementation options as shown in Guidance for Implementation 2 for the Options Report and Strategic Design, but consider the detail and resolution regarding requirements outlined in **Requirements 3.**

Guidance

a) National Embodied Carbon Measurement Guidance: provides a consistent methodology for measuring embodied carbon, aiding in project assessment for net zero support, evaluating carbon impacts, and considering low-carbon alternatives.

b) Royal Institute of Chartered Surveyors (RICS) Whole-life Carbon Assessment 2nd Edition provides a comprehensive methodology for measuring whole-life carbon emissions.

c) Modern Methods of Construction UK Guidance Note aids in quantifying and minimising carbon emissions in construction and infrastructure projects.

d) The Netherlands Platform CB23 provides guidelines for circular construction, aiding sustainable design and procurement.

Early market engagement, and delivery and procurement strategy

Depending on the size, complexity and location of the project, market sounding could occur as early as the needs analysis and strategic business case phase. Early market engagement affects critical outputs like the Delivery & Procurement Strategy by providing insights into the market's capacity, interest, and potential challenges. This information can help shape the project's scope, identify potential risks, and inform the selection of the most appropriate procurement method. It also allows for the identification of innovative solutions or technologies that may not have been previously considered.

Early market engagement is crucial to ensure that the supply chain is ready and able to deliver on a jurisdiction's requirements, and facilitates aligning project objectives with the market's capability and capacity. The process increases awareness and interest in the project, and informs the delivery approach. Some jurisdictions may undertake early market engagement through a strategic, broad-base, whole of program approach.

Market Interaction Processes (MIPs) are strategies that involve engaging with the market to test and validate various aspects of the project, such as procurement strategies, risk sharing mechanisms, and project timing. Adopting a partnership-based approach to risk allocation is a key aspect of these processes. This approach encourages collaboration and shared responsibility, leading to more balanced and effective risk management. By increasing the use of Market Interaction Processes at the early stages of a project, particularly for large or complex projects, it becomes possible to identify potential project risks sooner. This early identification allows for appropriate risk allocation, ensuring that all parties are aware of their responsibilities and are prepared to manage any potential challenges.

Technical analysis of options, including data collected from MIPs carried out by project and/or industry engagement teams, may inform the Delivery and Procurement Strategy. Refer to Requirements 3 for sample MIPs questions.

The Delivery and Procurement Strategy can confirm aspects of delivery and project scope through different approaches, including:

- market awareness survey or MIPs: used to gauge the market's knowledge, interest, and capacity in relation to the project, and can provide insight into potential suppliers, competitors, and market trends;
- workshopping of technical delivery model options: collaborative sessions where different technical and design options are considered to identify the most effective and efficient methods of delivery, also the delivery model; and
- packaging and contracting strategies: how the work will be divided, and how contracts will be structured and awarded. This could involve deciding between a single large contract or multiple smaller contracts, and choosing the most suitable contract type.

Traditionally, the decarbonisation priority has not formed a component of these strategies or the Delivery Model Assessment (DMA). As a result, there has been no mechanism to promote delivery models that share risk and reward for decarbonisation. A key finding of the UK Infrastructure Carbon Review 7 Year follow up report was the lack of commercial recognition for the ability to decarbonise, pointing to the opportunity in embedding the decarbonisation priority at the early stages of strategy development. It is recommended that decarbonisation is included in the strategy and any DMA, proportionate to other project and portfolio specific factors.

Guidance for Implementation 4:
Refer to the following documents for guidance on Delivery and Procurement Strategies and associated Delivery Model Assessment, and the suggested requirements in **Requirements 4.**

The following documents were developed by the UK Government Commercial Function, part of the Civil Service and the Cabinet Office that supports government procurement.

The Promoting Net Zero Carbon and Sustainability in Construction Guidance Note provides guidance on decarbonisation in the construction industry. It aims to help those procuring construction and infrastructure projects to drive decarbonisation. Refer to Section 3: Early Market Engagement and Clear Specification, and Section 4 Delivery Model Assessments and Effective Contracting (Government Commercial Function, 2022).

The Delivery Model Assessment Guidance Note provides detailed guidance on deciding the best approach for service delivery, and implementing an analytical, evidence-based approach to address common challenges in outsourcing or insourcing services. Refer to Step 3 - Identifying the Strategic and Operational Evaluation Criteria, and Appendix I: Framework to create a service definition and technical specification (Government Commercial Function, 2021).

The Should Cost Modelling Guidance Note provides high-level guidance for contracting authorities on 'Should Cost Models' (SCMs), a term used to describe whole-life cost modelling (Government Commercial Function, 2021). This document should be read in conjunction with the Whole-life carbon assessment for the built environment Professional standard, global 2nd edition (Royal Institute of Chartered Surveyors (RICS), 2023) and the International Cost Management Standard 3.

Project Example: Cross Tay Link, UK:

In Scotland, BAM Nuttal was awarded the contract for the Cross Tay Link Road – a project that consists of a 310m new multi span balanced cantilever bridge over the River Tay, and new roads, pedestrian and cycle links, and a green wildlife bridge. In 2019, Perth & Kinross Council (the asset owner) prepared a procurement strategy for the contract, developed from previous lessons learnt, early market engagement, and advice from contracting specialists. Perth & Kinross Council requested a 30% reduction in carbon emissions from the original design for the scheme in the tender (Institution of Civil Engineers, 2023)[8]. Through detailed design development and changes to construction measures, BAM have reduced carbon emissions by 35%, with an expectation of further reductions over the project's lifecycle. Cross Tay Link Road is expected to be completed in 2025.

Cost benefit analysis

The completion of a Cost Benefit Analysis (CBA) generally follows Infrastructure Australia and jurisdictional guidelines. This now also includes the Infrastructure Australia National Carbon Values and the Infrastructure and Transport Ministers' Meeting policy on applying the National Carbon Values, with respect to valuing emissions during CBAs.

Jurisdictions may struggle to accurately assess carbon baselines within accepted tolerances, especially when aligning them with the costs of various options or initiatives. The difficulty generally lies not in assigning a value to carbon in the CBA, but in achieving consistent assessments when design or option resolution is low.

This challenge becomes even more pronounced when an agency handles multiple concurrent CBAs across different asset types, with different PSCs engaged to execute the work. To address the challenges in making assessments, measurement protocols and procurement requirements should be well-defined. They should specify the chosen assessment method and any portfolio baselines and assumptions related to cost and carbon.

More mature jurisdictions may consider adopting an integrated system that captures both cost and carbon data. Some international transport agencies – including Transport for NSW – are moving towards this approach. This involves adapting existing cost management processes to include carbon, enhancing reliability, comparability, and consistency. This approach also establishes a consistent carbon baseline across complex portfolios, and allows for the potential marginal cost of abatement to be established.

Procurement requirements should be well defined and stipulate a chosen method of assessment and any portfolio baselines and assumptions for cost and carbon.

