Australasian Procurement and Construction Council

GUIDE TO BEST PRACTICE

PATHWAY TO GREEN CONSTRUCTION PROCUREMENT

AUGUST 2023

About APCC

The Australasian Procurement and Construction Council Inc (APCC) comprises Australian and New Zealand government agencies responsible for procurement, construction, asset management, and property management policy and practice.

As the peak council for public sector procurement and construction, the collective members create a unique central repository of knowledge and expertise to support improved delivery of services.

Established in 1967, the APCC was created by government for government. APCC members are responsible for procurement, construction and property and asset management policy for Australian State and Territory governments, the Australian Government and the New Zealand Government.

The work of the APCC is committed to procurement innovation, solutions and efficiencies designed to create savings, and maximise service delivery to the communities of Australia and New Zealand.

We achieve this by promoting a cohesive government procurement environment and managing national projects that deliver local benefit. Together, we harness the benefits of nationally consistent approaches through leveraging the extensive knowledge and expertise of members to generate innovative solutions that add value to what and how they buy, build and manage their assets.

APCC enables members to come together, collaborate and lead the broader public sector procurement and relevant industries while delivering quality engagement and resources.

We enhance the proficiency and stature of the profession by continually developing and applying knowledge and professional competence.

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Transport accounted for 19% of Australia's greenhouse gas emissions in 2022. Transport emissions continue to grow, and without intervention, the sector is projected to be Australia's largest source of emissions by 2030.

The APCC *Pathway to Green Construction Procurement* encourages practitioners to consider how sustainable decision-making can be prioritised throughout project lifecycles.

This is important work. In tandem with transport operation polices, climate-positive sustainable procurement of design, materials and construction can position transport agencies to create meaningful change and support government climate commitments.

Dr Geoff Allan
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Executive summary

Government procurement practitioners recognise that purposeful procurement practices create opportunities to advance environmental sustainability outcomes. They seek guidance on how to implement government environmental sustainability policies when procuring infrastructure and construction.

The *Pathway to Green Construction Procurement* focuses on the following key elements of environmental sustainability: energy, water, circular economy, biodiversity, and carbon emissions. It does not address the social or economic impacts of capital works projects.

While procurement practitioners are well versed in including environmental criteria and specifications in procurements, many decisions governing the success of these requirements are determined long before projects are placed in the hands of procurers. These decisions tie procurers and construction contractors to outcomes that may or may not be the most sustainable options for the realisation of the project. For this reason, many government agencies find that the effectiveness of environmental sustainability criteria used throughout the procurement phase is limited. The *Pathway* seeks to overcome this dilemma.

Existing environmental sustainability policies and guidelines focus largely on the operational and maintenance phase of buildings and roads. The *Pathway* encourages planners to embed environmental goals in the earliest possible phases of the project development process: in the initiation and ideation phases, then also in the planning, design, delivery and commissioning phases. These goals need to be continually translated throughout the process, setting best practice for achieving green construction procurement targets.

The Australasian Procurement and Construction Council (APCC) has developed the *Pathway* to make the inclusion of environmental sustainability criteria and considerations in government procurement more effective and assist governments as they move towards legislated emissions targets.

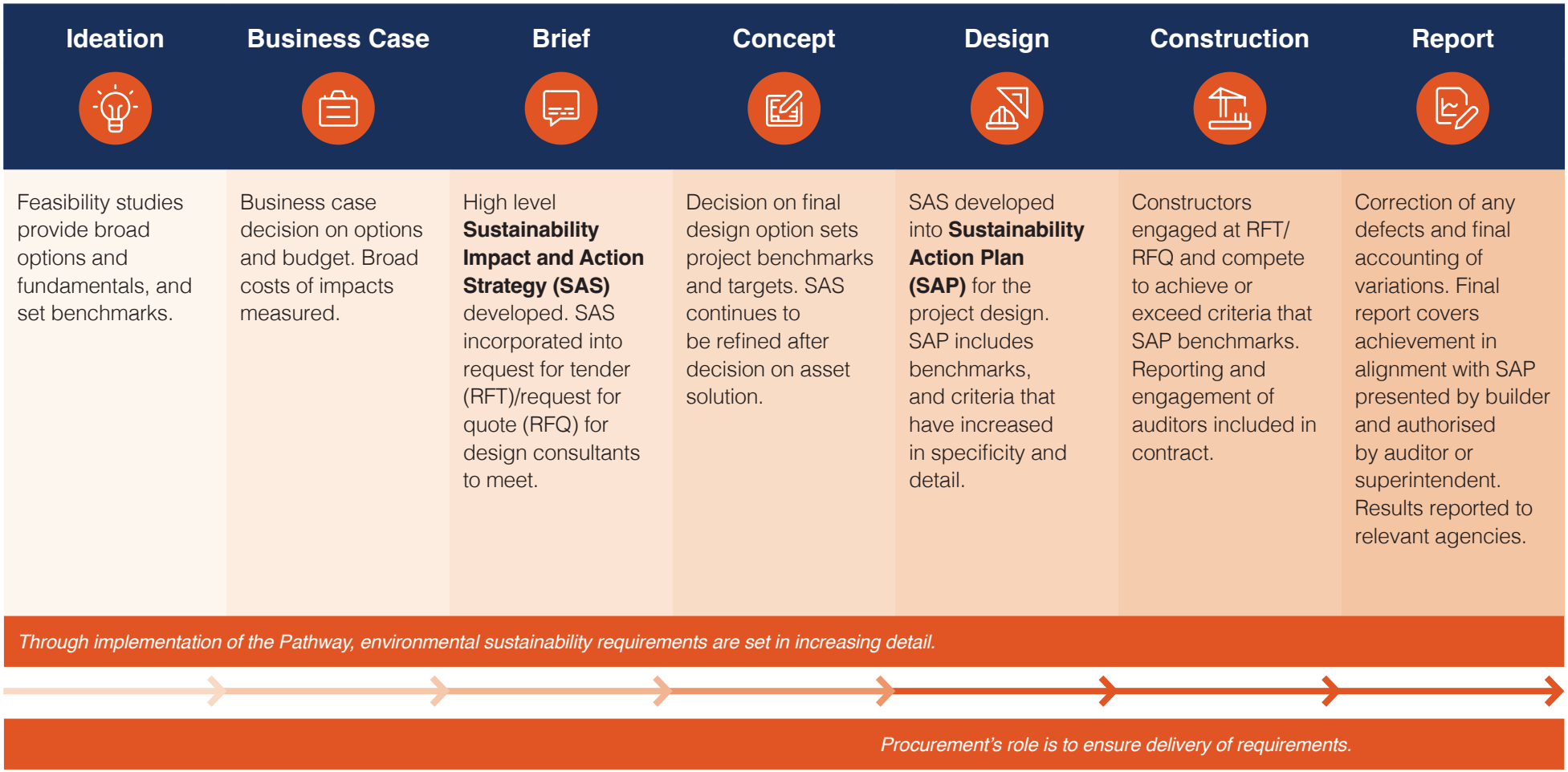
In the *Pathway*, green construction procurement refers to the engagement of builders to undertake work using construction materials, methods and works that maximise positive environmental outcomes in the built environment. This is achieved through the incorporation of environmentally responsible criteria in the procurement process, including key considerations of energy, water, circular economy, waste, biodiversity and carbon emissions. Green construction procurement seeks to limit negative environmental impacts in comparison to procurement that employs similar but less environmentally sustainable materials, methods and works. It has an environmental focus; thus, it does not address the social or economic impacts of capital works projects.

The *Pathway* aims to provide information and guidance to facilitate decarbonisation and strengthen other environmental efforts while granting space for government jurisdictions and agencies to shape their own approaches to environmental challenges in their respective operational contexts.

The *Pathway* addresses multiple phases, from ideation through to the business case phase, options analysis, design, procurement for works, construction and the handover phase. Upfront planning and strategy are considered in more detail to encourage agencies to 'front load' their decision-making processes in favour of environmental sustainability options and solutions to achieve better outcomes. The *Pathway* ends in the handover phase and recommends the inclusion of facilities managers in the ideation and advisory phases of design.

Summary of the Pathway to Green Construction Procurement

Figure 1: *Summary of the Pathway to Green Construction Procurement*



1. Introduction

1.1 Purpose of the Pathway

The *Pathway to Green Construction Procurement* has been developed to improve the effectiveness of environmental criteria included in government procurement and assist governments as they move towards legislated emissions targets. The *Pathway* aims to provide information and guidance to facilitate decarbonisation and other environmental outcomes throughout the procurement process, while granting space for government jurisdictions and agencies to shape approaches to environmental challenges in their respective operational contexts.

1.2 Green construction procurement

Green construction procurement refers to the engagement of builders to undertake work using construction materials, methods and works that maximise positive environmental outcomes of the built environment. This is achieved through the incorporation of environmentally responsible criteria in the procurement process, including key considerations of energy, water, circular economy, waste, biodiversity and carbon emissions.

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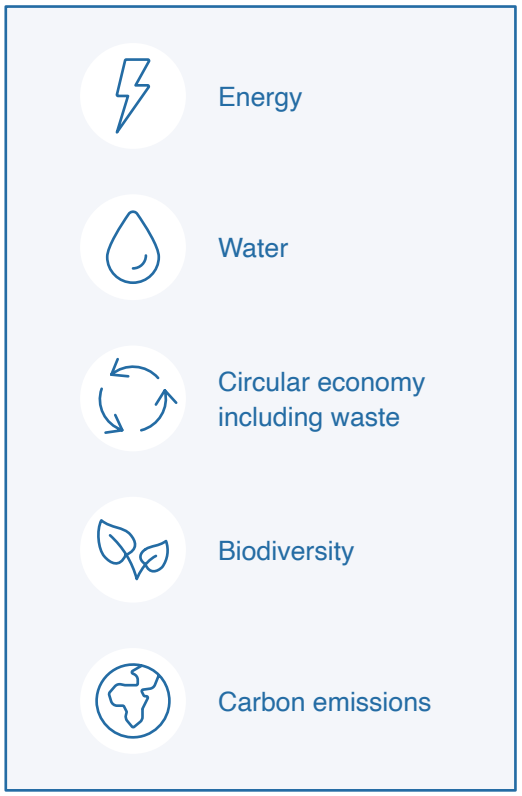


Figure 2: *Key considerations for environmentally responsible criteria.*

1.3 Scope of the Pathway

The *Pathway* lends itself to improved green outcomes across all forms of delivery and contractual models. The *Pathway* addresses multiple project phases: from ideation through to the phases of business case, brief, concept, design, and construction. It ends at the handover phase, although it urges for the inclusion of facilities managers much earlier, in the ideation and advisory phases of design.

The utilisation of standards ensures consistency and may help to facilitate the advancement of green construction procurement outcomes. The *Pathway* references PAS2080, a UK-based global standard for measuring and managing whole-of-life carbon during infrastructure delivery.

The PAS2080 standard emphasises leadership, targets and baseline-setting, measurement, monitoring and reporting that are fully in accordance with the principles recommended in the *Pathway*. While referencing the PAS2080 infrastructure work stages, the *Pathway* does not consider activities after handover and close-out; that is, operation and end of life. (See Figure 4).

Agencies seeking methodologies for managing costs and carbon may also consider the use of the International Cost Management Standard – 3rd Edition (ICMS3). ICMS3 provides a common reporting framework regarding the costs and carbon emissions of the construction life cycle.

While the *Pathway* highlights the use of PAS2080 and ICMS3, the adoption of these is dependent on respective policy landscapes and operational contexts; it falls within the authority of each jurisdiction and relevant delivery agencies.

1.4 Who should use the Pathway?

The *Pathway* is designed to assist government procurement practitioners seeking to improve the environmental outcomes of construction and infrastructure procurements. It aims to support government officials involved in policy, financial management and procurement as they assess environmental targets in their day-to-day decision-making and operational responsibilities.

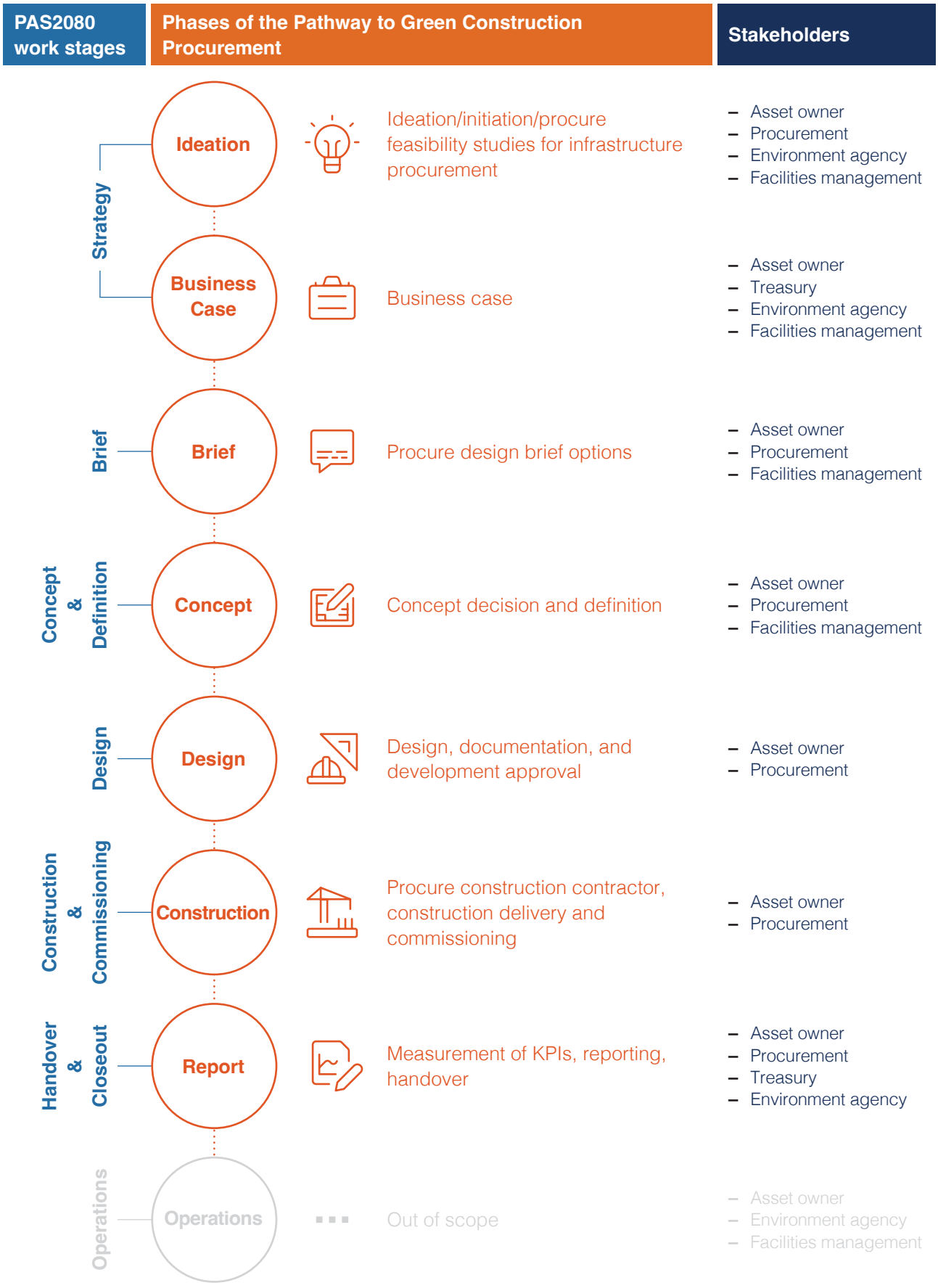
1.5 Why is the Pathway needed?

As the impacts of climate change unfold, we stand at a critical juncture for urgent action to drive emissions reductions and embed net zero targets in government procurement. While current practice seeks to avoid and minimise the environmental impacts of construction, more must be done to achieve legislated emissions targets. The *Pathway* intends to provide grounded and practical guidance in the present operational contexts.