Guidance for Implementation 5:
Refer to documents in Guidance for Implementation 1 on Cost Benefit Analysis for further information. See also suggested requirements in **Requirements 3.**

Guidance

a) ITMM Policy on the Application of the National Carbon Values: supports using a nationally consistent set of carbon values in assessing business cases for transport infrastructure projects over $100 million. This policy aims to ensure that emissions are consistently valued nationally.

b) Infrastructure Australia Guidance Note on Valuing emissions for economic analysis provides emissions values for economic analysis in infrastructure proposals.

c) Infrastructure Australia Guide to assessing greenhouse gas emissions outlines requirements for measuring and valuing GHG emissions in infrastructure proposals.

d) TPG23-08 NSW Guide to Cost Benefit Analysis (CBA) Section A3.4 Carbon Emissions and associated Technical Note provide methods for valuing carbon emissions in cost-benefit analysis in the NSW context.

e) UK Green Book Annexure 9. A1. Non-market Valuation and Unmonetizable Values for Natural Capital, and Enabling a Natural Capital Approach Supplementary Guidance provide methods for valuing non-market and unmonetisable natural capital, particularly in place-based applications.

f) ATAP Cost Benefit Analysis provides a framework for evaluating the economic efficiency of transport projects.

g) ATAP PV5 Environmental Parameter Values provides environmental unit costs for assessing transport policies and initiatives.

h) Transport for NSW are currently developing the Engineering, Cost & Carbon Library, which will define both baseline cost and baseline carbon for items and construction resources. This enables automation of baseline carbon with cost estimation. The Library forms part of the Common Data Model for Infrastructure with Environmental, Social, and Governance (ESG) dimensions. It is anticipated the document will be available by the end of June 2025.

i) ITMM Measurement Guidance provides guidance when estimating carbon and setting baselines and target.

Early contractor involvement and early supply chain involvement

The Early Contractor Involvement (ECI) process is a procurement approach that generally involves contractors at the design stage, fostering collaboration, efficient planning, innovation, and risk management. Jurisdictions will often use the ECI process to accelerate the delivery of contracts like those shown in Requirements 4. Early Contractor Involvement should not be confused with broader Early Market Engagement, which encompasses a wider range of activities aimed at understanding market capabilities, gathering feedback, and fostering competition among potential suppliers.

The ECI process can be used with the suite of contracts in Requirements 4, where the contracts used depend on the project circumstances and the objectives to be achieved.

The ECI process can significantly contribute to sustainability, particularly in terms of decarbonisation and the circular economy. This is largely due to the involvement of the contractor's personnel in the design phase, ensuring improved constructability and cost efficiencies. It can also help facilitate key aspects of Modern Methods of Construction (MMC), which refers to innovative construction practices aimed at improving traditional design and construction approaches. MMC includes techniques such as component standardisation, prefabrication, and off-site manufacture. Contractors, with their deep understanding of the supply chain, can leverage this knowledge to exceed the guidelines and deliver sustainable and efficient construction solutions.

Early Supply Chain Involvement (ESI) extends the principles of ECI by formally engaging the supply chain under a PSC contract in the pre-construction phase of a project. This involvement can contribute to design, costing, risk management, and project structuring. ESI can reduce project risk, add value in various aspects such as design, sustainability, and quality, and potentially enable projects to be brought to market sooner. It fosters a collaborative culture based on mutual trust, providing cost certainty and scope for innovation.

Generally, the implementation of ESI is not solely for environmental sustainability objectives like decarbonisation, but more broadly used to reduce risk and add value to the project. Some jurisdictional material registration systems could be considered for this purpose.

Projects that have identified ESI as a viable option when developing the Procurement and Delivery Strategy have a unique opportunity to involve the supply chain early, to understand and set ambitious baseline targets and objectives for construction procurement above those outlined in Requirements 4.

Guidance for Implementation 6:
Refer to the following documents for guidance on ECI and ESI:

The Market, Supplier & Supply Chain Engagement in Construction is a guidance note that provides instructions on how to effectively engage with suppliers and the broader supply chain. The guidance encompasses three types of supplier engagements: Market Health and Capability Assessments, which involve researching the market before engaging with suppliers; Early Market Engagement, which includes engaging with suppliers prior to commencing the tendering process; and Early Supply Chain Involvement (ESI), which involves formal engagement with suppliers and the supply chain in the pre-construction phase (Government Commercial Function, 2022).

The National Alliance Contracting Guidelines provides guidance on the collaborative procurement of infrastructure projects. It covers when and how to use collaborative procurement, how early contractor involvement can add value, the benefits and risks of collaborative procurement, and effective collaboration between clients and suppliers (Department of Infrastructure and Regional Development, 2015).

The Department of Transport and Main Roads has developed an Infrastructure Industry Engagement Charter with peak industry associations, to underpin developing and delivering collaborative procurement and delivery for projects.

Requirements 3: Sample requirements for concept design and investment decision making and final business case:

1. **Appendix 1**
   Sustainability Procurement Templates (Overview): Provides an overview of the template documents and how they are to be used.
2. **Appendix 1.A**
   Sustainability Requirements (Design): Defines minimum sustainability requirements for the strategic, concept and detailed design and sets out the designer's obligations to ensure alignment to PAS2080:2023.
3. **Appendix 1.B**
   Sustainability Reporting & Assurance Requirements (Design Phase): Sets out the designer's/contractor's sustainability reporting and assurance obligations for the Design Phase.
4. **Appendix 1.C**
   Sustainability Management Plan Requirements (Design Phase): Sets out the requirements for the Sustainability Management Plan and Carbon Management Plan (a sub-plan of the Sustainability Management Plan), both of which must be developed and implemented by the designer and contractor (if applicable).
5. **Appendix 1.D**
   PSC Returnable Schedule (Sustainability): Sets out the tender response requirements with respect to sustainability for the procurement of a design PSC.
6. **Appendix 1.I**
   Market Interaction Process (Sustainability Questions): Includes suggested sustainability related questions and format to support a MIP process.

Project Example: Tarmac – Supplier Sustainability Week and Decarbonisation Club, UK

In the United Kingdom, Tarmac, a CRH company and building material business, has worked collaboratively with its supply chain to drive decarbonisation outcomes (Institution of Civil Engineers, 2023). In 2021, the company held its first Supplier Sustainability Week, attended by more than 800 suppliers. The focus was on encouraging collaboration, supporting suppliers to embrace change, and identifying opportunities to reduce carbon collectively. Tarmac created a Decarbonisation Club, which now comprises of 16 suppliers that contribute towards 30% of Tarmac's Scope 3 emissions.

The forum is an example of progressive procurement that is focused on developing practical and deliverable solutions for Tarmac and supply-chain partners, to implement across construction and infrastructure projects. To date, 120 recommendations have been generated and 60% of these ideas use technology that is either currently available or will be within the next two years. The recommendations have been mapped on a marginal abatement cost (MAC) curve and judged against three main criteria – cost, timescales to implement and potential carbon savings – to help Tarmac and its partners to understand projects that can deliver change.

Project Example: North East Link, VIC

The North East Link is the largest ever transport investment in Melbourne's north east. The project includes 3 major road projects. The 6.5km 3-lane twin tunnels from Watsonia to Bulleen will connect the Eastern Freeway and the Monash Freeway, removing 15,000 trucks off local roads a day and reducing travel times by up to 35 minutes. Upgrades to the Eastern Freeway and M80 Ring Road will include new lanes, smart technology and a seamless connection to the North East Link tunnels.

The North East Link project was required under the Environmental Effects Act 1978 (VIC) to:

- Set sustainability targets and specify ratings to be achieved under the Infrastructure Sustainability Council of Australia's Infrastructure Sustainable Rating Tool;
- Integrate sustainable design practices which are best practice for major road and tunnel infrastructure projects into the design process and implement these to minimise, to the extent practicable, greenhouse gas emissions arising from construction, operation and maintenance of North East Link;
- Achieve at least a 30% reduction in carbon emissions from the construction of North East Link;
- Use of a minimum of 50% of renewable energy for electricity used to construct North East Link;
- Achieve net zero emissions in the operation and maintenance of North East Link (excluding user enabled emissions from traffic); and
- Achieve a reduction of the amount of Portland Cement content in concrete across the project by a minimum of 30%.

These requirements were subsequently incorporated into contracts.

In Victoria, Options assessment includes four 'guiding principles'. Principle 2 requires minimising greenhouse gas emissions, under environmental criterion 5: option greenhouse gas performance. Greenhouse gases were included in the optioneering assessment, including construction related emissions and operational emissions. The lower carbon option was selected, and this option was also supported for other reasons (including cost). [9]

[9] Information on the Project Example: North East Link was provided by the Victorian Major Transport Infrastructure Authority.

Construction procurement

Technical requirements

As part of readiness for market, procurement, contractual, and technical documentation is compiled to help realise the benefits outlined in the Final Business Case (FBC).

Technical requirements should be inserted into relevant scope of works documents, and the content should be used to inform Expressions of Interest (EOI) and Request for Tender (RFT). Four main components should be considered:

1. Project Plan requirements:
This includes a Sustainability Management Plan and a carbon management sub-plan. These plans outline the strategies for managing sustainability and decarbonisation throughout the project.

2. Sustainability requirements:
These are the specific sustainability mandates and/or targets that the project must meet, and relate to core project requirements, design, construction, engineering standards and specifications. They are also designed to ensure compliance with relevant legislation and policies.

3. Sustainability RFT schedules:
When formulating the readiness for market documents, the structure of the RFT schedule shown in Requirements 5 should be considered and align with the sustainability requirements, for example the emission reduction targets and/or other mandates.

4. Contractor Documentation requirements:
This sets out the need for the contractor to provide regular and consistent reports, and specifies how these reports should align with the project's requirements.

When developing technical requirements for decarbonisation, it is important to understand how overall risk is shared through differing delivery models. In Construct Only, the client bears the design risk, while the contractor handles construction risk. In Design and Construct, the contractor assumes both design and construction risks, providing a single point of responsibility. In Collaborative Delivery, all parties share risks and rewards, fostering joint problem-solving and innovation.

Projects delivered by a Construct Only delivery model will typically complete detail design under a PSC contract or inhouse design. To achieve emission reduction, it is critical that environmental sustainability requirements are included in the Detail Design professional services scope, to avoid allocation of additional pay items in the Construct Only contract. Requirements 4 shows sample requirements compatible for detail design, traditional and collaborative delivery models.

Guidance for Implementation 7:
Refer to the documents below to understand fundamental principles for traditional and collaborative contracting:

The National Framework for Traditional Contracting outlines best practice in traditional contracting methods to procure infrastructure. The framework addresses areas like consistency, project definition, budgets, governance, and continuous improvement. The framework emphasises practical implementation guidance, and allows flexibility to tailor practices to specific projects (Department of Infrastructure and Regional Development, 2015).

The Guide to Alliance Contracting provides consistent and leading practice guidance for public sector agencies that develop and own infrastructure projects. The Guide emphasises successful delivery of risky and complex projects through alliance contracting. Under an alliance contract, owners and non-owner participants collaborate to determine the best project solution. The guide aims to enhance value-for-money outcomes, improve consistency, and ensure commercial success in government alliance projects (Department of Infrastructure and Regional Development, 2015).

The TMR C7523/C7524 Addendum to Infrastructure Sustainability Design Requirements clearly call out the detailed design professional services scope, including a recommended 15% emissions reduction target.

Project Example: Bruce Highway Upgrade, QLD

C2SIW widened the 11-kilometre section of the Bruce Highway from four to six lanes between Caboolture-Bribie Island Road and Steve Irwin Way (Exit 163). The project was constructed in sections, using two separate contracts. Contract 1 delivered the section from Caboolture-Bribie Island Road to Pumicestone Road. Contract 2 delivered the section from Pumicestone Road to Steve Irwin Way (Exit 163).

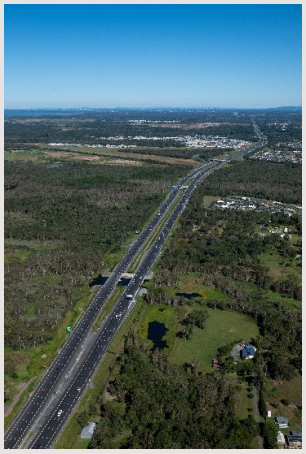
Key works for Contract 1 included upgrading the section of Bruce Highway between Caboolture-Bribie Island Road to Pumicestone Road from four to six lanes, demolishing and reconstructing four traffic bridges over creeks, three highway interchange modifications, realignment of adjacent service roads, and installing Smart Motorways technologies/Intelligent Transport Systems.

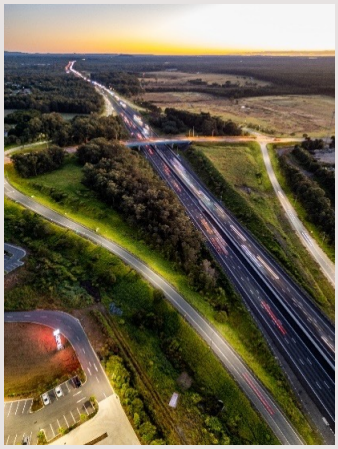
The specifications issued for construction of Contract 1 included requirements to demonstrate a reduction in energy use and material life cycle impacts against a business-as-usual footprint, adopt renewable energy for construction facilities, and use biodiesel for plant/equipment and light vehicles.

Against the background of these contractual requirements, measures adopted to reduce estimated emissions from the project included:

- High proportions of fly ash Supplementary Cementitious Material (SCM) for particular construction elements, including: 30% fly ash for precast elements, and 25% fly ash for drainage elements;
- Incorporation of EME2 pavements into the project with both a longer lifespan, hence reducing future maintenance, and 20% less material requirements, reducing transport emissions;
- Partial substitution of diesel with biodiesel on site;
- Site office energy sourced 100% from solar panels instead of diesel-fuelled generators;
- Approximately 10% of energy requirements for lighting towers sourced from solar power; and
- Upgrading of existing light poles from HPS to LED bulbs.

These initiatives collectively resulted in a 17% reduction on fuel and energy consumption (construction and operation) and a 25% reduction in material life cycle emissions.





Project Example: Blacktown Bus Layover, NSW

The Blacktown Bus Layover is an example of scaling sustainable procurement across all project sizes. It was upgraded as part of the NSW Government's Easing Sydney Congestion (ESC) program, which aims to enhance operational efficiency across Sydney's road network through targeted infrastructure developments. This initiative served as a successful pilot for developing and informing Transport for NSW sustainable procurement approach for projects with very minor capital delivery costs.

The layover area is 12 meters wide with 3.5-meter-wide bus bays on either side, providing holding capacity for 11 buses, and includes a five-meter-wide central travel lane. A single-level driver's facility building with a lunchroom and toilet block is provided, along with a footpath on the eastern side to ensure safe access for bus drivers.