As governments and industry increase their efforts, government procurement remains one of the biggest levers for driving the required emissions reductions. The *Pathway* recognises and encourages innovation, and promotes opportunities to avoid and minimise environmental impacts, achieve net zero and, aspirationally, work towards net positive environmental impacts for green construction procurement.

Figure 3: *The business case with time, quality and cost that includes sustainability.*

Figure 4: *Procurement phases: Pathway to Green Construction Procurement and PAS2080 work stages*



**NB: The Pathway depicts general phases and actors. Facilities management is a subset of the project owner, though it is acknowledged that each organisation uses its own terminology and structures.*

2. Opportunities for green construction procurement

The *Pathway to Green Construction Procurement* aims to build on existing environmental policies and guidelines to provide government agencies with procurement methodologies and mechanisms that will enable them to measure, benchmark, and maximise positive environmental outcomes. The *Pathway* aims to achieve this by adhering to the following principles:

2.1 Early target-setting for green construction considerations in the business case phase

The *Pathway* emphasises the importance of embedding green procurement targets, including carbon emissions, in the earliest possible phases of the project development process; that is, in the phases of initiation and the business case.

While existing environmental sustainability policies and guidelines focus mainly on the operational and maintenance phase, procurement outcomes are significantly affected by decisions made at the outset of projects. Addressing this means a change in business case requirements. Hence, the *Pathway* encourages embedding green procurement goals in the early stages of the planning phase and threading these considerations throughout the life cycle of a project.

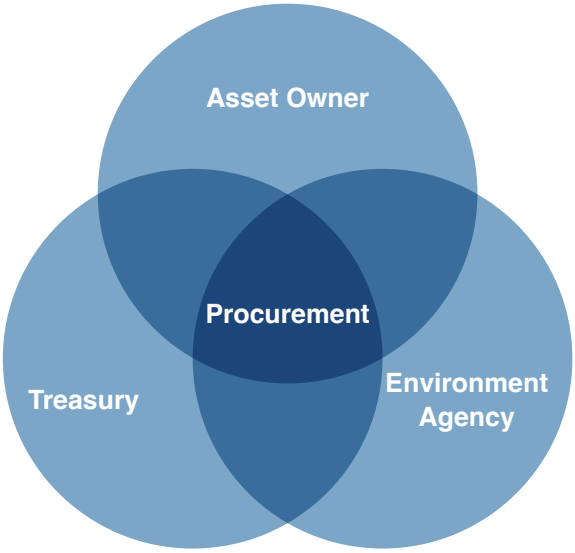


Figure 5: *Collaboration between procurement, treasury, asset owners and environmental agencies*

2.2 Collaboration for improved green construction procurement

Procurement has a vital role to play in supporting wider environmental efforts throughout project timelines; however, it is also vital that the efforts towards, and commitment to, improved environmental outcomes occur in collaboration with treasuries, departmental asset owners or facilities managers, and environmental agencies. Opportunities to engage industry should also be considered in order to drive green construction procurement outcomes.

Industry-government collaboration

The Materials and Embodied Carbon Leaders' Alliance (MECLA), jointly funded by the New South Wales Government and Government of South Australia, and managed by the World Wild Fund for Nature Australia, Presync and Climate-KIC Australia, consists of over 140 industry, government and research entities. There are currently eight MECLA working groups driving reductions in embodied carbon in the building and construction industry.

2.3 Carbon costing in the business case phase

Bringing more robust environmental outcomes into business case frameworks can be achieved by incorporating a monetary value for carbon emissions (e.g. carbon valuations) into project costs. Many corporations already take this approach, using a 'shadow carbon price' to assist in decision-making processes. As governments move towards net zero commitments, improving cost objectives to reflect emissions will help to maximise green construction procurement outcomes.

When seeking budget funding for projects, client agencies can achieve this by providing more extensive estimates of the environmental impacts of the options quantified in dollar terms. Business case templates need to reflect this requirement.

2.4 Broadening environmental criteria for improved outcomes

While governments have already incorporated sustainability principles into procurements, further work can be done to ensure that the environmental impacts of government infrastructure and building works play a more prominent role in the assessment of alternative solutions.

The *Pathway* outlines strategies and practices to maximise green procurement outcomes by integrating broader environmental criteria into construction procurements, including energy, water, circular economy, waste, biodiversity and decarbonisation.

2.5 Measurement and benchmarking

The *Pathway* emphasises the importance of embedding consistent measurement methods, and benchmarks for environmental outcomes, in the earliest possible stages of the project development process. Agencies proposing new or additional infrastructure or building projects can demonstrate leadership in green construction procurement by setting benchmarks and 'no-go' limits with respect to options for solving infrastructure needs.

These measurements may be facilitated by Australasian bodies that are actively working towards the development of consistent measurement tools, and the development of local and specific datasets and sources. Instances of unsuitable measurement, such as setting the dollar value of carbon too low or using measurement tools not relevant to Australasian conditions, lead to the provision of inaccurate advice to governments and can be misleading.

The provision of an inadequate range of options or lack of sufficient detail concerning the comparative whole-of-life costs of all available options can also skew decisions in the business case phase.

Measuring, and consistently and appropriately benchmarking, environmental impacts, including carbon valuation of each option in dollar terms, forms a critical principle in the *Pathway*.

ICMS 3: Emissions Reporting Framework

ICMS 3 provides a global framework that enables professionals to consistently measure, record, and report cost and carbon emissions across the life cycle of construction projects.

PAS 2080: Carbon Management Framework

PAS 2080 is a comprehensive carbon management framework that considers the whole-of-life cycle of infrastructure projects, providing a systematic approach for measuring, managing and reducing carbon emissions.

2.6 Reporting on outcomes

The final principle embodied in the *Pathway* is the requirement for reporting on outcomes. Post-implementation evaluation of projects is relatively standard practice. However, widened reporting on environmental outcomes to all stakeholder agencies, including environmental agencies, provides a significant opportunity to collect data and act on lessons learned, facilitating continual improvement and measurement against the government's environmental policy objectives.

See Section 5 and Section 6 for further detail.

3. Factors impacting green construction procurement

There are several factors that will influence the *Pathway to Green Construction Procurement*:

Commercial signals

Strong commercial signals and incentives (financial and contractual) must be sent to industry to maximise green construction procurement outcomes. Builders will respond to these signals in the competitive tender process. Without these signals, industry is unlikely to respond.

Leveraging technology

Leveraging technology, alongside other shifts in the industry, will support innovation, strengthen environmental objectives and ultimately contribute to the improvement of procurement outcomes. Building Information Modelling (BIM) is an essential enabler for implementing and measuring green construction procurement practices and environmental outcomes. Industry and government need to embrace the potential of technology to assist them.

Product certification

Product certification plays a critical role in the *Pathway*, offering validated measures of a product or service's environmental impact and enabling informed decision-making. The *Pathway* supports the use of libraries containing certified products. The APCC guide, Procurement of Construction Products, also provides guidance on product compliance for construction products.

Capability

While the capability for green construction procurement evolves, it will remain critical for government agencies to continue to upskill their procurement staff to meet these emerging challenges. Despite measures already undertaken, builders report that they are awaiting requests to provide more innovative solutions. Continually underestimating capability will not contribute to the advancement of green construction procurement outcomes.

Capacity

Buyers and suppliers must be empowered with the knowledge and training to understand how environmental targets translate to their reputational standing, costs, and revenue streams. As noted, buyers and suppliers have reported that they have greater capacity than procurers currently demand.

Standards

Adopting clear standards for environmental reporting and measurement is critical to advancing green construction procurement. Procurers can integrate standards established by bodies such as the International Organisation for Standardisation (ISO) and Standards Australia into their contracts to integrate expectations from suppliers concerning environmental impact. These standards must be accompanied by detailed specifications, evaluation criteria, measurement tools, and stringent reporting requirements. Some of these standards and specifications are currently in development, such as the ongoing revisions to the National Construction Code. As these standards mature, it will be crucial to provide clear guidance regarding which standards will be required and accepted.