By embedding civil standards and specifications within sustainable procurement requirements, the project achieved significant circular economy outcomes. The project used the maximum amount of recycled crushed concrete in the select material zone and dense graded base. It also optimised the use of recycled crushed glass, ground granulated blast furnace slag, and fly ash for lean mix concrete subbase and base. The project incorporated the maximum level of recycled crushed glass in asphalt, and 80% of the energy used during construction was sourced from renewable energy.

Registration of interest (ROI) and Expressions of interest (EOI)

A Registration of Interest (ROI) is a formal request asking potential suppliers to express their interest in participating in the procurement process. This process notifies the market of the opportunity, and helps the procurer gauge market interest. As applicants are asked to demonstrate experience or capacity, it can also be used as a shortlisting or screening tool. Typically, limited details about the project are provided at this stage.

Successful ROI applicants will then be invited to submit an Expression of Interest (EOI). During the EOI process, the procurer will provide more specific details about the project. Applicants can then submit information to demonstrate their capability, or a proposal to undertake work.

Given the early nature of engagement for EOI and ROI, it is recommended that an organisation's commitment to decarbonisation be evaluated based on their organisational Carbon Reduction Plan (CRP), and demonstrated compliance.

To drive efficiency, uplift is required to the national prequalification system. The recommended approach is outlined in the prequalification section below.

Carbon Intensity Options (CIOs), which are designed to outline key carbon abatement opportunities within a project, are typically submitted as part of the formal RFT process. For larger projects, the structure of CIOs for construction resources can be requested at the earlier EOI stage and/or may be specified into program-wide standards. This allows potential contracting partners to propose their strategies for carbon reduction early in the procurement process. The feedback received from the market will allow a gradual increase to the baseline targets for carbon reduction at the RFT stage. This means that the baseline minimum requirements for carbon reduction can be raised based on the capabilities demonstrated by potential contracting partners. Additionally, aligning these key civil material emission reduction strategies with jurisdictional emissions reduction targets ensures that the project contributes to broader regulatory and policy goals for carbon reduction.

This approach encourages innovation, and provides a procurement mechanism that rewards bids that exceed the base project requirements.

Requirements 4
The following sample requirements are suggested to assist jurisdictions to include carbon management into their procurement processes and contracts:

1. **Appendix 1**
Sustainability Procurement Templates (Overview): Provides an overview of the template documents and how they are to be used.

2. **Appendix 1.A**
Sustainability Requirements (Design): Defines minimum sustainability requirements for the strategic, concept and detailed design and sets out the designer's obligations to ensure alignment to PAS2080:2023.

3. **Appendix 1.B**
Sustainability Reporting & Assurance Requirements (Design Phase): Sets out the designer's/contractor's sustainability reporting and assurance obligations for the Design Phase.

4. **Appendix 1.C**
Sustainability Management Plan Requirements (Design Phase): Sets out the requirements for the Sustainability Management Plan (which includes a Carbon Management Plan), both of which must be developed and implemented by the designer and contractor (if applicable).

5. **Appendix 1.D**
PSC Returnable Schedule (Sustainability): Sets out the tender response requirements with respect to sustainability for the procurement of a design PSC.

6. **Appendix 1.E**
Sustainability Requirements (Construct): Defines minimum (baseline) sustainability requirements for the construction phase, including any Carbon Intensity Options or Sustainability Innovation Options put forward by the contractor as part of their tender response.

7. **Appendix 1.F**
Sustainability Reporting & Assurance Requirements (Construct Phase): Sets out the contractor's sustainability reporting and assurance obligations for the Construct Phase.

8. **Appendix 1.G**
Sustainability Management Plan Requirements (Construct Phase): Sets out the requirements for the Sustainability Management Plan and Carbon Management sub-Plan, which is to be included in the PSC/Contractor's Project Plan.

9. **Appendix 1.H**
Contractor Returnable Schedule (Sustainability): Sets out the tender response requirements with respect to sustainability for the procurement of a contractor.

Request for Tender (RFT)

Returnable schedules typically comprise the documents that contractors must submit as part of the Request for Tender (RFT) process. These schedules play a crucial role in the bidding and procurement process. It is recommended that carbon reduction and sustainability requirements be included as part of these schedules; market outcomes can be optimised by leveraging competitive tension when it is at its peak during the RFT process.

It is recommended that sustainability returnable schedules are inserted into RFT documents to extract the best out of the market when competitive tension is highest. The structure of the returnable schedule will be dependent on the delivery model.

Refer to suggested RFT returnable in Requirements 5. Generally, the structure of the Schedules include:

- Aligned sustainability requirements to scope documents, with embedded civil standards and specifications and allowances for Contractors to nominate higher bids than the minimum, including for infrastructure ratings (if applicable)
- Sustainability Innovation Options (SIOs)
- Carbon Intensity Options (CIOs)

Sustainability Innovation Options (SIOs)

The Tenderer suggests Sustainability Innovation Options (SIOs) in a Returnable Schedule. These are unique and individual initiatives that the Contractor can put forward to enhance sustainable outcomes in the project.

Where applicable, the SIO should include reference to any:

- cost impacts, including both capital and operational expenditure;
- program impacts;
- proposed method for assurance during the contract as part of payment.
- description of the innovation and sustainability benefits delivered through SIO (quantifying those such as carbon reduction potential, where possible);
- any impacts on technical/operational performance or quality; and
- any other potential risks, constraints, or trade-offs (for example safety, environmental, supply)

Project teams have the option to include SIOs based on value and benefit to the project. See guidance for evaluating SIOs in Tender Evaluation Section.

Carbon Intensity Options (CIOs)

Carbon Intensity Options (CIOs) outline key carbon abatement opportunities within a project. Because of the type and quantity of bulk civil materials typically used in transport infrastructure delivery, CIOs can be an important strategic tool.

It is also important to understand potential cost and program implications for CIOs, and the structure allows for flexibility to capture any potential implications.

Project teams have the option to include CIOs in the contract based on proposed carbon abatement, weighing up potential cost or schedule implications.

The CIOs address carbon emissions reduction by considering both technical specifications and cost-related factors: they are aligned to items (specifications), and resources used in cost management (for example, extracted from the TfNSW Engineering Cost & Carbon Library and other relevant datasets);

The process to execute a CIO is as follows:

a) The agency identifies key opportunities for carbon abatement, aligned with relevant data and guidelines (for example the TfNSW Engineering, Cost & Carbon Library). The agency specifies a capped quantity associated with these proposed abatement measures, also assured baseline carbon. See the example shown in Guidance for Implementation 8.

b) During the RFT process, the contractor specifies the carbon intensity associated with their proposed solution. They provide evidence supporting a lower carbon intensity, which could come from sources like an Environmental Product Declaration (a declaration that quantifies environmental information about the life cycle of a product) or other agency-assured lower carbon alternatives. The contractor also nominates the proposed method for providing assurance during the contract as part of payment.

c) The contractor estimates the carbon abatement, and outlines any anticipated impact to the cost or program.

d) The agency reviews the CIOs, and decides which options to adopt based on value and benefit. As an extension to the CIO, the agency can establish incentivisation regimes specifically targeting areas with high carbon intensity (carbon hotspots). These incentives aim to drive further performance in reducing carbon emissions, as outlined in Requirements 5.