Scalability

When addressing the scope of green construction procurement, the proposed measures must be scalable for project size and must account for the differences in regional and metropolitan areas, where trades, materials and expertise may be limited. In addition, considerations must be made about the relative benefit of taking a 'heavy' or 'light' implementation approach to project objectives as the supply chain, capability and other factors transition to a new normal.

Urgency

We stand at a critical juncture for urgent action to drive emissions reductions and embed net zero targets in government construction procurement. Environmental actions and outcomes must be realised urgently to meet international commitments and mitigate the impacts of climate change.

Leadership

Strong leadership across the public and private sector is crucial to implementing the *Pathway* with the requisite urgency.

4. Considerations for green construction procurement

4.1 Embodied emissions and a whole-of-life carbon framework

Acknowledging the array of challenges to be addressed to achieve meaningful outcomes, the *Pathway* considers the integration of several important environmental concepts into the procurement process.

Firstly, it is essential that governments move to integrate whole-of-life carbon assessment for decarbonisation throughout the initiation, feasibility, design, and construction phases of construction procurements. This brings particular focus to the reduction of embodied emissions, which are all emissions associated with the entire life cycle of a material or product.

To date, the primary focus of decarbonising government assets has been on operational energy use (Stage B). There are multiple options for the certification of the operational stage for buildings in Australasia.

However, as governments accelerate efforts towards emissions reductions, the embodied emissions must be addressed.

"For the most part, the majority of the carbon embedded into a project during its construction has been determined during the early planning phases of the project".

Decarbonising Infrastructure, Infrastructure Partnerships Australia, p5.

Data availability and transparency for whole-of-life carbon assessments will be essential in reducing total emissions of government construction projects. In 2050, embodied emissions will account for 85 per cent of emissions if action is not taken.[1] Infrastructure Sustainability (IS) rating suggests embodied emissions for roads are 2.5 times higher than operational carbon emissions.[2]

In the building space, a reduction of 10 per cent of upfront embodied emissions could save at least 19.9 million tonnes of CO2e between 2022 and 2030 and at least 63.5 million tonnes of CO2e between 2022 and 2050.[3]

Operational certification

The Climate Active Carbon Neutral Standard for Buildings is a voluntary standard to manage greenhouse gas emissions and achieve carbon neutrality. Developed for diverse building types, the Standard sets down the measurement, reduction, validation and reporting of a building's greenhouse gas emissions that will help achieve carbon neutrality. The standard can be used to improve the comprehension and management of carbon emissions and facilitate credible carbon neutrality claims, as well as for carbon-neutral certifications. Buildings achieving certification can use the Climate Active Carbon Neutral Certification Trade Mark. This mark offers immediate evidence to clients and stakeholders of the building's commitment to reliable, low-emission operations.

1 Vickers, Jeff et al., *Report on Embodied Carbon and Embodied Energy in Australia's Buildings* (Sydney and Wellington, NZ: Green Building Council Australia and thinkstep-anz, 2021), https://www.thinkstep-anz.com/resrc/reports/embodied-carbon-and-embodied-energy-in-australias-buildings-gbca/.

2 Infrastructure Sustainability Council, ClimateWorks Australia and Australian Sustainable Built Environment Council (Sydney, Melbourne, Auckland, 2020), 'Reshaping infrastructure for a net zero emissions future', Issues Paper, March 2020, https://www.cefc.com.au/media/sfxjzt5n/reshaping-infrastructure-to-lower-emissions-march-2020.pdf.

3 Vickers et al., *Embodied Carbon*.

To achieve emissions reductions, a whole-of-life carbon assessment, including upfront carbon, must be integrated into construction procurement processes. Identifying the emissions potential of different types of assets in the business case phase is, thus, a key step in green construction procurement.

The *Pathway* encourages project, policy, and procurement officers to use emissions data to benchmark carbon emissions generated by building and infrastructure from the earliest point of options analysis. Consultants are able to provide these estimates in early phases.

The *Pathway* also encourages procurers to utilise relevant tools and certification processes to maximise decarbonisation efforts.

Embodied carbon measurement in certification

NABERS, the Australian rating system for building environmental performance, is expanding to include ratings for embodied emissions from new buildings and major refurbishments. The NABERS embodied emission tool, shaped by feedback from market feasibility analysis, will measure, benchmark, and verify base building emissions, providing a consistent and effective means to assess a building's environmental footprint throughout the construction process.

	DELIVERY PHASE					IN USE / OPERATIONAL PHASE							END-OF-LIFE PHASE				NEXT PRODUCT
A0	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	C1	C2	C3	C4	D
Pre-construction	Raw material supply	Material transport	Manufacturing	Product transport	Construction and installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Other operational processes	Deconstruction / Demolition	Material transport	Waste processing	Disposal	Re-use, Recovery, Recycling. Exported utilities.

Figure 6: *Emissions stages adapted from EN 15978: 2011, PAS2080: 2016, ICMS3: 2021.*

4.2 Circular economy and waste management

Building materials alone, account for almost half of all the materials used globally and half of all the solid waste generated annually.[4] In Australia, over 6 million tonnes of construction waste are disposed of in landfills each year.[5] Construction and demolition waste constitute up to 50 per cent of New Zealand's landfill. In construction procurement, lack of technical expertise, information, appropriate design, specifications and training contribute to the challenge of reducing waste. The extraction, transport and disposal of materials and products used in developing buildings all contribute to emissions from the built environment.

With 90 per cent of critical waste decisions made in the design, this phase is the most common source of errors contributing to increased construction waste. However, with appropriate decisions and thorough considerations throughout the design phase, approximately one-third of construction waste can be avoided.[6]

A circular economy is based on three principles: eliminating waste and pollution, circulating products and materials, and regenerating nature.[7] Modelling suggests that transitioning to a circular economy could reduce Australia's carbon emissions by 165 million tonnes per year.[8]

The *Pathway* strongly encourages agencies to consider improved waste management, a key principle of a circular economy, when developing a Sustainability Impact and Action Strategy and corresponding plans for a project.

Australasian jurisdictions are beginning to incorporate circularity requirements to decrease waste during the construction phases. However, the *Pathway* considers that government construction procurement can do more to integrate principles of circularity throughout the procurement process.

Integration of circularity can be encouraged through training and resources so that suppliers can implement their own circularity management design, and other waste avoidance and reduction initiatives, including the allocation of a budget for resource recovery.

Procuring options that bolster a circular economy, governments may consider approaches that use recycled materials, prefabricated parts and modular designs. Governments should consider whether to build new structures or retrofit existing assets. Options that encourage ease of repair, upscaling and disassembling can further reduce waste and improve opportunities for reuse and recycle at the end of life.

Furthermore, incorporating features such as green roofs, rainwater harvesting systems or greywater recycling can also help regenerate natural systems.

As government procurers integrate requirements for circularity, decision-makers must take care to avoid decisions that cost more in the long term. As considerations for a circular economy are integrated into procurements, options must be considered in whole-of-life assessments and against full procurement criteria.

Leading Australasian initiatives

- South Australia's Waste Strategy 2020 – 2025 addresses the built environment sector and construction and demolition waste.
- The NSW Government *Circular Design guidelines for the built environment* present a whole-of-system approach for implementing circular design strategies.

4 Australian Government Department of Climate Change, Energy, the Environment and Water, National Waste Report 2020 (Canberra: Australian Government Department of Agriculture, Water and the Environment, 2020), https://www.dcceew.gov.au/environment/protection/waste/national-waste-reports/2020.

5 Edge Environment Propriety Ltd, *Construction and Demolition Waste Guide* (Canberra: Australian Government Department of Climate Change, Energy, the Environment and Water, 2011), https://www.dcceew.gov.au/environment/protection/waste/publications/construction-and-demolition-waste-guide.

6 PwC Australia, Building a More Circular Australia: The opportunity of transitioning to a circular economy (March 2023), https://www.pwc.com.au/assurance/esg/building-a-more-circular-australia.pdf.

7 'What is a Circular Economy?', Ellen MacArthur Foundation, (n.d.), https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview?gad=1&gclid=EAIaIQobChMIhorgmo7CgAMVvRF7Bx1jgQuVEAAYASAAEgKAzvD_BwE.

8 Othman, M., & Abdelrahim, M. (2019). Energy performance of building envelopes in hot arid climates: A review. *Renewable and Sustainable Energy Reviews*, 114, 109313.

4.3 Energy choice and efficiency

The energy sector, including extraction, generation or conversion, storage, transmission, distribution and consumption, contributes to 37 per cent of greenhouse emissions globally.[9] The path to net zero will require a transition to renewable energy options, and thorough consideration of energy choice and efficiency.

Improved energy performance is a cost-effective measure on the path to national emissions reduction targets and net zero by 2050. Improving energy performance in the commercial building sector can significantly reduce emissions, with the sectors responsible for around 25 per cent of overall electricity use and 10 per cent of total carbon emissions in Australia.[10]

The International Energy Agency (IEA) considers energy efficiency 'the first fuel', representing more than 40 per cent of the emissions abatement needed by 2040, which, along with electrification and behavioural change, will drive the 35 per cent reduction in energy intensity by 2030 needed in their Net Zero by 2050 Scenario.[11] Electrification will play a key role in the energy transition and supporting emissions reduction objectives.

Buildings are long-lived assets, with more than half of the building stock in 2050 expected to have been built or refurbished after 2019.[12] This means that delays in improving energy performance can lock in higher emissions for decades into the future.

To enable action in each sector of the economy, it is crucial to strengthen green construction and develop an understanding of relevant supply chains to inform the development of the energy strategies.

In most cases, improving the energy performance of existing buildings requires substantial retrofitting and the upgrading of appliances. As a result, new opportunities will emerge for businesses to deliver energy performance. At the same time, upgrades will increase demand for new products and construction materials, posing challenges for our supply chains. Improving supply chains and creating jobs will underpin the necessary upgrades to energy performance across the economy.

The *Pathway* recognises that all Australasian jurisdictions are well advanced in requiring energy efficiency in the design and construction of government buildings through the requirement to meet NABERS and other energy ratings levels.

The *Pathway* supports measures to increase energy efficiency and the development of renewable energy sources. In road construction, this may include calculating and comparing emissions, diesel use, embodied energy, and electricity consumption between different alternatives for materials for road and bridge construction as well as the construction methodology.

The *Pathway* supports the success of energy-efficient innovations in road infrastructure, such as LEDs and smart control in streetlights, proven to cause a 52 per cent reduction in energy use and a further 10–20 per cent improvement when smart controls are included.[13]

9 Thacker S, Adshead D, Fantini C, Palmer R, Ghosal R, Adeoti T, Morgan G, Stratton-Short S., *Infrastructure for climate action*, Copenhagen, Denmark: United Nations (UNOPS), 2021, https://content.unops.org/publications/Infrastructure-for-climate-action_EN.pdf?mtime=20211008124956&focal=none.

10 'Commercial buildings', Australian Government Department of Climate Change, Energy, The Environment, and Water, 2023, https://www.energy.gov.au/government-priorities/buildings/commercial-buildings.

11 Alyssa Fischer, "How energy efficiency will power net zero climate goals", International Energy Agency, 2021, https://www.iea.org/commentaries/how-energy-efficiency-will-power-net-zero-climate-goals.

12 ClimateWorks Australia and the Australian Sustainable Built Environment Council, 'Low Carbon, High Performance: How buildings can make a major contribution to Australia's emissions and productivity goals', 2016, https://www.asbec.asn.au/research-items/low-carbon-high-performance-report/.

13 'Street lighting Smart controls (SLSC) Roadmap', Institute of Public Works Engineering Australasia (IPWEA) & Australian Government Department of Environment & Energy, 2016, https://www.slsc.org.au/slsc-publications/slsc-roadmap.

The *Pathway* also acknowledges current actions by governments designed to reduce energy consumption in the construction of roads. These include investing in the development of recycled asphalt, which reduces rolling resistance and CO2 emissions, and using alternate materials and energy-saving technology in tunnels and toll stations, all of which can significantly reduce a road's overall energy usage.

Choosing energy sources should involve considering options that produce the least emissions, waste, and disruption to the natural environment. Improved energy efficiency in the construction sector is vital to reducing total energy consumption and emissions.

Australasian energy efficiency measures

Australia and New Zealand have implemented several measures to improve energy choice and efficiency:

- Australia's Trajectory for Low Energy Buildings outlines the trajectory towards zero-energy-ready buildings.
- Australia's 2022 National Construction Code (NCC) revisions pay special attention to existing residential buildings, particularly to the improvement of thermal performance, lighting, conditioning, and water use.
- New Zealand's Building for Climate Change sets minimum levels of operational efficiency for new buildings. For example, the NZ government sets operational emissions cap requirements for fossil fuel combustion, electricity, and water use. Initial, intermediate, and final operational emissions caps are the targets that all new buildings must meet in consent and code compliance phases.

4.4 Water management and conservation

Australia and New Zealand continue to experience extreme water resource variability. According to the Australian Bureau of Meteorology, in January 2020, the total accessible storage volume of urban water storages reached its lowest level (53 per cent of capacity) since the Millennium Drought ended[14]. Similarly, New Zealand has experienced severe widespread drought conditions that threaten water availability in the country. It is estimated that in a one-in-five-year drought, daily water demand in New Zealand is larger than the remaining flow of the water source.[15]

Water is essential throughout the construction life cycle: in direct construction activities, in the production of construction materials and throughout the operation of a built asset.

Water management and considerations should be integrated throughout the procurement process. Considering the type and scale of the project, it may be beneficial for procurers to require contractors to manage and calculate the water consumed and diversify their sources of water, including using recycled water and harvesting stormwater. This includes decisions on water sourcing, location, the layout of pipes and storage, heating methods, and specified appliances and fixtures. The availability and quality of water is thus crucial throughout the life cycle of built environment assets.

Moreover, the *Pathway* recommends calculating and assessing the embodied water or the water footprint in construction materials. This may include considering the use of concrete or asphalt mixed with polished, filtered, and reclaimed wastewater, and treated wastewater.

Construction can set the agenda to conserve and maintain high-quality water. The *Pathway* encourages considerations for water management, to be to be considered early in the planning and design phase of procurements to conserve water across the life of projects and maximise opportunities for improved water management.

All Australasian governments have implemented policies in procurement requiring the reduction of water use for the utilisation phase of buildings. Various water-efficiency measures in the design and construction phases can also reduce water waste and reap financial benefits. The *Pathway* endorses and encourages the strengthening of existing initiatives such as the New Zealand Government's Sustainable Construction Procurement Guidelines.[16]

New Zealand Sustainable Construction Procurement Guidelines

The Sustainable Construction Procurement guidelines require agencies to include a water-saving and management plan for both freshwater consumption and wastewater discharge in the design stage. Agencies, designers, and contractors are encouraged to work together to:

- provide water conservation education to staff
- conduct regular checks on installations for leaks
- prioritise the installation of low-flow toilets and bathroom fixtures and fittings
- incorporate efficient water treatment and recycle systems.

14 Bureau of Meteorology, *Water in Australia 2019–20* (Commonwealth of Australia, 2021), 23, http://www.bom.gov.au/water/waterinaustralia/files/Water-in-Australia-2019-20.pdf.

15 Bureau of Meteorology, *Water in Australia*.

16 New Zealand Government Procurement, Sustainable Construction Procurement Guidelines, Wellington: New Zealand Government, 2019, https://www.procurement.govt.nz/procurement/specialised-procurement/construction-procurement/construction-procurement-guidelines/.

4.5 Biodiversity conservation and regeneration

The biodiversity of Australian and New Zealand is declining. The construction industry has both direct and indirect impacts on biodiversity, through pollution, habitat loss and environmental degradation. Biodiversity conservation and regeneration are essential elements of the *Pathway*. The *Pathway* recognises that under national and state legislation, and local government environmental regulations, Australasian jurisdictions require the assessment of impacts on biodiversity in the feasibility and planning approval phases of construction projects.

When a consultant or client agency completes biodiversity impact assessments, procurers can ensure that design guidelines help protect local ecosystems and vulnerable habitats. The *Pathway* encourages procurement officers to consider biodiversity impacts during the design phase by including biodiversity conservation and regeneration in contracts.