Guidance for Implementation 8:
A sample Carbon Intensity Option populated by the Agency before RFT

Item	Description	Unit	Agencies Defined Intensity Threshold (kg CO2e/ Unit)	Quantity under CIO	Contractor Nominated Intensity (Below Threshold)	Estimated Abate-ment	Cost or Program implications (if any)	Any other constraints (e.g. technical / quality/ safety)	Any other benefits (e.g. ircular economy)
B80	40 MPa Exposure	m3	361	2580	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]
R116	Heavy Duty Dense Asphalt in Corrective Courses -20mm Nominal Size	t	63	610	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]
R44	Treatment Type C2 – Backfill – Imported Material	m3	32.5	210,150	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]	[Tenderer to populate]

Requirements 5
Sample Returnable Schedule for Request for Tender
Returnable Schedule structure will be dependent on the delivery model:

Appendix 1.D
PSC Returnable Schedule (Sustainability): Sets out the tender response requirements with respect to sustainability for the procurement of a design PSC.

Appendix 1.H
Contractor Returnable Schedule (Sustainability): Sets out the tender response requirements with respect to sustainability for the procurement of a contractor.

Tender Evaluation

The procedures for the evaluation of ROIs, EOIs and Tenders are specific to the respective jurisdiction's Submission Evaluation Guide or equivalent. Jurisdictional legislation and policies that impact tender evaluation need to be noted and applied in this phase. For example, the UK requires a minimum 10% weighting of the total score to be given to social value (which includes sustainability, carbon and environmental objectives).

Sustainability can be scored in evaluation through non-price criteria being applied to:

- All tenders for Design & Construct, Alliance, Construct Only and Managing Contractor contracts where the estimate for the works equals or exceeds a cost threshold;
- For PSCs contracts: EOIs and Tenders for business case advisory, strategic design, concept design and cost estimation; and
- Tenders for Supply contracts where the total value of the materials to be supplied exceeds a cost threshold.

Sustainability can be scored against value add criteria including:

- The bid commitments against each of the items listed in Requirements 4, including proposed targets such as those incorporated into an Infrastructure Sustainability Council IS Rating, Green Building Council Greenstar Rating or other alternative internal sustainability performance assessment process;
- Past performance on sustainability as evidenced by results in the Contractor Performance Reports or in referee checks; and
- Certified carbon management procedures and systems (where applicable).

SIOs and CIOs that do not have cost or program impact should be evaluated as a component of the non-price criteria, and subsequently incorporated into the contract. Where a SIO or CIO does have cost implications, this can then be assessed in line with jurisdictional processes around alternative tenders, and evaluated for Value for Money (VfM).

Monetised values, which represent the financial worth assigned to various factors, can be used in bid evaluation to determine the Most Economically Advantageous Tender (MEAT), now referred to as simply the Most Advantageous Tender (MAT). For example, by assigning monetary values to embodied carbon or other criteria, which are then subtracted from the actual offered price to determine a corrected total price that includes environmental impacts. The consideration is then that contract is awarded to the bidder with the lowest corrected total price.

Guidance for Implementation 9:
Transport for NSW is currently developing the Valuing Sustainable Outcomes Technical Guidance as part of the Sustainable Infrastructure Program which sets out a consistent value definition framework and an aligned monetisation framework leveraging existing local and global best practice. The guidance will include clear direction on the Most Advantageous Tender. This resource will be publicly available in early 2025 following industry engagement.

Project Deed Execution and Pre-Agreed Variations

Agencies may choose to implement an agreed-upon variation. This can be a key aspect of the procurement phase, ensuring that Sustainability Innovation Options and Carbon Intensity Options are included in the Project Deed through a pre-agreed variation. Sustainability, Technical and Commercial considerations should always be considered in liaison with the project team to:

- Push forward innovation that was assessed as part of the Tender Evaluation;
- Ensure appropriate options from a Pre-Agreed Variation; and
- Subsequently incorporate into the Project Deed.

Any increases in the bid amounts, as specified in the returnable schedule of the Request for Tender (RFT), must be included in the final contract. This ensures that all adjustments to the bids, particularly those related to Carbon Intensity Options (CIOs) and Sustainability Intensity Options (SIOs)1, are transparently documented and legally binding.

Agencies could also consider establishing incentive regimes shown in REQUIREMENTS 6 that help realise the decarbonisation benefits set out in the FBC (for projects over $100M value).

Requirements 6:
Suggested Incentive Regime template:

1. **Appendix 1.J**
Incentive Regime to be utilised where applicable.

Project Example: Parramatta Light Rail Stage 1, NSW

Transport for NSW set high standards for performance and compliance in sustainability for the Parramatta Light Rail Stage 1 project by establishing sustainability targets and requirements underpinned by the Infrastructure Sustainability Council (ISC) Infrastructure Sustainability (IS) Rating tool. The project is a transformative initiative aimed at enhancing connectivity and sustainability in Western Sydney. It features innovative environmental measures such as an encapsulating rail boot system to reduce noise and vibration, the use of macro synthetic fibres in concrete to increase durability, and NSW's first 'green track' to mitigate urban heat and noise. The project has achieved significant environmental benefits, including reusing over 50% of ballast, 60% of rail, and 90% of sleepers from the old T6 Carlingford Line. Additionally, it incorporated 1,000+ tonnes of recycled glass in asphalt, reused 25,000+ m^2 of existing asphalt, and utilised 6,000+ tonnes of recycled asphalt pavement. Impressively, 99% of construction and demolition waste was recycled in the Infrastructure Works package, avoiding over 145,906 tonnes of waste in landfill, and there was a 36% reduction in carbon emissions through construction and operations.

Native trees and grass are planted by light rail track heading towards Bidgee Bidgee Bridge. Copyright State of New South Wales (Transport for NSW)

By 2026, it is expected to serve around 28,000 daily passengers, significantly reducing car travel in the region. Other benefits include a Tree Offset Strategy that added over 5,500 trees; a Construction Monitoring Program to protect the Grey-headed Flying Fox camp in Parramatta Park; innovative use of weathered steel for the Bidgee Bidgee Bridge to minimise future maintenance; heritage protection measures respecting Parramatta's rich history; and significant social outcomes including job creation, support for local businesses, and enhanced opportunities for local communities.

Project Example: Light Rail Stage 2A, ACT

Light Rail Stage 2A will extend the light rail system from Alinga Street to Commonwealth Park. The 1.7km extension will follow along London Circuit West. It will feature new stops at Edinburgh Avenue, City South, and Commonwealth Park. Stage 2A reached a major milestone in 2023 with the signing a of a contract with long term delivery partner Canberra Metro. Construction is set start on the project in late 2024. Light Rail Stage 2A will provide greater connection between the city and the lake. It will support active travel in the city by including new cycling and walking infrastructure. Several new trees will improve the urban landscape as part of the project. Light Rail Stage 2A is jointly funded by the Australian and ACT Governments.

The Light Rail Stage 2A project committed to a number of mitigation measures, including:

- Ensuring the Project can obtain a third party sustainability rating using Infrastructure Sustainability Council's Infrastructure Sustainability Rating tools;
- Minimise direct and indirect greenhouse gas emissions, through the development of a Carbon and Energy Management Plan;
- Develop a Resource and Waste Management Plan to apply waste and circular economy hierarchies during construction. Implementation of the Plan minimises pressure on waste and resource management facilities and maximises reuse and recycling of waste; and
- To retire carbon offsets for all Scope 1 and Scope 2 emissions for the construction footprint of the project.