The *Pathway* further encourages procurers to strive to ensure contractors develop mitigation strategies, underpinned by clear goals and targets, and measure impacts on biodiversity from their sourcing of materials in global supply chains. For instance, this could mean examining certifications of materials purchased and limiting the purchase or use of materials recognised to have significant negative impacts on ecosystems.

Governments can further help procuring agencies and contracting agencies by providing guidelines to consistently measure, report on and set targets for biodiversity conservation and regeneration.

Procurers may consider biodiversity regeneration in the early stages of design by encouraging the application of biophilic design principles and nature-based solutions in project design and delivery, and in surrounding landscapes.

Other areas where the whole procurement process and framework can support the preservation and enhancement of biodiversity include:

- adopting biomimicry design that mimics natural vegetation
- minimising construction noise by scheduling high-noise operations at specific times of the year and avoiding such activities during the mating season of birds
- understanding breeding cycle or seasons
- avoiding small yet important habitats such as ponds and rivers that serve as biological corridors.[17]

Another common method of enhancing biodiversity in the case of ecologically sensitive transport infrastructure is the inclusion of design measures such as artificial hollows and nest boxes, and the provision of fish-friendly culverts, rope bridges, glider poles and dedicated fauna underpasses and overpasses.

While all these initiatives depend on the type and scale of the project, the important point is that biodiversity needs to be considered in the initial stages and right through the project phases.

Emerging certification for an Australian nature repair market

The Australian Federal Nature Repair Market Bill 2023 aims to establish a voluntary national market for enhancing biodiversity. Eligible landholders undertaking biodiversity projects would receive trackable tradable certificates via a national register. The framework encourages private investment in biodiversity, especially when carbon storage projects offer co-benefits. The market aims to be science-based and empower Aboriginal and Torres Strait Islanders to share their unique knowledge on their own terms. Legally establishing the market ensures its integrity, encourages nature investment and drives environmental improvements nationwide.

17 Transport for NSW, *Future Transport 2056*, Sydney: NSW Government, 2018, 153, https://media.opengov.nsw.gov.au/pairtree_root/9a/76/83/89/3b/f3/45/7c/a5/a2/97/82/13/55/89/18/obj/168352.pdf.

5. The Pathway

Ideation Business case Brief Concept Design Construction Report

5.1 Ideation

Effective environmental outcomes begin with decisions in the ideation and business case phases. At this point, government decides on goals for the project and generates the viable options to be considered as solutions to the need. The ideation phase is fundamental in setting up the options for decision-makers to consider in the business case phase. During the initial decision-making phase, when government is discovering and assessing needs, the advice given should include reference to the full breadth of policy goals and targets. In this phase, feasibility studies should be conducted that describe the broadest range of environmental impacts and goals, including the potential emissions of all viable alternatives.

Feasibility studies should include considerations for green construction procurement: decarbonisation, circular economy and waste management, energy choice and efficiency, water management, and biodiversity conservation and regeneration. Consideration of Indigenous practices, people and policies may also serve to further enhance identifying environmental outcomes at the ideation stage.

Requests for Tender (RFT) or Requests for Quote (RFQ) given to consultants to undertake feasibility studies on proposed construction should contain requirements to estimate environmental factors as well as economic and social ones. They should also contain requirements to consultants to calculate estimates of the environmental impacts of all viable alternative solutions.

The brief to the consultants should require the following for each option in contrast to a 'do nothing' or status quo option, regardless of size or location:

- impact on the natural environment and potential mitigation actions
- estimation of the full-life-cycle emissions generated by each option, with estimation of the embedded carbon (this enables a benchmark to be set)
- allocation of a cost to these factors, especially to the mitigation of emissions, and suggestions as to how this can be achieved
- advice and targets for the type and level of ratings (NABERS, GreenStar, ISC, GBCA etc.) that it would be most appropriate to seek in the construction phase
- advice and targets for potential recycling, use of recycled materials, savings on waste and retrofitting.

These will necessarily be broad estimates at this stage. This process sets the initial benchmarks, which are then fine-tuned over the planning and procurement process. These benchmarks are informed, calculated estimates, based on experience and rough estimates of quantities in like projects. They provide improved information for government decision-makers, allowing them to compare the options put forward. Current consultants are fully capable of providing this information.

Ideation | **Business case** | Brief | Concept | Design | Construction | Report

5.2 Business case

The business case decision on options and budget is the earliest point of action and pivotal to environmental outcomes. The business case is completely influenced by the feasibility study results, which have generated the viable options to be considered as solutions to the need. At this point, when seeking budget funding for projects, client agencies need to provide more extensive estimates of the environmental impacts, and of the options presented in dollar terms, as developed in the ideation phase. These must include the cost of emissions. Business case templates need to reflect this requirement.

The business case should also include the analysis of options against all criteria. This should include consideration of whether to build or not to build, and options to maintain or retrofit existing assets. The business case should also include any financial incentives for the builder to meet or exceed the benchmarks and ratings set for the proposed project, and the cost of any audit function.

At this juncture, it is important that appropriate measurement tools are employed, and implied or derived costs of impacts are included. Consistency of measurement across alternatives, including reliability and veracity of approach, is also crucial.

5.3 Procure design brief

At this point in the project timeline, the *Pathway* proposes the Client Agency develop a Sustainability Impact and Action Strategy (SAS) embedding environmental impacts and objectives in a clear and consistent manner in line with the business case to maximise value and green construction procurement outcomes. This would contribute to a stronger impetus for improved practices and environmental considerations throughout the full project lifecycle.

The SAS should address the broadest environmental sustainability impacts of the chosen option (established at the ideation phase).

In this phase, the high-level SAS should include sections covering whole-of-life carbon, circular economy and waste management, energy, water and biodiversity. Strategies and opportunities for innovation such as nature-based solutions, and use of certification should also be considered. The broad estimates of impacts – for example estimates of carbon emissions – continue to develop at this phase, and become fixed targets and benchmarks, to be improved upon at the design and construction phases. Options must be considered in whole-of-life assessments and the co-benefits of each approach quantified. The development of the Risk Assessment Plan should also describe any risks relating to climate change and be cross referenced to the SAS.

The SAS should be incorporated into the RFT/RFQ for designers and should encourage competition and innovation to meet or exceed targets and green construction procurement goals. This encourages designs that incorporate green products and materials.

Life Cycle Analysis standards and certification

Standards and certification for Life Cycle Analysis (LCA) play a critical role in encouraging sustainable procurement by offering detailed, trustworthy and extensive data on a product's environmental footprint across its lifespan. Adhering to robust LCA standards and certification protocols, organisations can effectively incorporate environmentally responsible products into their procurement processes. For LCAs conducted by the Australasian EPD Program and the Global GreenTag EPD Program, compliance with Australian Standards AS ISO 14040, 14044, ISO 14025 and EN 15804+A2 is essential. In the built environment, these LCA standards are prerequisites for the use of the Green Star Ratings tool and the Infrastructure Sustainability Rating tool.

5.4 Concept decision and definition

In the concept decision and definition phase, the client agency's decision on a design option for the asset solution provides further opportunity to refine the SAS. The SAS underpins a detailed Sustainability Action Plan (SAP), which provides clear benchmarks for the tender competition between potential designers and builders.

The decision on the final design option sets benchmark levels for emissions and other environmental sustainability targets. These benchmarks have now been established as 'requirements' and will be further developed as the SAS feeds into an SAP for the elected design to be constructed by the builder.

Ideation · Business case · Brief · Concept · **Design** · Construction · Report

5.5 Design, documentation, and development approval

During the phase of design, documentation, and development approval, it would be expected that previous phases have adjusted and refined the SAS, as it can now develop into the Sustainability Action Plan (SAP) for the defined project. It is expected that the SAP includes a broad range of environmental benchmarks, such as Green Star, NABERS, ISCA, PAS2080 and other methods of measurement of embodied carbon, depending on the type of project. The SAP should also incorporate outcomes that align with broader government policies, such as energy and water-saving requirements.

The Risk Assessment Plan should describe any risks relating to climate change and be cross-referenced to the SAP. Agencies should ensure that the successful tender is required to provide reporting on the SAP.

With the SAP now defined with a full design approach, it can be used to demonstrate to potential builders what goals they should seek to achieve or exceed in their bids to tender for the project. The SAP provides important guidance to builders in terms of the standards to be met. The green construction procurement offer from the successful builder then forms part of their contract requirement.

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5.6 Construction procurement and delivery

The construction procurement and delivery phases involve engagement with the market to deliver the project. Government agencies may consider enhancing their prequalification criteria so that builders are to include assessment of their commitment to environmental sustainability principles, as well as their financial stability, quality of staffing and so on. MECLA's Environmental Sustainability Pledge is one method of encouraging construction firms to improve their environmental sustainability work practices.

Apart from changes to prequalification, the RFT/RFQ for construction should require potential contractors to compete to achieve, or innovate to exceed, the benchmarks provided in the SAP. This encourages contractors to compete to improve on already established environmental design criteria.

Assessment criteria for the tenders could be a pass/fail or graded, depending upon the specific criterion and required outcome. The contract to engage the winning bid must commit the contractor to achieving the benchmarks in their tender, and, if agreed in the business case phase, any incentives for exceeding the benchmarks described. The contract/s should also require regular reporting and engagement of accredited auditors where appropriate, or compliance with client-engaged superintendents or auditors if necessary. The contract for non-certified auditors (e.g. auditor for waste management) needs to specify oversight requirements and reporting.

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5.7 Reporting, commissioning and handover

The commissioning and handover phases are the culmination of efforts to achieve environmental sustainability outcomes throughout the procurement phases of the project (noting that the *Pathway* does not cover the facilities maintenance and end-of-life phases).

The correction of defects and final accounting of variations includes any over-achievement in terms of the environmental sustainability benchmarks set for the project, and, therefore, any financial incentives agreed to under the contract.

The final report on the outcomes of the project covers the achievements in terms of the SAP. These outcomes, including embedded emissions levels achieved, are reported to the relevant asset owner and environmental agency.

Figure 7: *Summary of steps on the Pathway to Green Construction Procurement*

1. Ideation

1. The ideation phase is fundamental in setting up the options for decision-makers to consider in the business case phase.
2. The RFT for consultants to undertake feasibility studies requires calculation of broad environmental impacts, including whole-of-life carbon emissions for all alternative solutions.
3. Broad estimates are to be provided against a status quo option. This sets the initial benchmarks, which are then fine-tuned throughout the planning and procurement process.

2. Business case

1. The business case decision on options and budget is the earliest point of action and pivotal to sustainability outcomes. Submission to government for agreement on project options and funding includes broad green-construction impacts and cost of carbon emissions measured in a cost-benefit analysis of options.
2. The business case includes consideration of any financial incentives that will be provided to the builder for meeting or exceeding the benchmark or ratings set for the proposed project, and the cost of any audit and reporting function.

3. Procure design brief

1. A high-level SAS is developed, based on the option chosen and benchmark estimates for green construction targets and goals.
2. RFT/RFQ for design consultants requires they work to the Strategy, providing alternatives to meet or exceed the sustainability targets, including reductions in emissions, creating an opportunity for designers to compete in terms of providing innovative solutions.

4. Concept decision and definition

1. The decision-making phase of the design concept provides a further opportunity to refine the SAS to strengthen sustainability goals and benchmarks based on the design option chosen.
2. The decision on final design sets a level or benchmark of emissions and other green construction targets designed and/or provided by designers.

5. Design, documentation, and development approval

1. The SAS is amended and becomes a Sustainability Action Plan (SAP) for the specific project now defined. A broad range of green construction factors have benchmark criteria set, e.g. Green Star, NABERS, ISCA, PAS 2080.

6. Construction procurement and delivery

1. RFT/RFQ for builders undertaking construction has a requirement for builders to compete to achieve or exceed benchmark criteria concerning a range of environmental factors. Assessment of tenders could have pass/fail or graded marks for each criterion.
2. The contract requires the achievement of benchmarks, and allows for exceeding benchmarks and a potential bonus. The contract requires regular reporting against SAP benchmarks.
3. An auditor, or ratings auditors, by the builder or client ensures compliance and the achievement of benchmarks. Where a non-certified benchmark is established, a ‘superintendent/ auditor’ can be contracted to monitor the reporting on, and meeting of, the SAP criteria.

7. Reporting, commissioning, and handover

1. Defects are corrected and final accounting of variations completed.
2. The final report against the SAP is presented by the builder and authorised by the auditor or superintendent and must be supplied to the asset owner and the environmental agency as certification of achievement of ratings and benchmarks.
3. Embodied emissions reported to the environmental agency.

6. Sustainable Action Plan Matrix

	Ideation, Business Case and Brief	Concept and Design	Construction	Report
	Sustainable Impact and Action Strategy (SAS) completed →	**SAS detailed into Sustainability Action Plan (SAP)** →	**SAP implemented** →	**SAP achievements reported and plan handed to asset owner**
Whole-of-life carbon	– Business case includes proposal of carbon-base case, which outlines emissions through a whole-of-life perspective for each option under consideration. Consultants undertake feasibility studies to provide estimates of emissions at all stages of proposed options as well as mitigation strategies. – SAS is developed early for project.	– SAS begins to turn into a SAP for the specific project. – Whole-of-life (including embodied carbon) benchmark established for preferred design option and included in SAP.	– Contract for construction requires meeting established benchmarks. – Could include incentives for overachievement.	– Results of carbon goals in SAP reported to relevant agencies.

	Ideation, Business Case and Brief	Concept and Design	Construction	Report
	Sustainable Impact and Action Strategy (SAS) completed →	**SAS detailed into Sustainability Action Plan (SAP)** →	**SAP implemented** →	**SAP achievements reported and plan handed to asset owner**
Circular economy	– Feasibility studies include circularity principles and requirement detailed in SAS.	– Design incorporates circularity principles, such as designing for deconstruction and reuse. – Collaboration with suppliers and builders is emphasised to minimise waste to landfill during construction, considering end-of-life phase and demolition. – Targets are set for recycling, using prefabricated or modular parts, and employing green or recycled materials. – Procedures for recording, reporting and verifying recycled content under the contract are outlined, ensuring its maximum use without compromising quality, safety or capability. – Standards or specifications for using recycled content in goods or services under the contract are specified.	– Contractors may choose suppliers and resources that use Environmental Product Declarations and/or product stewardship schemes.	– Audit and report on circularity.
Waste	– SAS addresses issues of waste in construction and during life of asset.	– SAP and contract for design requires minimisation of waste in construction through design and considerations of waste minimisation during use and life of asset.	– SAP and contract for construction require builder to monitor and report on all waste and recycling actions.	– SAP includes reporting of results on waste and recycling to asset owner.

	Ideation, Business Case and Brief	Concept and Design	Construction	Report
	Sustainable Impact and Action Strategy (SAS) completed →	**SAS detailed into Sustainability Action Plan (SAP)** →	**SAP implemented** →	**SAP achievements reported and plan handed to asset owner**
Energy	– Requirement of minimisation of energy consumption and achievement of certified rating in SAS.	– Design establishes a benchmark energy rating to be achieved. – Design choice minimises total energy consumption, e.g. through thermal performance, lighting, conditioning in buildings, or LEDs and Smart Controls in streetlights. – Design prioritises renewable energy sources and avoids use of non-renewable energy resources such as gas for operations. – Energy choice aims for minimal emissions, waste and disruption to environment. – Design for net energy producer through localised energy generation where appropriate.	– Use of energy-efficient equipment and resources. – Minimal use of fuel and gas where possible. – Construction to achieve energy rating set in contract.	– Implementation of energy efficiency through facilities management.
Water	– Requirement to achieve certified rating and minimise consumption of water. – SAS requires water strategy (reuse, pollution avoidance, storage) as part of achievement of rating certification.	– Design considers water efficiency and conservation measures and minimises negative impacts on local hydrology. – SAP requires designers to set highest potential rating certification scale in design.	– Minimisation of water use in construction phase. – Utilisation of non-potable water where possible to achieve rating scale set in SAP.	– Water saving achievements and built-environment water-saving devices reported to building owner.