These requirements were incorporated into the project tender and contract documents, including the following specific targets:

- Achieve at least a 30% reduction in Scope 1 greenhouse gas emissions for the project delivery phase, before the use of offsets;
- Achieve at least a 25% reduction in Scope 3 greenhouse gas emissions for the project delivery phase;
- Offset all Scope 1 (including LULUCF) and Scope 2 emissions for the project delivery phase;
- **Achieve a minimum 40% reduction in Ordinary Portland Cement on average across the project; and**
- **Achieve recycling and reuse rates of 100% for VENM, 95% for concrete, timber, steel, and asphalt waste, and 50% of office waste.**

Contract Administration

This stage involves managing and overseeing the execution of the contract to ensure that all terms and conditions are met. This includes monitoring the contractor's performance, handling any modifications or amendments, and ensuring compliance with all contractual obligations. Effective contract administration is crucial for the successful delivery of infrastructure projects, ensuring they are completed on time, within budget, and to the required standards.

Sustainability Management Plan

During the procurement phase, jurisdictions will set the requirements for the nature and scope of the various plans that need to delivered by the Contractor. Depending on project size, complexity, location and potential sustainability opportunity, jurisdictions should establish a threshold for requiring a Sustainability Management Plan (SMP). The SMP details how the contractor will comply with the sustainability requirements outlined in the Deed, and contractors must regularly evaluate and report on its implementation. For some projects, a Carbon Management Plan can be included as a sub plan to the SMP, as this will provide improved management and outcomes. For some smaller projects (for example those smaller than $20m), it may be appropriate to instead include these requirements in the Project Management Plan or equivalent document.

The SMP is generally finalised shortly after the Deed is executed. At this point, the contractor has already committed to clear targets, and the respective Sustainability Innovation Options and Carbon Intensity Options have been incorporated into the Deed. The jurisdiction's Technical, Environment & Sustainability SMEs will review the SMP with the project team, and the contractor will amend it based on their feedback.

Monitoring and Reporting

As part of requirements established during the procurement phase, contractors must complete comprehensive monthly sustainability reporting. Carbon reporting is typically aligned with key design and construction milestones.

For Environmental Product Declarations (EPDs), it is important the project assurance be undertaken to ensure that the terms are delivered. After initial assessment and accreditation, the accrediting organisation typically does not provide assurance during the five-year life of the EPD.

Contractor Performance Reporting

Contractor performance reporting is designed to provide a consistent and objective method for measuring a contractor's performance. Jurisdictions may set their own reporting milestones for all major construction contracts, larger professional services contracts, and other contract types, including minor physical works and services, and supply contracts.

It is recommended that jurisdictions update contractor performance reporting procedures and systems as needed to ensure alignment with contractual sustainability requirements. This will enable agencies to make more informed tender evaluation decisions regarding contractors' sustainability performance and facilitate informed discussions with industry to identify barriers and opportunities for improved sustainability outcomes.

Guidance for Implementation 10:

Jurisdictions should adopt the reporting guidance and templates in the National Embodied Carbon Measurement Guidance. Jurisdictions may also consider more detailed reporting breakdown in line with RICS Section 6 Reporting (Royal Institute of Chartered Surveyors (RICS), 2023). These documents detail required disclosures, reporting structure, units of measurement, and communication of WLCAs to third parties, with guidance on reporting at different project phases. The reporting is also aligned to the ICMS3.

Project Example: Light Rail Stage 2A, ACT

Light Rail Stage 2A will extend the light rail system from Alinga Street to Commonwealth Park. The 1.7km extension will follow along London Circuit West. It will feature new stops at Edinburgh Avenue, City South, and Commonwealth Park. Stage 2A reached a major milestone in 2023 with the signing a of a contract with long term delivery partner Canberra Metro. Construction is set start on the project in late 2024. Light Rail Stage 2A will provide greater connection between the city and the lake. It will support active travel in the city by including new cycling and walking infrastructure. Several new trees will improve the urban landscape as part of the project. Light Rail Stage 2A is jointly funded by the Australian and ACT Governments.

The Light Rail Stage 2A project committed to a number of mitigation measures, including:

- Ensuring the Project can obtain a third party sustainability rating using Infrastructure Sustainability Council's Infrastructure Sustainability Rating tools;
- Minimise direct and indirect greenhouse gas emissions, through the development of a Carbon and Energy Management Plan;
- Develop a Resource and Waste Management Plan to apply waste and circular economy hierarchies during construction. Implementation of the Plan minimises pressure on waste and resource management facilities and maximises reuse and recycling of waste; and
- To retire carbon offsets for all Scope 1 and Scope 2 emissions for the construction footprint of the project.

These requirements were incorporated into the project tender and contract documents, including the following specific targets:

- Achieve at least a 30% reduction in Scope 1 greenhouse gas emissions for the project delivery phase, before the use of offsets;
- Achieve at least a 25% reduction in Scope 3 greenhouse gas emissions for the project delivery phase;
- Offset all Scope 1 (including LULUCF) and Scope 2 emissions for the project delivery phase;
- **Achieve a minimum 40% reduction in Ordinary Portland Cement on average across the project; and**
- **Achieve recycling and reuse rates of 100% for VENM, 95% for concrete, timber, steel, and asphalt waste, and 50% of office waste.**

Project Example: Albion Park Rail Bypass, NSW

The Albion Park Rail Bypass is an example of the circular economy in action, utilising over 1 million tonnes of recycled material. This project was designed to complete the missing link for a high-standard road between Sydney and Bomaderry, improving connectivity for freight, buses, and tourists. It extends the M1 Princes Motorway by 9.8 kilometres, bypassing the town of Albion Park Rail between Yallah and Oak Flats. The project includes 13 bridges and various local road upgrades, as well as pedestrian and cyclist facilities to enhance connectivity.

Through the procurement, tender documentation, and contract management processes, Transport for NSW was able to influence material and process selection, encouraging innovation. Many of the initiatives on Albion Park Rail Bypass were contractor led throughout delivery, and supported by Transport for NSW in a fully collaborative approach to achieve outcomes.

Albion Park Rail Bypass adopted a circular economy approach to keep materials in use for longer. The project represents best practice in circular infrastructure, successfully reusing approximately:

- 500,000 tonnes of coal wash, a low-grade mining waste
- 300,000 tonnes of tunnel spoil
- 130,000 tonnes of recycled Select Material Zone (SMZ) material
- 180,000 tonnes of Heavily Bound Base (HBB)
- 6,000 tonnes of Recycled Crushed Glass (RCG) used in asphalt

To replace sand used in asphalt, the Albion Park Rail Bypass used recycled crushed glass equivalent to 30 million glass bottles. The base asphalt layer used on the bypass is made up of 25% recycled material, including 10% recycled crushed glass and 15% reclaimed asphalt pavement. 15% reclaimed asphalt pavement. The project received grant funding from the NSW EPA through the Civil Construction Market Program to promote RCG uptake, demonstrating collaboration between NSW Government agencies.

Asset Handover

Asset handover involves transferring control of assets for operational or maintenance management, which may not coincide with ownership changes or contract closure. It is a critical milestone requiring careful planning and can occur at any point in the asset life cycle, typically upon completion of new or modified assets. Jurisdictions have their own standards setting minimum requirements to ensure proper handover, minimising costs, delays, and safety risks. These standards provide asset custodians with visibility into the impacts on cost, risk, and network performance, enabling them to fulfill their statutory and asset management responsibilities (Transport for NSW, 2023).