	Ideation, Business Case and Brief		Concept and Design		Construction	Report
	Sustainable Impact and Action Strategy (SAS) completed →		**SAS detailed into Sustainability Action Plan (SAP)** →		**SAP implemented** →	**SAP achievements reported and plan handed to asset owner**
Biodiversity	– SAS includes biodiversity impact assessment. – No net loss for biodiversity where base case considers mitigation hierarchy: avoidance, minimisation, rehabilitation, restoration and offset.		– SAP includes design innovations to protect or encourage biodiversity to be included in brief and contract for design, e.g. green roofs and green walls.		– SAP and contract for builder includes biodiversity elements developed during design phase.	– Biodiversity achievements reported in SAP to asset owner.

Glossary

Asset owner	An individual or entity that legally owns and holds rights to an asset. These assets can be financial, such as stocks, bonds or real estate properties, or non-financial, such as machinery, vehicles or intellectual property. Asset owners have the right to utilise the asset, earn income from it and decide its disposition (e.g. sell, exchange or transfer). They are also responsible for the risks, costs and liabilities associated with the asset. In the context of investment, an asset owner could be an institutional investor such as a pension fund, insurance company or sovereign wealth fund.
Benchmark criteria	Contractual criteria of reference against which project contracts may be compared or assessed. Specific standards or goals that projects or initiatives are expected to meet or exceed.
Biodiversity	The variety of life in a particular habitat or ecosystem, encompassing the range of species, genes, and ecosystems.
Biophilic design	An architectural design approach that seeks to connect building occupants more closely to nature by incorporating natural elements or patterns into the built environment. Biophilic design can improve the health, wellbeing and productivity of the occupants and reduce stress.
Carbon costing	The process of quantifying the environmental impact of a product, process or service in terms of its carbon dioxide equivalent emissions. When described in dollar terms, carbon costing can enable organisations to understand and manage their carbon footprint.
Circular economy	Includes three principles: designing out waste and pollution, keeping products and materials in use through refurbishing, reusing and designing for adaptation or deconstruction, and regenerating natural systems. The concept of retaining materials at their highest value normally means that embodied carbon invested is also retained, and low carbon outcomes are more likely. However, this is not always the case, and it is important to design for outcomes that are both low carbon and circular.[17]
Client agency	The organisation, often within the context of public sector or government, that seeks the expertise or services of another party (often a contractor or service provider) to complete a project or task. The client agency outlines the project's requirements, sets the objectives and goals, provides necessary information and often has ultimate decision-making power over the project.
Climate risk factors	Potential negative effects of climate change on an organisation's operations, financial performance, or physical assets. These can include extreme weather events and regulatory changes related to climate change.
Construction	The process of creating physical structures of the built environment, including buildings, roads and rail systems. It involves planning, design and execution activities to transform designs into tangible structures. Construction covers residential, non-residential, commercial, industrial and infrastructure projects, including site preparation, foundation laying, framing, installations, finishing and landscaping. It utilises materials, equipment and skilled labour to bring projects from concept to completion.

17 'What is a Circular Economy?', Ellen MacArthur Foundation, (n.d.), https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview?gad=1&gclid=EAIaIQobChMIhorgmo7CgAMVvRF7Bx1jgQuVEAAYASAAEgKAzvD_BwE.

Embodied carbon/ embodied emissions	Terms used interchangeably in this paper to refer to the greenhouse gas emissions associated with materials and construction processes throughout the life cycle of a building or infrastructure. The terms include the sum of up-front embodied carbon, in-use embodied carbon and end-of-life embodied carbon, measured by CO2-e.[18]
Energy choice	Choice of energy sources that produce the least emissions, waste and disruptions to the natural environment.
Environmental criteria	Specific benchmarks or guidelines related to environmental performance or impact, used to evaluate projects, products or services.
Energy efficiency	The practice of reducing total energy consumption by using the least amount of energy to provide the same service or perform the same function. Energy-efficient devices or systems limit energy waste and consume less energy than energy-inefficient products and services for the same, or improved, performance.
Environmentally sustainable procurement	Assessing the impact and opportunities of all the goods, works and services in the construction of infrastructure so that they inflict minimum damage and provide a positive contribution to the environment throughout their life cycle.
Green construction procurement	The engagement of builders to undertake work using construction materials, methods and works that maximise the positive environmental outcomes of a built environment. This is achieved through incorporating environmentally responsible criteria into the procurement process, including key considerations of energy, water, circular economy, waste, biodiversity and carbon emissions. Green construction procurement seeks to limit negative environmental impacts in comparison to the impacts of materials, methods and works that would otherwise be procured for the same purpose.
Green Star	A rating system or certification program for buildings or projects that meet specific environmental criteria. Green Star certification typically considers various aspects of a building or project, such as energy efficiency, water conservation, waste management, indoor environmental quality and sustainable material usage. The certification aims to promote environmentally responsible and resource-efficient practices in the built environment.
Infrastructure	The construction and maintenance of foundational physical structures in the built environment, primarily focusing on non-residential buildings, roads and bridges.
ISC	Infrastructure Sustainability Council. The ISC is a member-based, non-profit organisation that promotes sustainability in the planning, design, construction and operation of infrastructure projects in Australia, New Zealand and beyond.
Life cycle analysis (LCA)	A systematic analysis of the environmental impact of a product or service throughout its life cycle, from raw material extraction through to disposal or end of life.
NABERS	National Australian Built Environment Rating System: an initiative by the Australian government to measure and compare the environmental performance of Australian buildings and homes. It provides a rating from one to six stars, indicating the energy efficiency, water usage, waste management and indoor environment quality of a building or home. A higher rating represents better environmental performance.
PAS2080	A UK-based global standard for measuring and managing whole-of-life carbon during infrastructure delivery. The standard was developed by the Green Construction Board (GCB), the Department for Business, Innovation and Skills (BIS), and representatives from Mott MacDonald and Arup.
Phases of procurement	The structured stages in acquiring or developing a government asset, which are typically consistent across different types of assets. These phases outline the process flow, as depicted in Figure 1, and involve various elements of development.

Post-implementation evaluation	A review process conducted after the completion of a project to assess its performance and the degree to which its objectives were met. This evaluation also identifies lessons learned that can be applied to future projects.
Risk assessment plan	A document that outlines potential risks to a project, their possible impacts, and strategies to manage and mitigate these risks.
Resource recovery	The practice of extracting useful materials or energy from waste or discarded materials. This can include recycling waste material, composting organic matter or converting waste into energy. The goal of resource recovery is to conserve resources, reduce waste and minimise environmental impact.
Sustainability Impact and Action Strategy (SAS)	A strategy that embeds environmental sustainability considerations and objectives in the whole of a project's life cycle. By aligning with the project's business case, the SAS maximises both value and positive environmental outcomes, serving as an impetus for improved environmental practices.
Sustainability Impact and Action Plan (SAP)	A comprehensive plan evolved from the SAS during the Design, Documentation, and Development Approval phase of a project. In this phase, initial estimates, such as carbon emissions identified during early feasibility stages, are refined into firm targets and benchmarks in the SAP, with the aim of continually improving these during the construction phase.
Nature-based solutions	A termed coined by the International Union for Conservation of Nature, referring to the sustainable management and use of nature for tackling socio-environmental challenges. Such challenges include climate change, water security, water pollution, food security, human health and disaster risk management. Nature-based solutions harness the power of nature and the services it provides to address these issues, often providing simultaneous economic, social and environmental benefits. These solutions can involve a range of strategies, including the protection and restoration of natural ecosystems, the creation of new green spaces and the sustainable management of existing natural areas.
Water management	The planning, development, distribution and management of water resources to ensure their optimal use. In an environmental context, this often refers to strategies designed to conserve and protect water resources while meeting the needs of populations and ecosystems.
Whole-of-life carbon	The total amount of carbon dioxide emissions produced throughout the life cycle of a product, building, or service. It includes carbon produced during manufacture and use, and end-of-life disposal or deconstruction.

Further resources

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