It is recommended that all capital procurement and contractual data requirements align to RICS Section 6 Reporting (Royal Institute of Chartered Surveyors (RICS), 2023), ITMM measurement guidance and the International Cost Management Standard 3rd edition (ICMS Coalition, 2021). Ensure this data is included in the formal asset handover, incorporated into asset management systems, and used for reporting on operational emissions. Continuously refine and feed this data back into capital decision-making to improve whole-life carbon forecasting.

Material Passports and individual asset level digital tagging for larger projects should be handed over at completion and include the embodied carbon of the resulting infrastructure. This is addressed as part of the TfNSW Common Data Model for Infrastructure with ESG dimensions.

Operations

Supply Contracts Panels

During the maintenance and operational phase of an asset, procurement of construction materials and services can be managed through supply or maintenance contracts. A supply contract panel, established through a tender process, consists of pre-approved suppliers who provide goods or services under standardised terms. When forming these panels, a supplier's ability to decarbonise and/or supply lower carbon materials should be an evaluation criterion. Most jurisdictions require panel members to be prequalified under the National Prequalification System.

It is recommended that each transaction within a panel adopts a similar approach to the Carbon Intensity Options (CIO) framework. This means the jurisdiction sets a baseline for carbon intensity, and the tenderer proposes a solution that offers a lower carbon alternative. The degree to which the proposed solution reduces carbon intensity below the baseline is then assessed. This could be used to inform a price adjusted score utilising carbon values.

Guidance for Implementation 11:

Consider recommended updates to the National Prequalification Scheme in **Guidance for Implementation 13**, also **Guidance for Implementation 8 to 10**.

End-of-life

End-of-life decarbonisation for infrastructure aims to minimise carbon emissions during decommissioning, demolition, and disposal. The whole-life carbon assessment (WLCA) approach includes these end-of-life stages, ensuring carbon impacts are considered throughout the asset's lifecycle (Royal Institute of Chartered Surveyors (RICS), 2023). This promotes recycling, reuse, and the application of circular economy principles. Integrating carbon management into decision-making and procurement processes from project inception to end-of-life is crucial. This involves setting requirements for managing whole-life carbon, including clear guidelines for material reuse, efficient demolition practices, and adopting low-carbon solutions, ensuring decarbonisation efforts are embedded in all stages of infrastructure projects.

Guidance for Implementation 12:

Refer to the following documents for guidance on end-of-life:

a) RICS Section 5.6 End-of-life stage provides guidance on assessing emissions at the end-of-life stage of an asset, including considerations of circular economy.

b) RICS Section 6.2.4 requires asset owners/managers to optimise operational performance, identify retrofitting needs, procure asset management services based on whole life carbon, capture operational data to improve baselines, and assess and report emissions and performance against targets, including for end-of-life emissions.

c) International Cost Management Standard 3 (ICMS3) provides a high-level structure and format for classifying, defining, measuring, recording, analysing and presenting life cycle costs and carbon emissions associated with construction projects and constructed assets, including end-of-life emissions.

d) Transport for NSW is developing the Carbon & Cost Management in Infrastructure Technical Guidance. The guidance clearly delineates end of life in the cost structure. This includes considerations for asset renewal and augmentation of existing infrastructure, which has previously only been considered from a cost perspective in decision making, but now can be extended for carbon. Industry engagement has concluded with documents available to jurisdictions in late 2025

Requirements 7:

Suggested requirements and end-of-life principles are embedded throughout **Appendices A-H.**

is developing the Carbon & Cost Management in Infrastructure Technical Guidance. The guidance clearly delineates end of life in the cost structure. This includes considerations for asset renewal and augmentation of existing infrastructure, which has previously only been considered from a cost perspective in decision making, but now can be extended for carbon. Industry engagement has concluded with documents available to jurisdictions in late 2025.

Prequalification

The National Prequalification System, administered by the state and territory road agencies, classifies contractors who wish to tender for road and bridge construction contracts based on technical and managerial expertise, financial capacity, and past performance. Decarbonisation is proposed to be considered for future inclusion in the assessment criteria. Until this is resolved by Austroads, jurisdictions are encouraged to initiate suitable processes to extend the minimum requirements for delivering infrastructure. Austroads does not administrate this process; once prequalified, contractors can seek recognition from other agencies, subject to certain conditions.

The UK Procurement Policy Note 06/21 Taking account of Carbon Reduction Plans in the procurement of major government contracts (the Policy Note) (Government Commercial Function, 2021) outlines how to consider suppliers' Net Zero Carbon Reduction Plans in the procurement of major Government contracts. Many organisations are already incorporating these reduction approaches as part of their decarbonisation strategies. The Policy Note provides a comprehensive system with guidance, technical standards, Carbon Reduction Plan templates, and selection criteria. For industry, there are also multiple publicly available Carbon Reduction Plans that follow this technical guidance and can be used as references (see Balfour Beatty as one example).

As part of any overhaul of the National Prequalification System (NPS) to promote decarbonisation, or to apply any additional decarbonisation requirements, it is recommended to enhance and adopt a similar approach to the structure of the Policy Note and other documents listed in Guidance for Implementation 13. This would require extensive industry engagement and support from government, but would yield benefits, such as transforming other procurement approaches that the NPS can subsequently influence. Particularly in early project procurement such as ROI and EOI, also through operations under supply contracts.

Contact details for each state and territory representative can be found on the Austroads website, at: https://austroads.com.au/infrastructure/national-prequalification

Guidance for Implementation 13:

Background documents for recommended approach to prequalification and forming Supply Contract Panels.

UK Procurement Policy Note 06/21 Taking account of Carbon Reduction Plans in the procurement of major government contracts (the Policy Note) focuses on incorporating Carbon Reduction Plans (CRPs) into the procurement process for major government contracts. It requires suppliers bidding for major government contracts to commit to the goal of achieving Net Zero carbon emissions by 2050, and publish a Carbon Reduction Plan.

PPN 0621 Taking account of Carbon Reduction Plans Jan22.docx (publishing.service.gov.uk)

The assessment of suppliers' CRPs is based on their understanding of their environmental impact and carbon footprint relevant to the contract. Suppliers can be excluded if they fail to meet the CRP requirements.

The policy includes guidance on how to adopt and apply the selection criteria, ensuring that suppliers' carbon reduction efforts are considered in the procurement process.

Guidance and selection criteria
Guidance on adopting and applying PPN 06_21 – Selection Criteria April 23 (publishing.service.gov.uk)

Technical standard for the completion of Carbon Reduction Plans
Microsoft Word - PPN 0621 Technical standard for the Completion of Carbon Reduction Plans.docx (publishing.service.gov.uk)

Frequently asked questions
PPN 06/21: Frequently asked questions - GOV.UK (www.gov.uk)

Carbon Reduction Plan Templates
PPN-0621-Carbon-Reduction-Plan-Template-Jan22.odt (live.com)

Terms and Definitions

Terms	Definitions
Agency	All infrastructure delivery agencies and public non-financial corporations.
Asset Manager (or steward)	The manager tasked with developing and delivering the capital infrastructure project, before handing back to the Asset Owner.
Asset Owner	The owner of the developed infrastructure.
Baseline (or reference case)	Scenario for what carbon emissions and removals would have been in the absence of planned measures aimed at reducing emissions.
Biodiversity	The variety of life forms within a given ecosystem or habitat, crucial for maintaining ecological balance.
Carbon	Does not just refer to CO2 – but also to other relevant Greenhouse Gas (GHG) emissions – which are often measured in carbon dioxide equivalent units (CO2e). The use of CO2e allows for more accessible reporting and straightforward tracking and reporting of emissions over time. CO2e includes all seven of the greenhouse gases defined within the Kyoto protocol: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3). Each of these greenhouse gases has a conversion factor to its carbon equivalent.
Carbon Intensity	The amount of carbon emissions produced per unit of output or activity.
Carbon Intensity Options	Strategies to reduce carbon emissions in infrastructure projects by evaluating and implementing low-carbon solutions, considering cost and schedule impacts.
Capital Projects Framework	A structured approach for managing large-scale infrastructure investments.
Circular economy	An economy that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles.
Concept Design	A design completed with sufficient detail to spatially define each design element of the work in association with the environmental assessment (that is, general arrangement and footprint). The concept design must be completed in sufficient detail to: • Allow calculation of material quantities, including pavement quantities. • Ensure integration with existing road infrastructure. Potential conflicts with existing utilities and other infrastructure are to be identified during the design process and have addressed safety in design through early intervention in planning and design.
Constructability	The extent to which a project design is optimised to ensure the project can be constructed and maintained safely, efficiently and practically, while meeting project objectives. Constructability is closely related to Health and Safety in Design (HSiD). The two sets of processes are paired to provide safe, efficient and practical design.

Terms and Definitions

Terms	Definitions
Cost Benefit Analysis (CBA)	An economic analysis technique for assessing the economic merit of an infrastructure proposal. It involves assessing the benefits, costs and net benefits to society that the proposal would deliver. It aims to attach a monetary value to the benefits and costs wherever possible and provide a summary indication of the net benefit.
Decarbonise	To reduce or eliminate carbon dioxide emissions from infrastructure activities.
Early market engagement	The process of engaging with potential contractors and suppliers during the development of a project and generally prior to procurement. Early market engagement can be undertaken using a variety of methods, including market sounding, supplier briefing sessions and early contractor involvement practices.
Embodied carbon (or broader embodied emissions)	The greenhouse gas emissions and removals associated with the creation, maintenance and end-of-life disposal of an asset. This includes the emissions associated with the production and transportation of materials, construction related emissions and end-of-life emissions. In-use stage material-related emissions including maintenance, repair, replacement and refurbishment are also considered part of embodied carbon.
End-of-life carbon	Carbon associated with the deconstruction, transport, waste processing, and disposal of capital assets at the end of their useful life.
Environmental Product Declaration	An independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact (including carbon emissions) of products and services in a credible way. An EPD is compliant with the standard ISO 14025 and is known as a Type III environmental declaration.
Established maturity	Agencies with established maturity have a clear decarbonisation strategy aligned with net-zero goals, understand whole-life carbon emissions, develop low-carbon capabilities, encourage innovation, and continuously improve.
Foundational maturity	Agencies with foundational maturity have limited or no experience quantifying carbon emissions on their projects.
International Cost Management Standard 3rd Edition	ICMS is a principles-based international standard that sets out how to classify, define, record, analyse, present and compare construction proj-ect life cycle costs and carbon emissions in a structured and ogical format.
Investor Assurance Gates	Key checkpoints ensuring the viability and confidence of investors in infrastructure projects.
Legal Document Sets or Exhibits	Official documents used in legal contexts or as part of contract agreements.
Market Sounding	The process of assessing market interest and gathering feedback for infrastructure projects.

Terms and Definitions

Terms	Definitions
Maturing	Agencies with maturing capability have experience quantifying carbon emissions on its projects and the capability to set targets.
Modern Methods of Construction (MMC)	Innovative construction techniques aimed at improving efficiency, quality, and sustainability in construction and infrastructure.
Multi Criteria Analysis	A decision-making tool that evaluates multiple factors to determine the best option.
Nature Based Solutions	Utilising natural processes and systems to tackle environmental, social, and economic challenges in infrastructure projects by maximising the benefits provided by nature.
Net Zero	A target of completely negating the amount of greenhouse gases produced by human activity.
Operational carbon	Emissions generated during the use of the asset and can include operational energy, operational water, other operational processes and user's utilisation of the asset.
PAS 2080:2023 Carbon management in buildings and infrastructure	Specifies requirements for the management of whole-life carbon emissions in buildings and infrastructure in the provision, operation, use and end-of-life of new projects or programmes of work as well as the management or retrofit of existing assets and networks.
Project Team	The Project Team, made up of representative(s) the Agency (usually the asset manager or steward) and other designated representatives or stakeholders relevant to the activity being performed.
Professional Services Contractor (PSC)	External labour which has provided specialist advice, assistance or services.
Registration of Interest	An initial step where parties indicate their interest in participating in an infrastructure project.
Royal Institution of Chartered Surveyors (RICS)	The Royal Institution of Chartered Surveyors is a global professional body for those working in the Built Environment, Construction, Land, Property and Real Estate.
Strategic Design	The strategic design provides the location and alignment, typically of a number of design solutions. The following drawings may be used to show details of various design options developed for the Strategic design phase: 1. Alignment plans (including road corridor boundary) 2. Longitudinal sections 3. Typical cross sections 4. Preliminary cross sections at specific chainages. 5. Supplementary information drawings 6. Combined constraints maps including environment and major hazard creators, utilities. The alignment plan, longitudinal section and typical cross sections may be presented on Geographic Information System (GIS) or a digital model. A key part of strategic design is to identify the major constraints and risks and those things that may be creators of issues in the future design stages.

Terms and Definitions

Terms	Definitions
Supply chain	A network of organisations that convert raw materials into finished products.
Supply Contract Panels	Pre-approved lists of suppliers for streamlined procurement, ensuring consistent quality and competitive pricing.
Upfront Carbon	The carbon emissions and removals associated with the creation of an asset, network or system up to practical completion. This includes the emissions associated with the production and transportation of materials and construction related emissions. It excludes emissions generated during the use and end-of-life phase of an asset.
Value chain	The organisations, agencies, and industry stakeholders involved in creating, operating, and managing assets.
Value Engineering	The practice of improving project value by enhancing function and reducing costs.
Whole-life carbon (or whole of life carbon)e	The total greenhouse gas emissions and removals associated with the creation, operation and end-of-life disposal of an asset. This includes upfront carbon as well as in-use emissions (such as maintenance, repair, refurbishment and operational energy), end-of-life disposal, and benefits and loads beyond the system boundary.

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Appendix 1 – Sustainability Procurement Templates (Overview)

Transport for NSW is tasked with updates to sample requirement appendices.

For the latest sample requirements appendices contact: InfrastructureIndustryEngagement@transport.nsw.gov.au

Appendix 1.A
Sustainability Requirements (Design)

Appendix 1.B
Sustainability Reporting & Assurance Requirements (Design Phase)

Appendix 1.C
Sustainability Management Plan Requirements (Design Phase)

Appendix 1.D
PSC Returnable Schedule (Sustainability)

Appendix 1.E
Sustainability Requirements (Construct)

Appendix 1.F
Sustainability Reporting & Assurance Requirements (Construct Phase)

Appendix 1.G
Sustainability Management Plan Requirements (Construct Phase)

Appendix 1.H
Contractor Returnable Schedule (Sustainability)

Appendix 1.I
Market Interaction Process (Sustainability Questions)

Appendix 1.J
Incentive Regime (Sustainability)